Landscape scale risk assessment of cyanobacteria blooms in California lakes

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  - Annual dog deaths attributed to cyanotoxins
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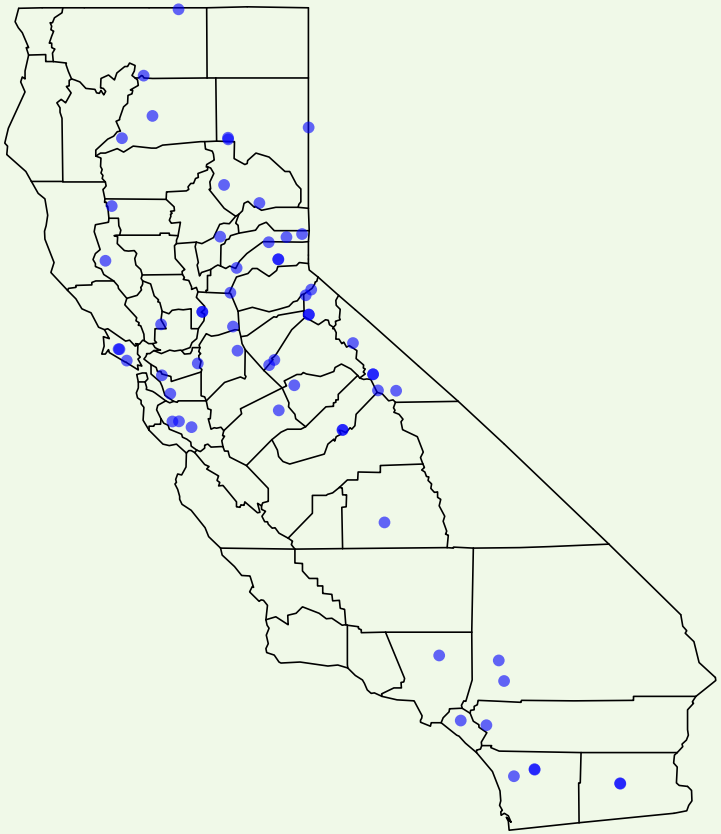
- New situations and HAB organisms
  - Golden algae, *Pyrmnesium parvum*
  - Ubiquitous and year round toxins
  - Cyanotoxins detected in marine shellfish and marine outflows

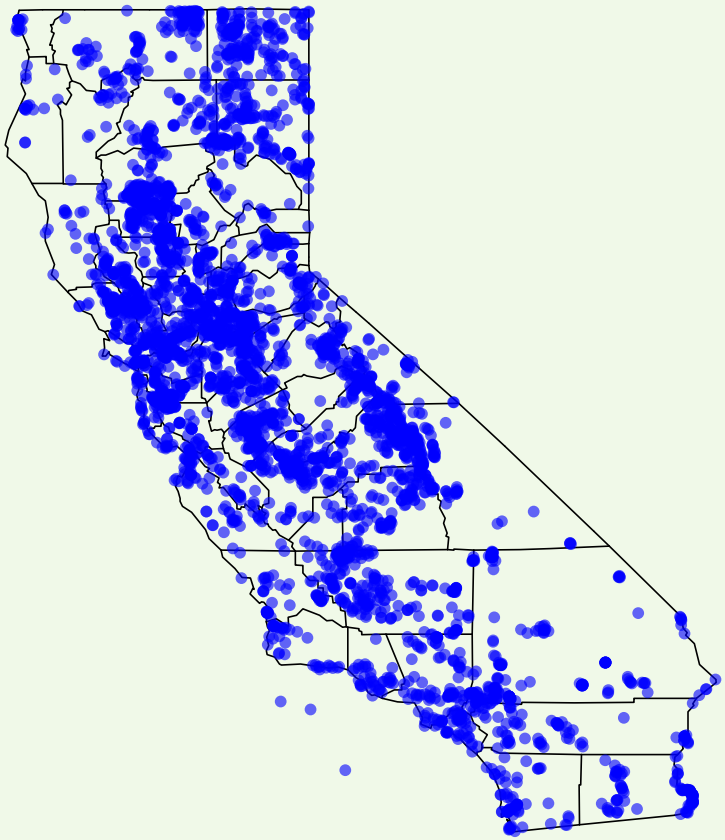
Lack of routine monitoring data for California lakes

Limited *in situ* data for risk assessment, lots of watershed data

NLA07, NLA12: 59 lakes

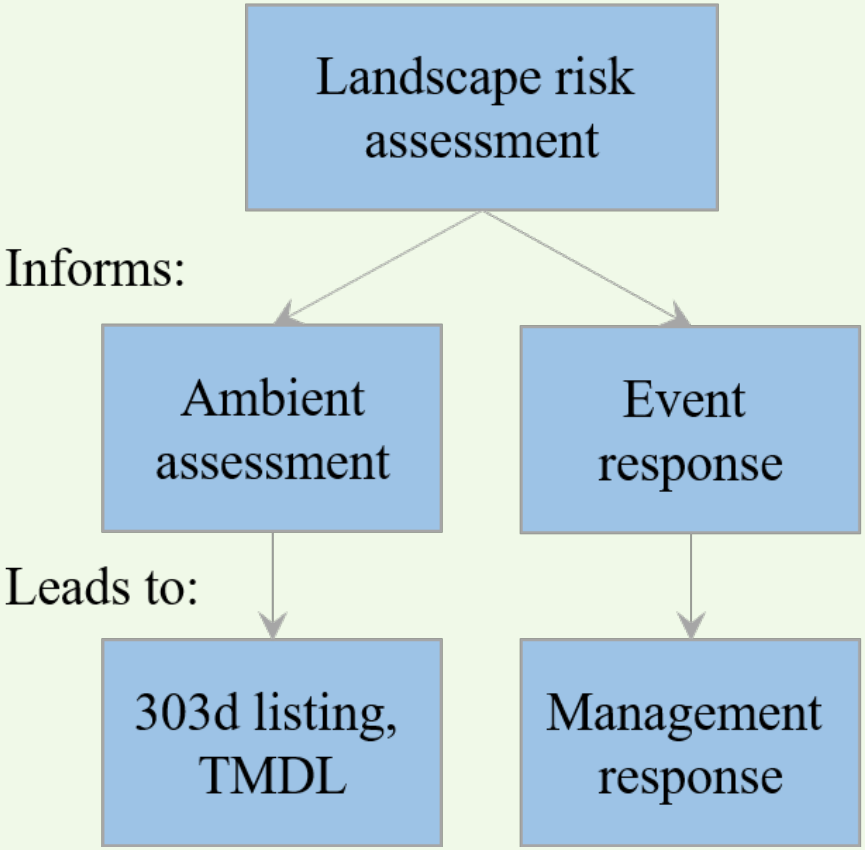


LakeCat: 4924 lakes



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

California has a strategy to develop a lake bioassessment program



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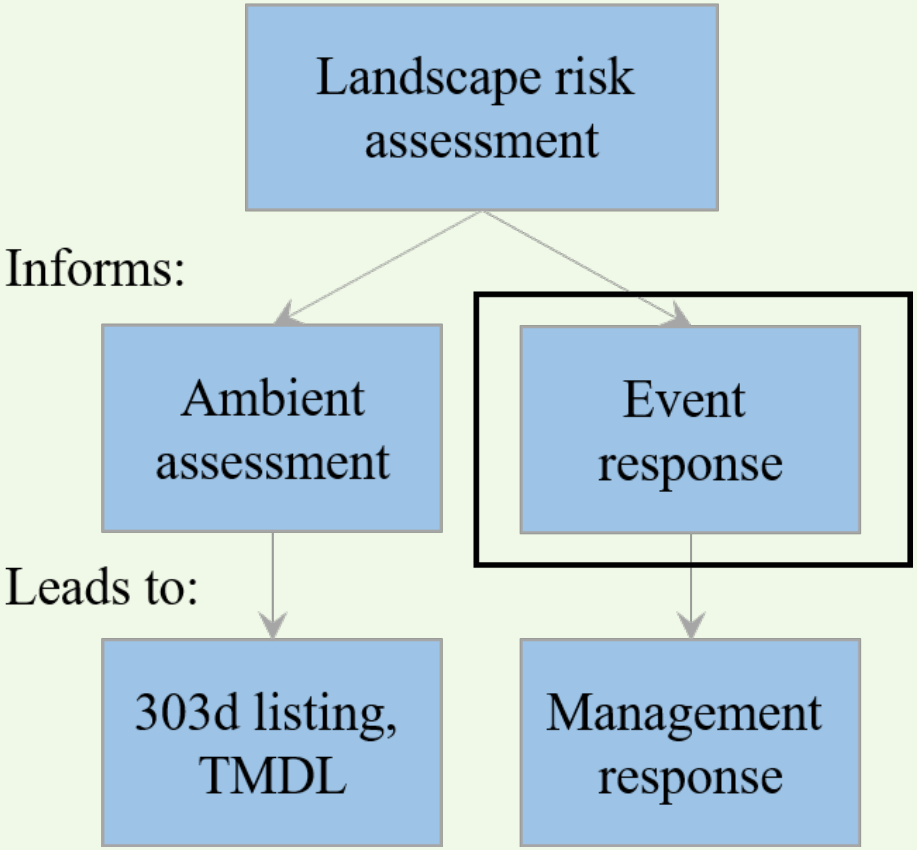

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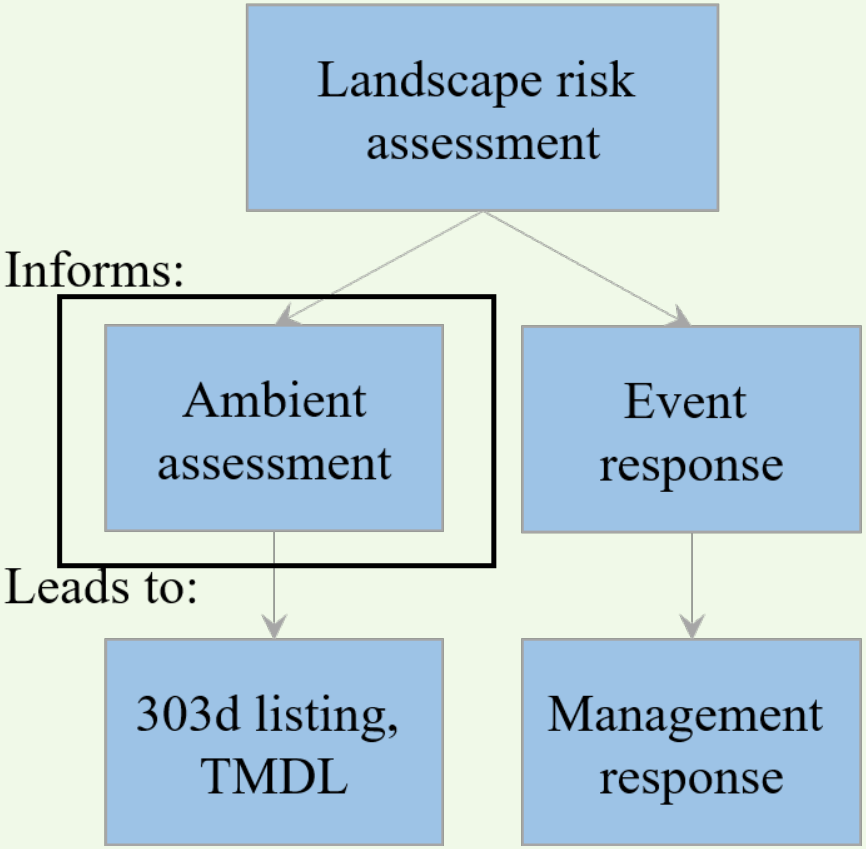

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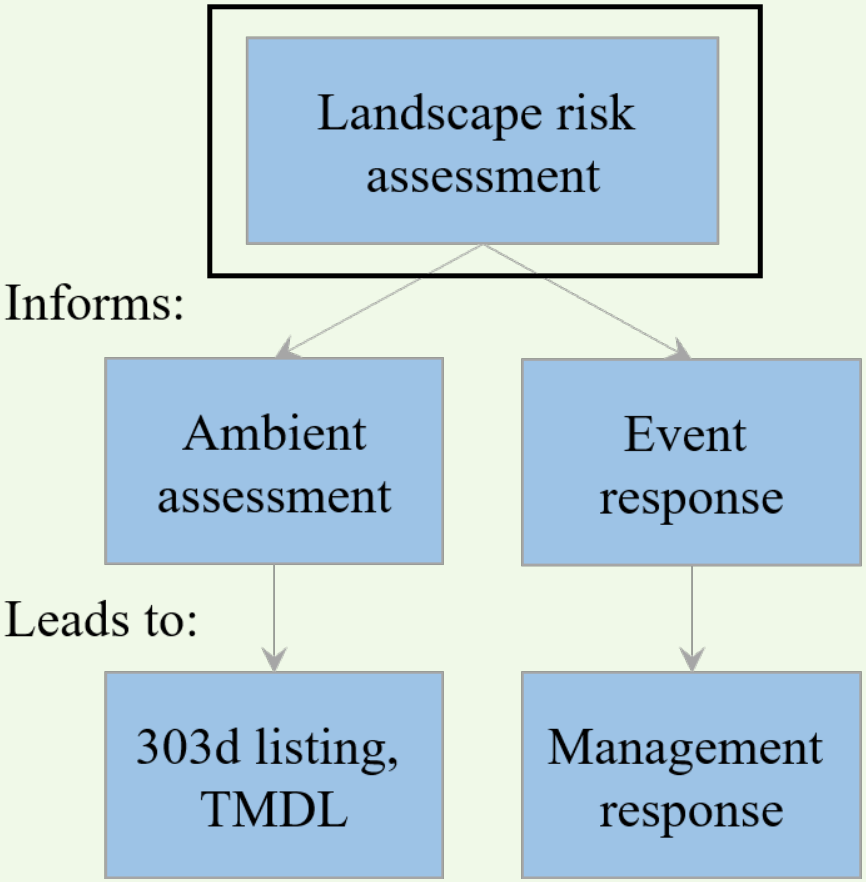

- Some components developed...
- ...others are not
- Landscape screening can inform the process

Alternative data sources

Remote sensing limited to large lakes, 95 in CA

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

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

Develop a landscape screening tool for microcystin risk

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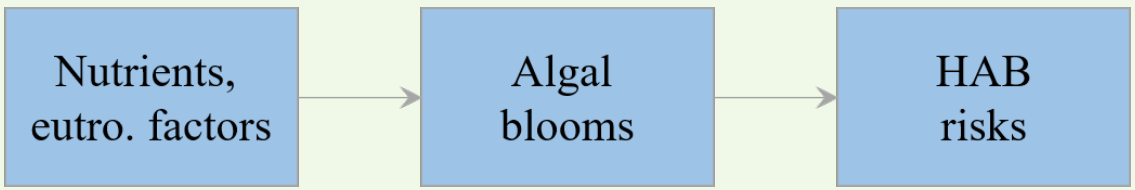
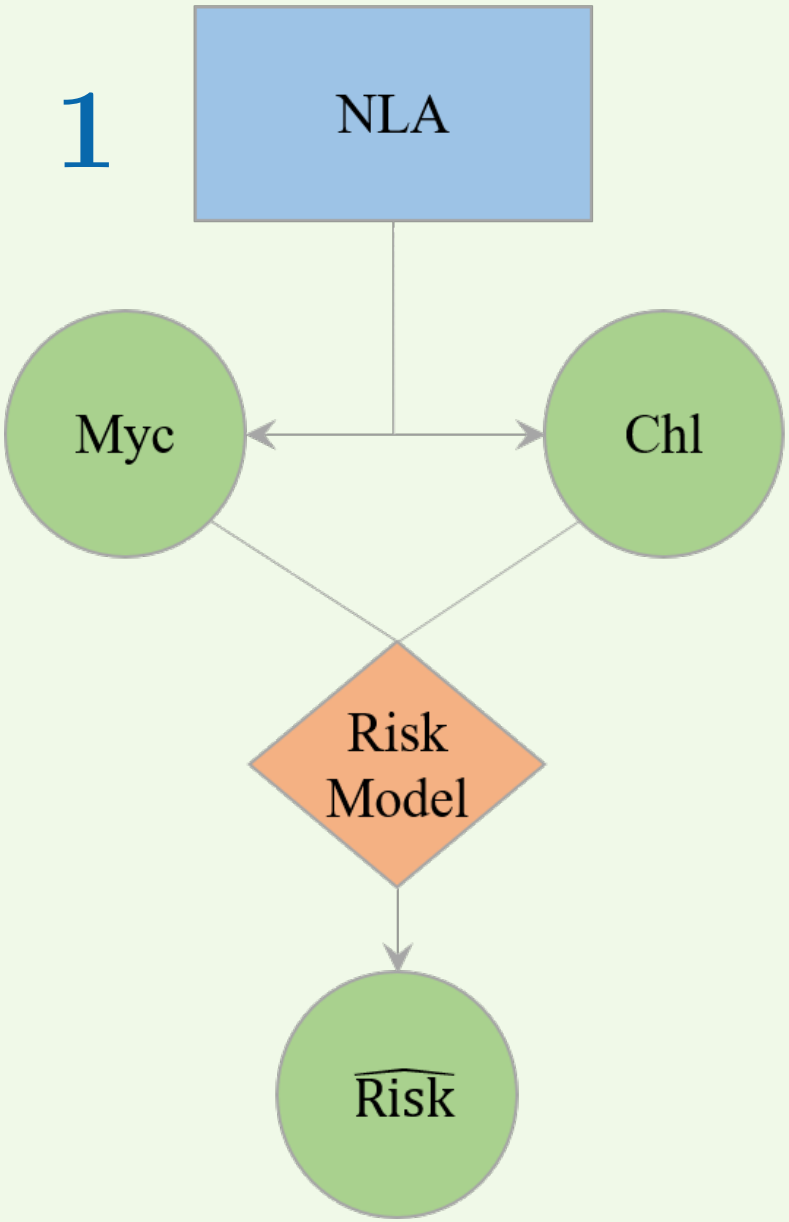
Why chlorophyll?



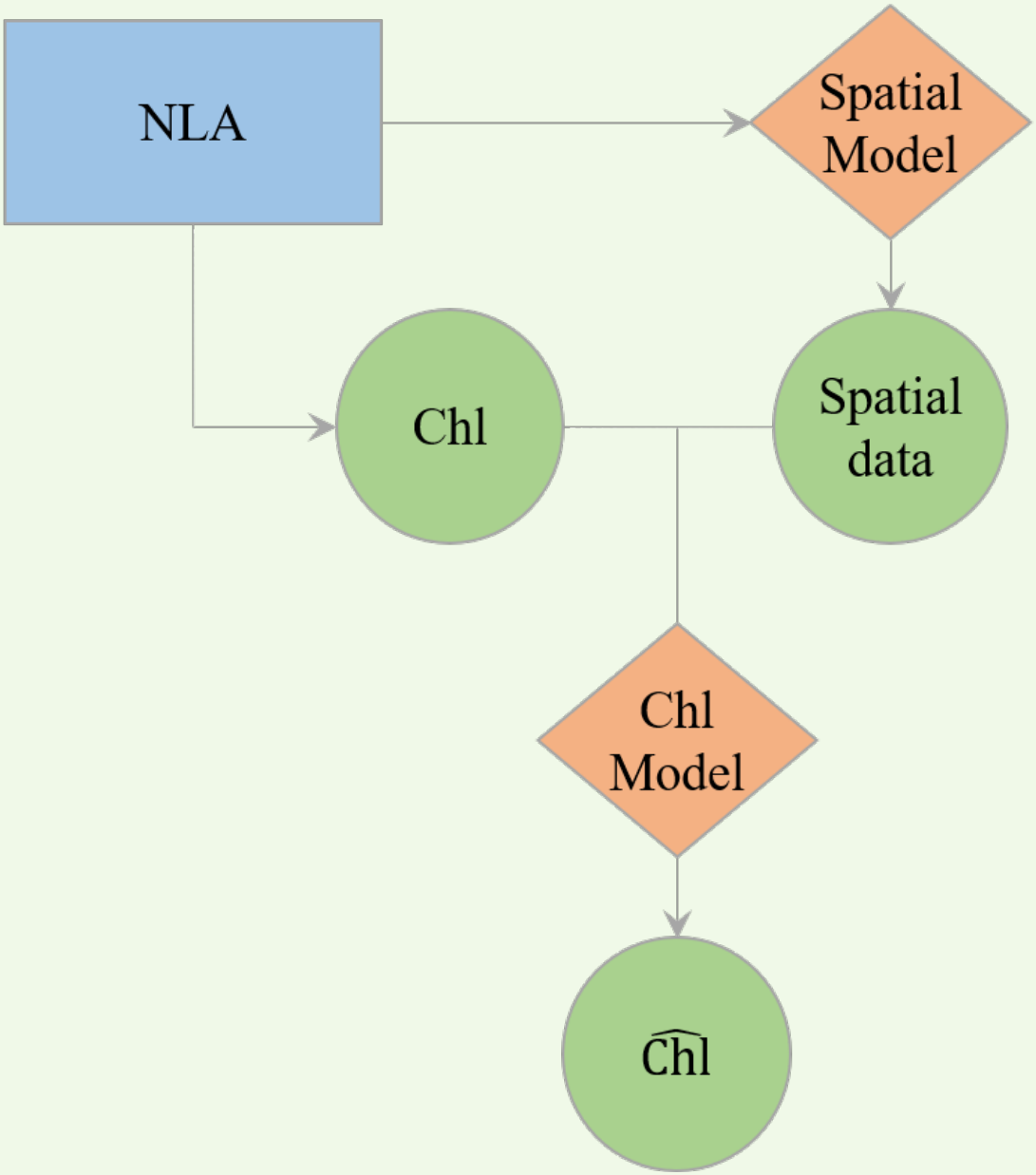
Modelling approach



Link between chlorophyll and microcystin

Modelling approach

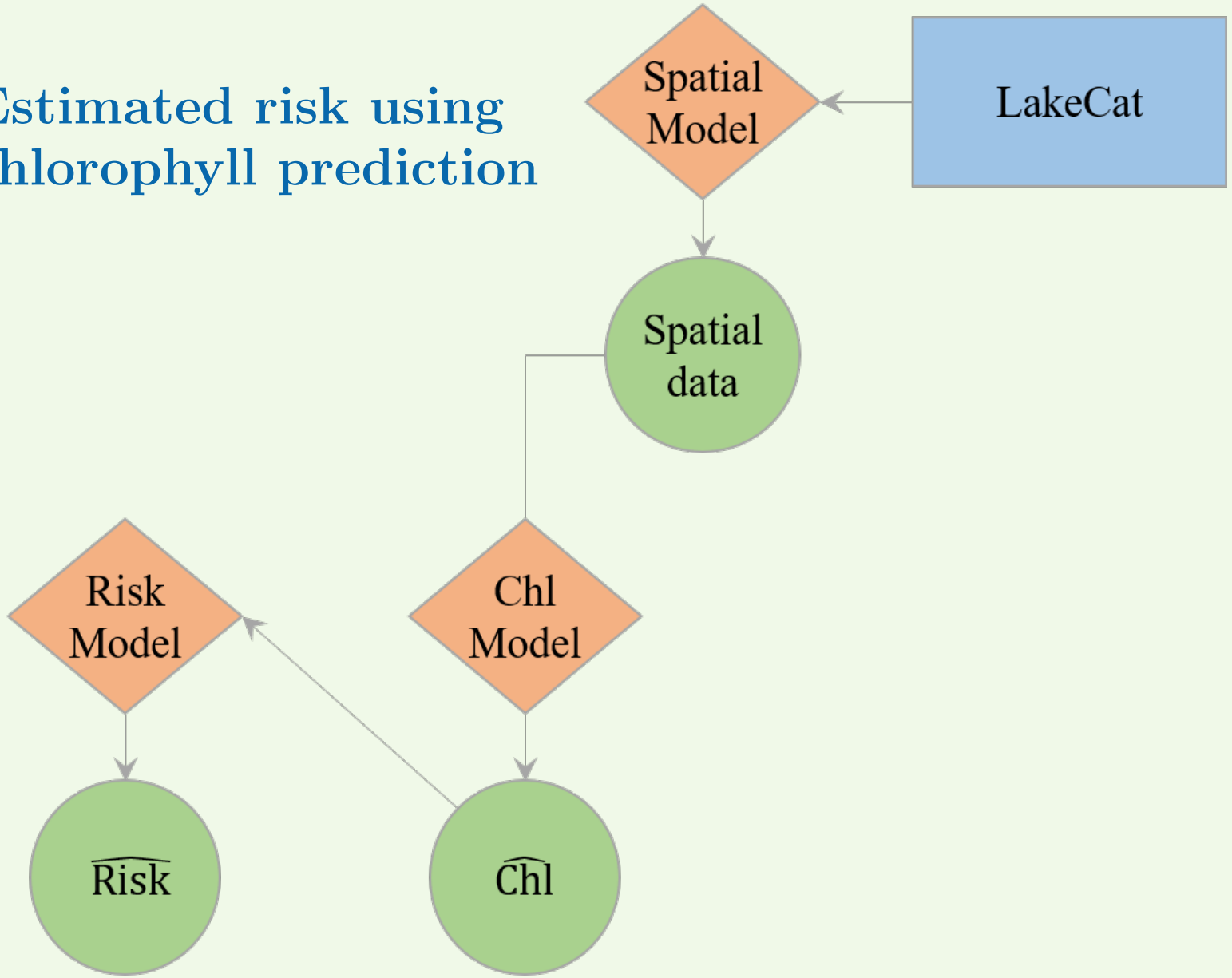
2



Link between chlorophyll and location

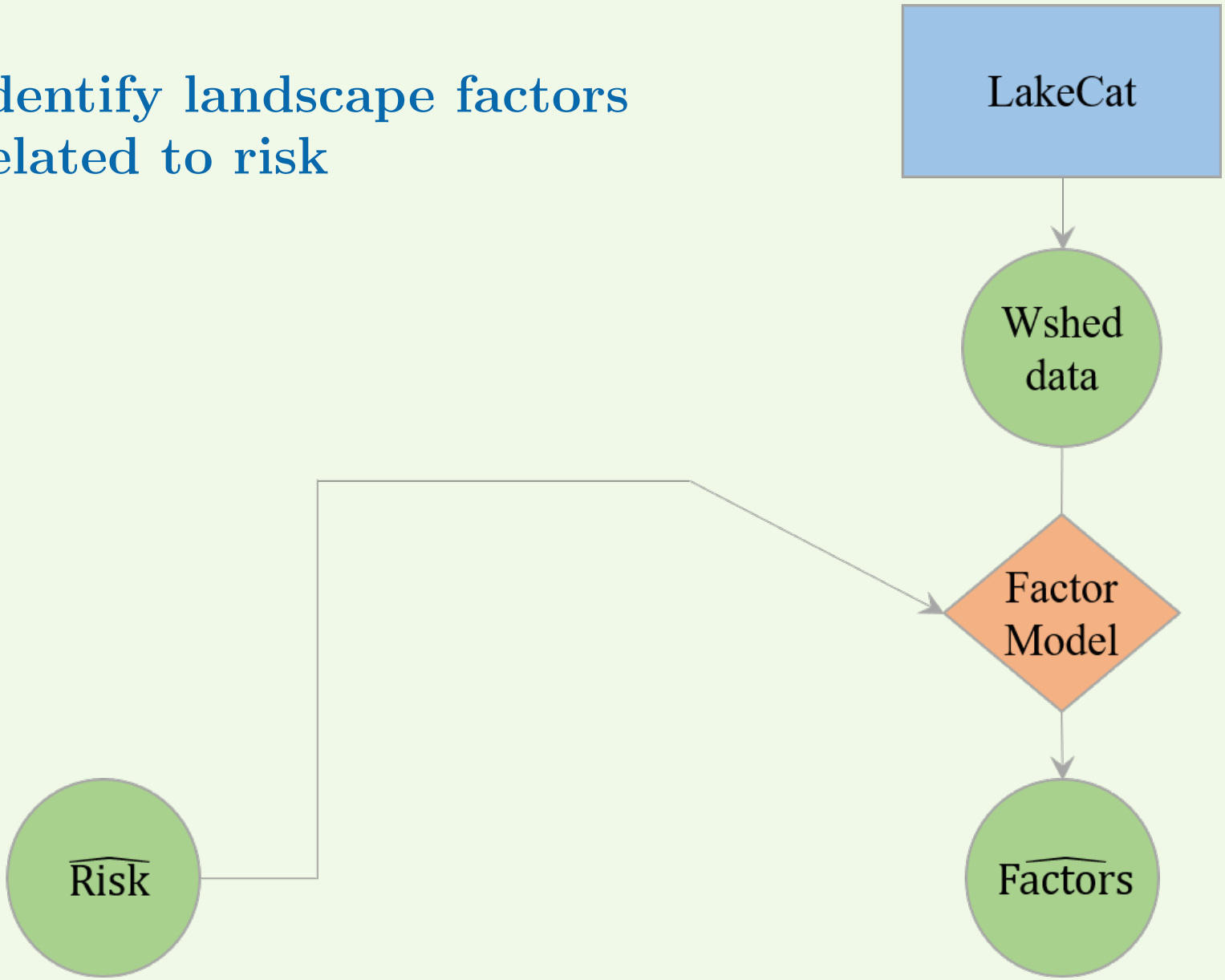
Modelling approach

3 Estimated risk using chlorophyll prediction



Modelling approach

4 Identify landscape factors related to risk



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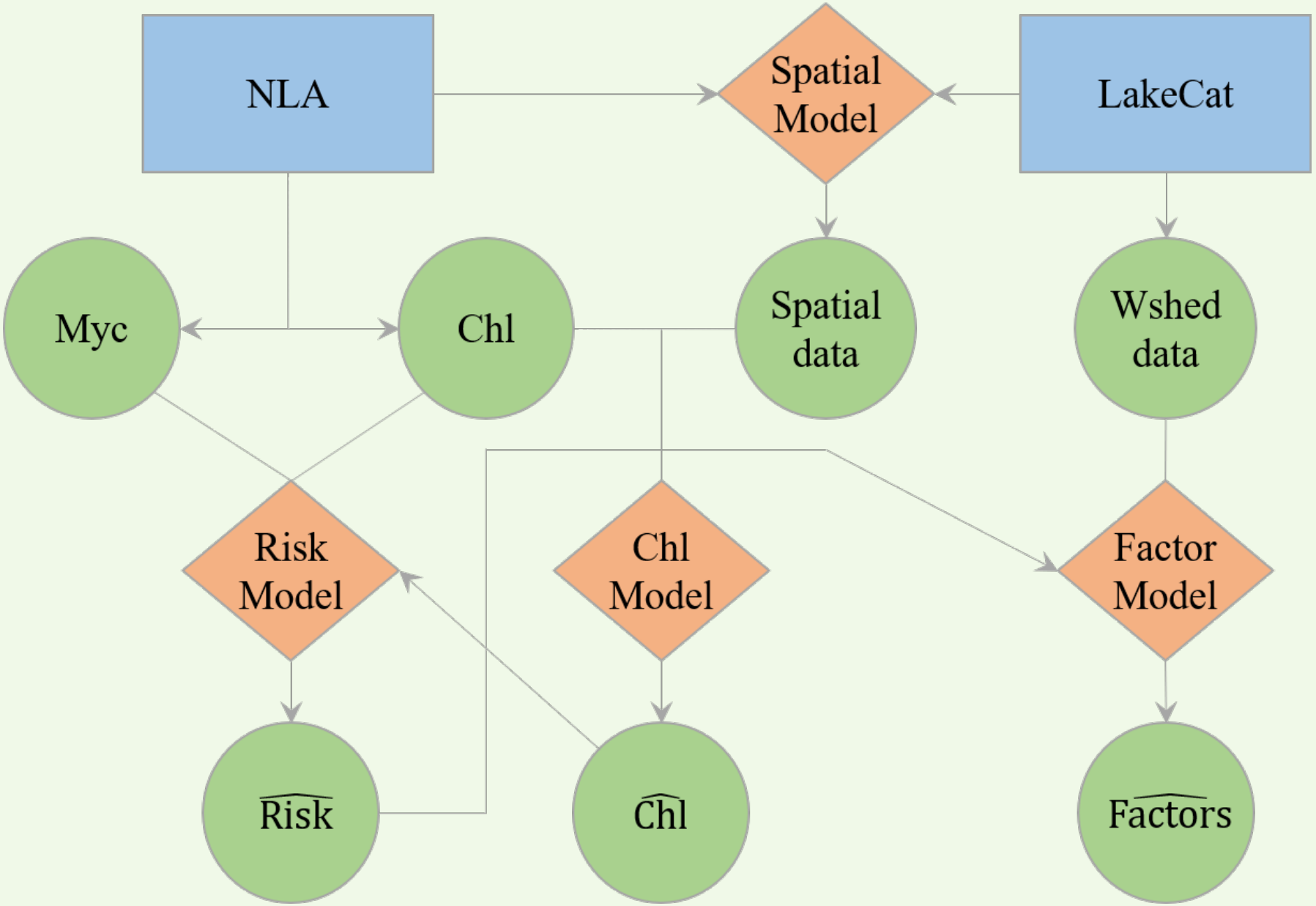
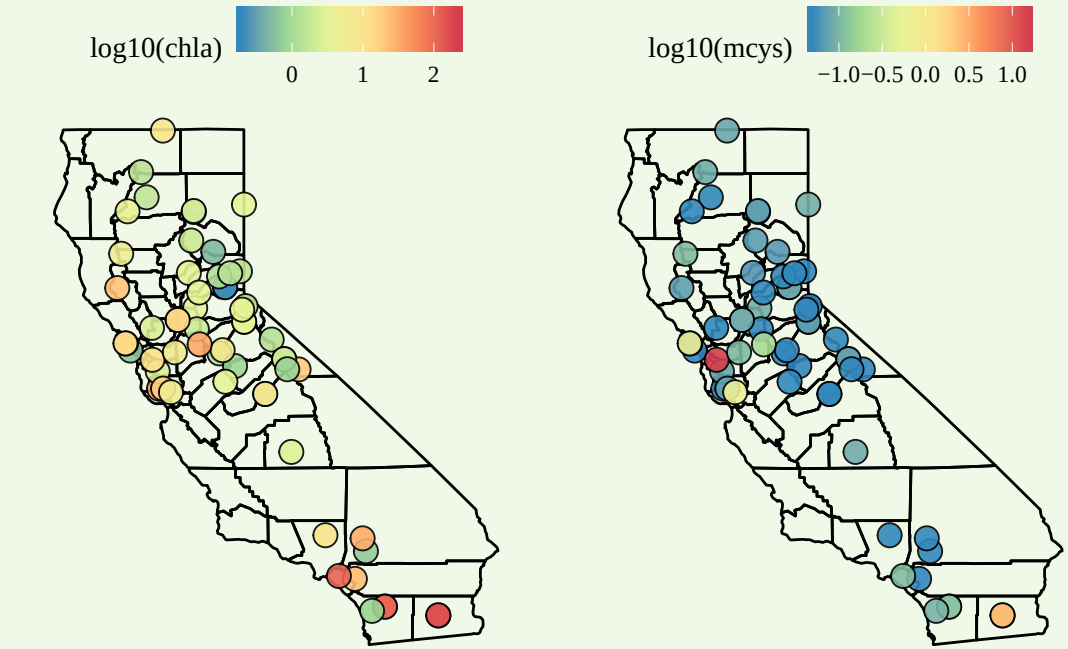
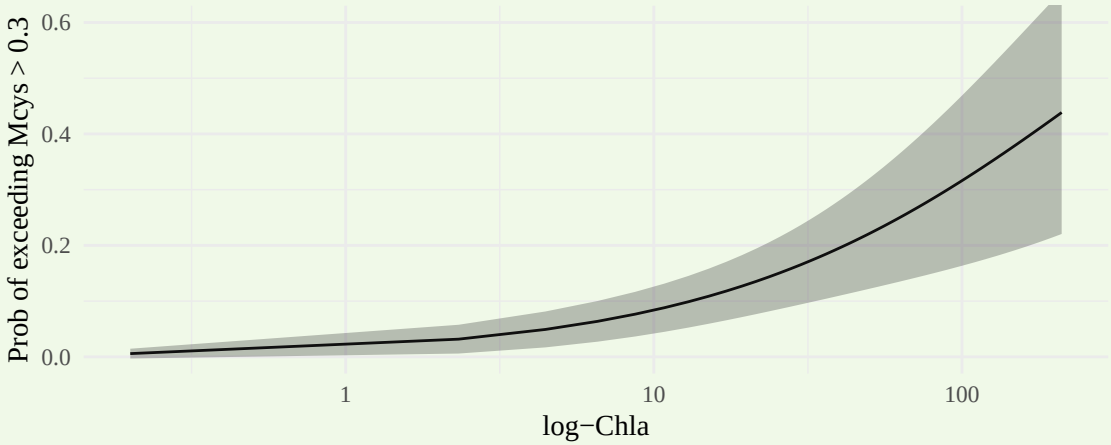


1) Link between chlorophyll and microcystin

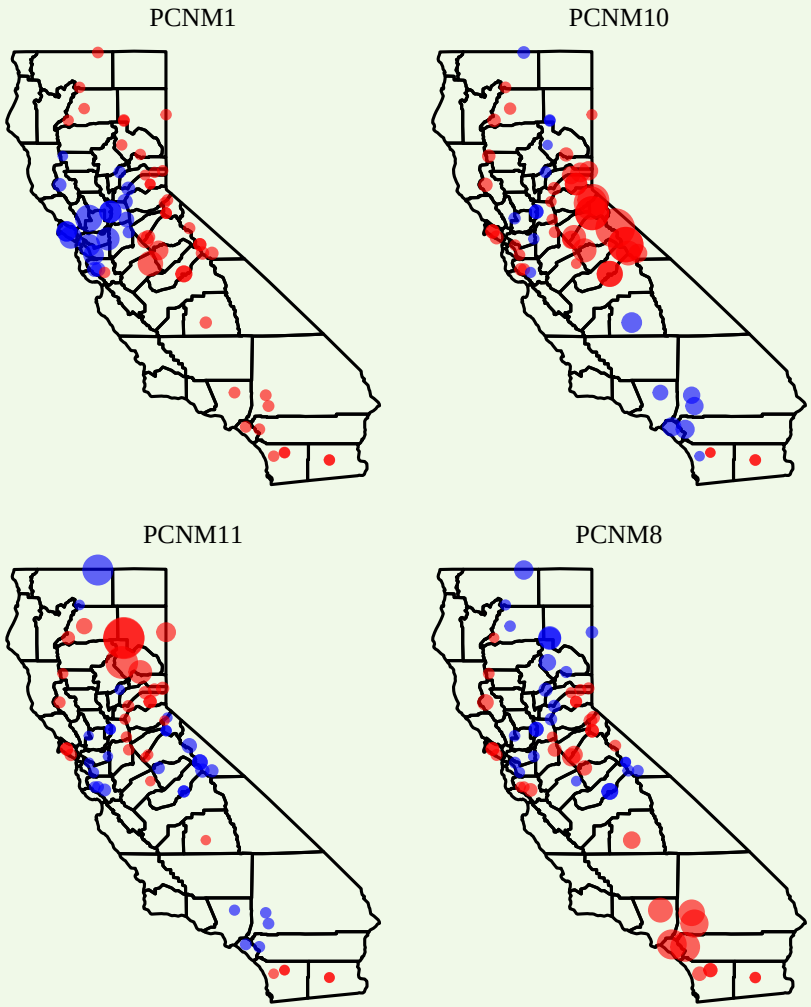


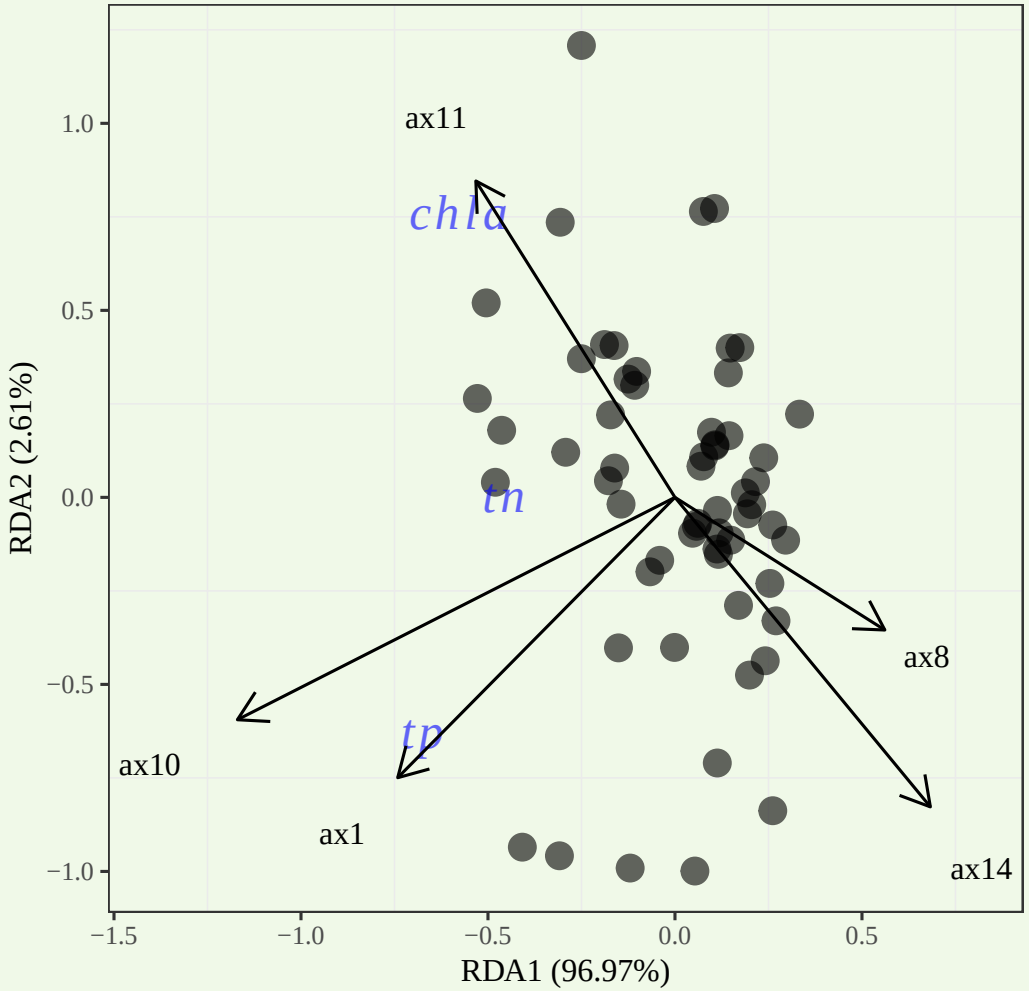


- *In situ* NLA data as probabilistic survey
- Build a simple model of the likelihood of exceeding some threshold
- Define a criteria threshold, arbitrary at this point

2) Link between chlorophyll and location

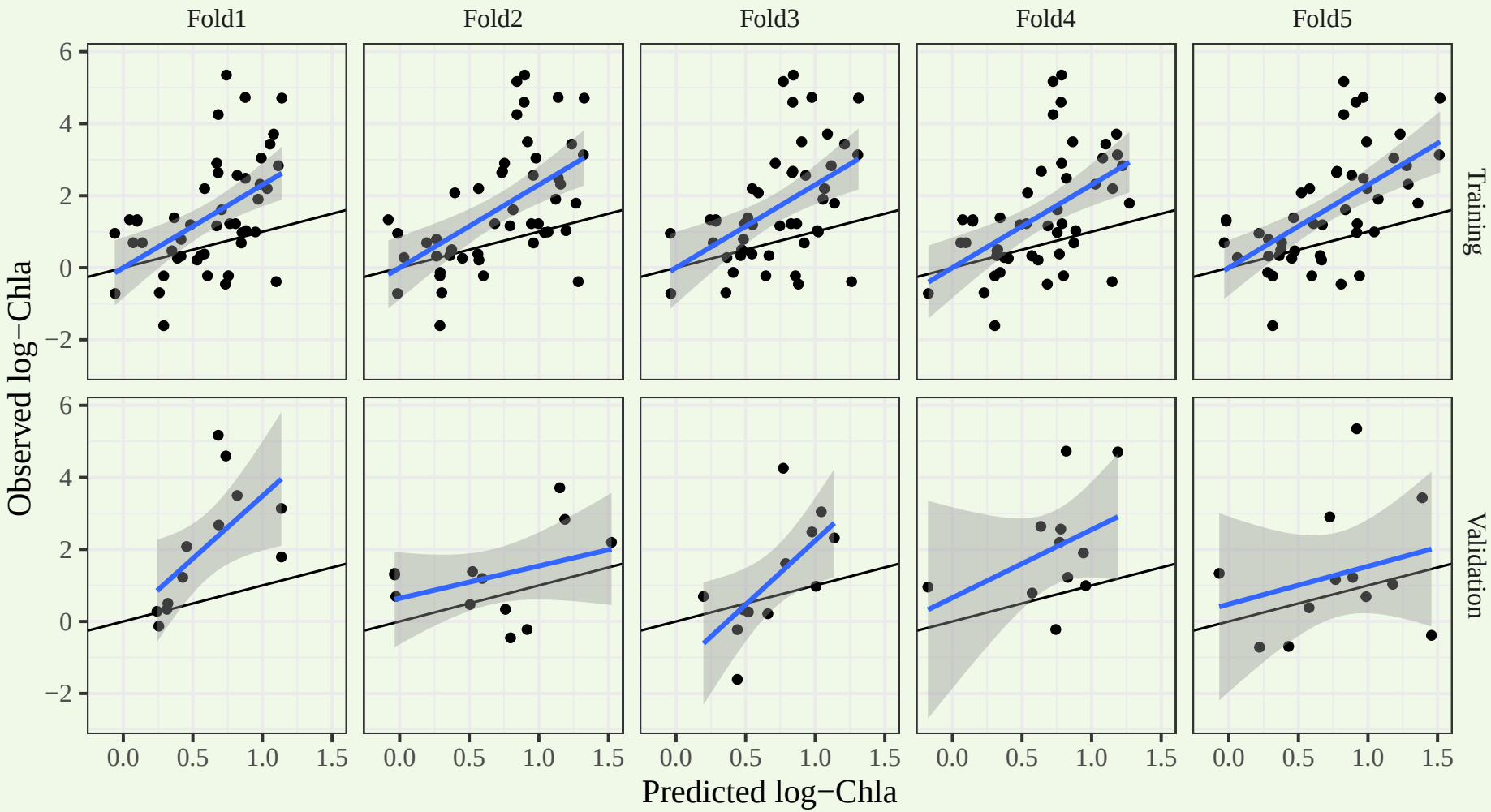
Using a spatial model to predict chlorophyll from lat/lon





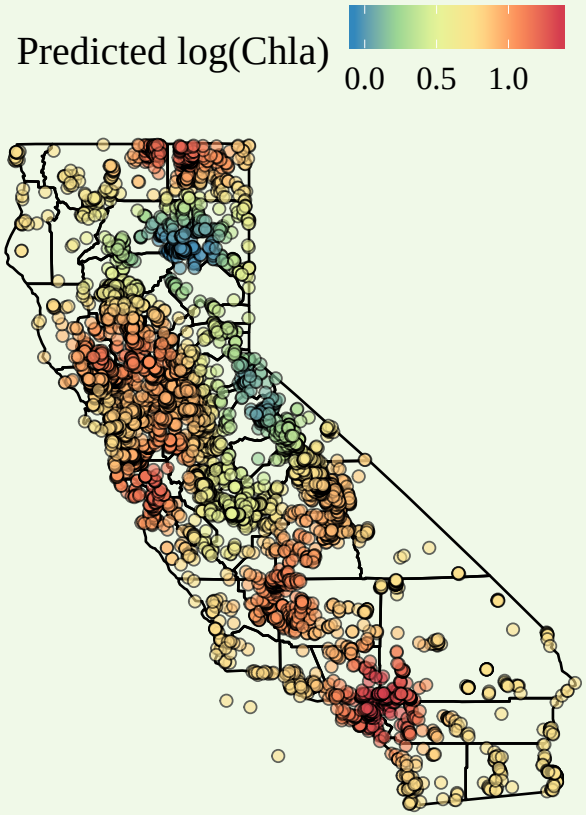
2) Link between chlorophyll and location

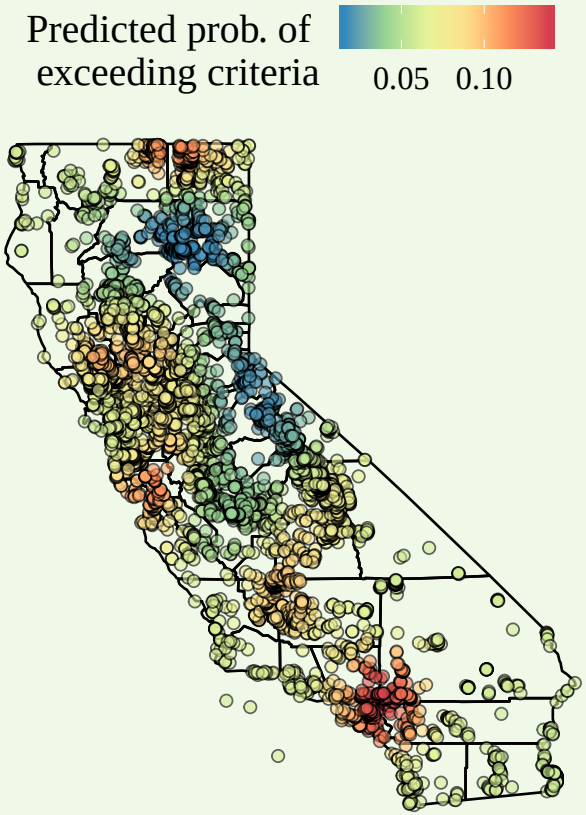
Predicted chlorophyll from location seems okay

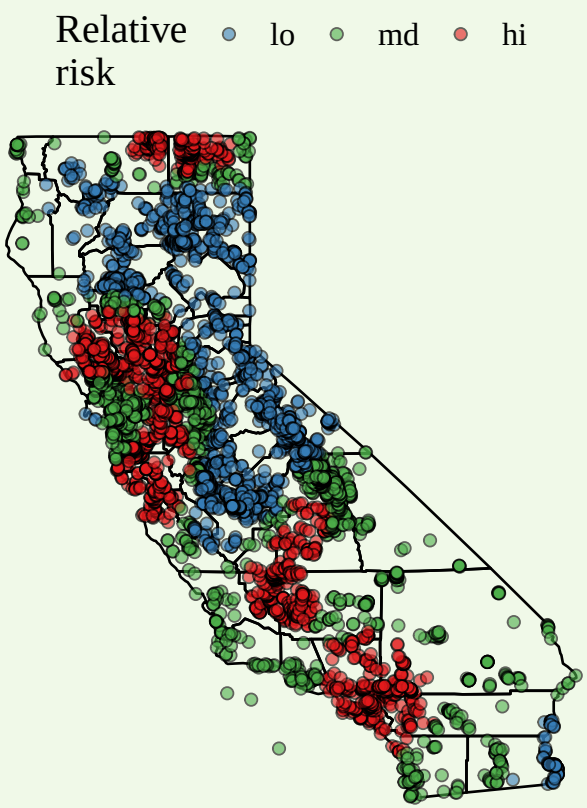


3) Estimated risk from chla prediction

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

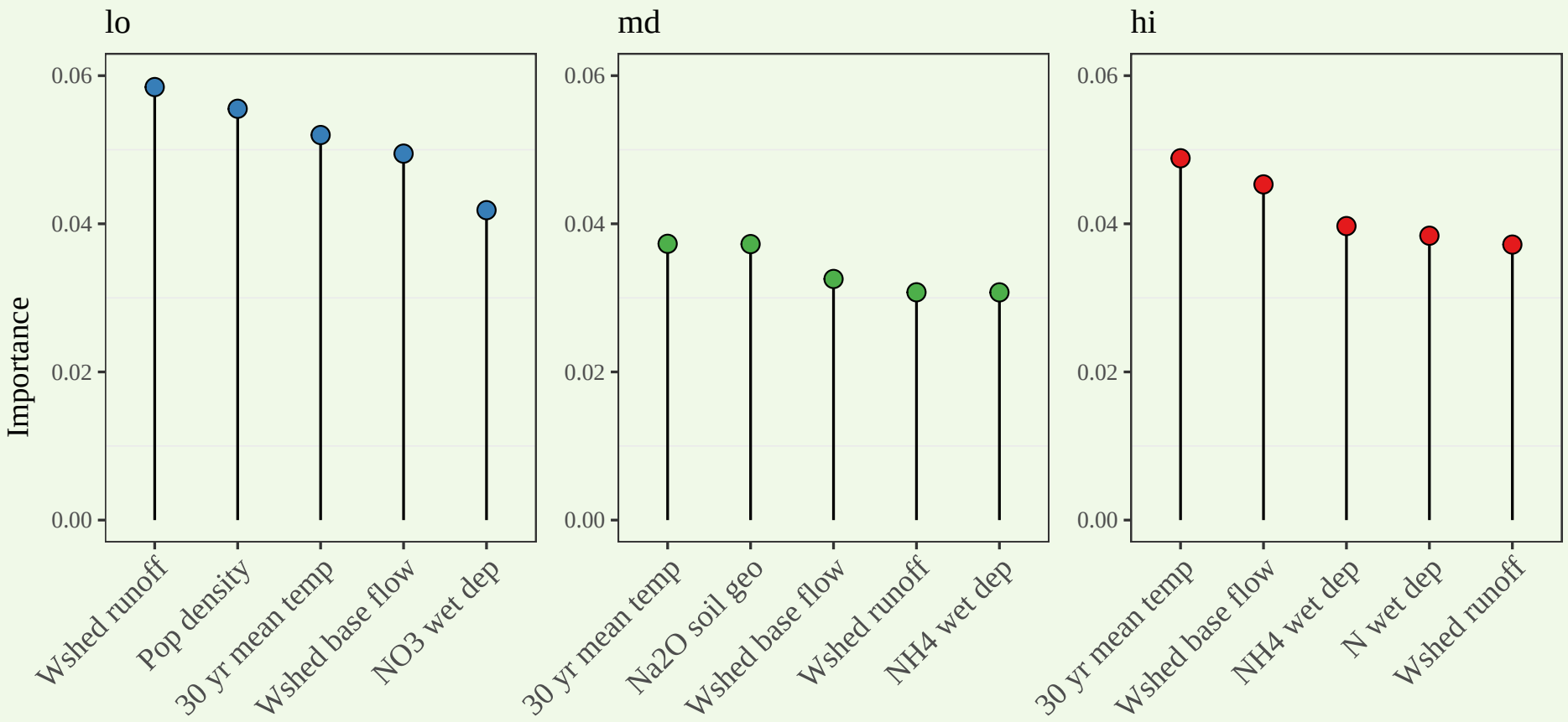




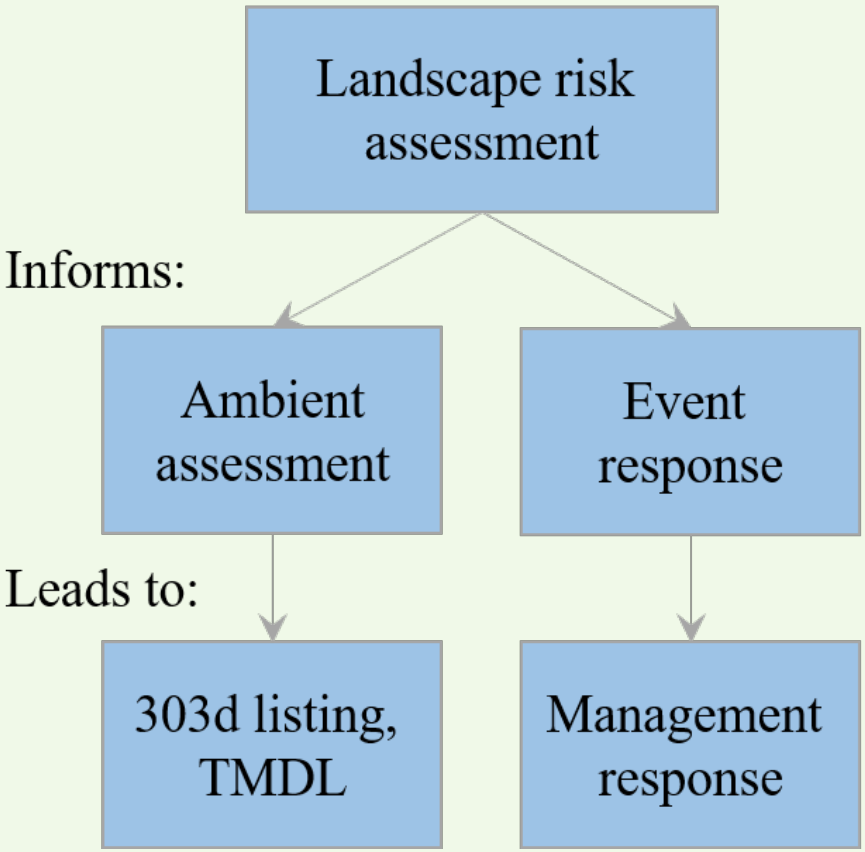


4) Identify landscape factors related to risk

Top five most important watershed factors linked to risk categories



California has a strategy to develop a lake bioassessment program



- Foundation for statewide risk assessment is critical

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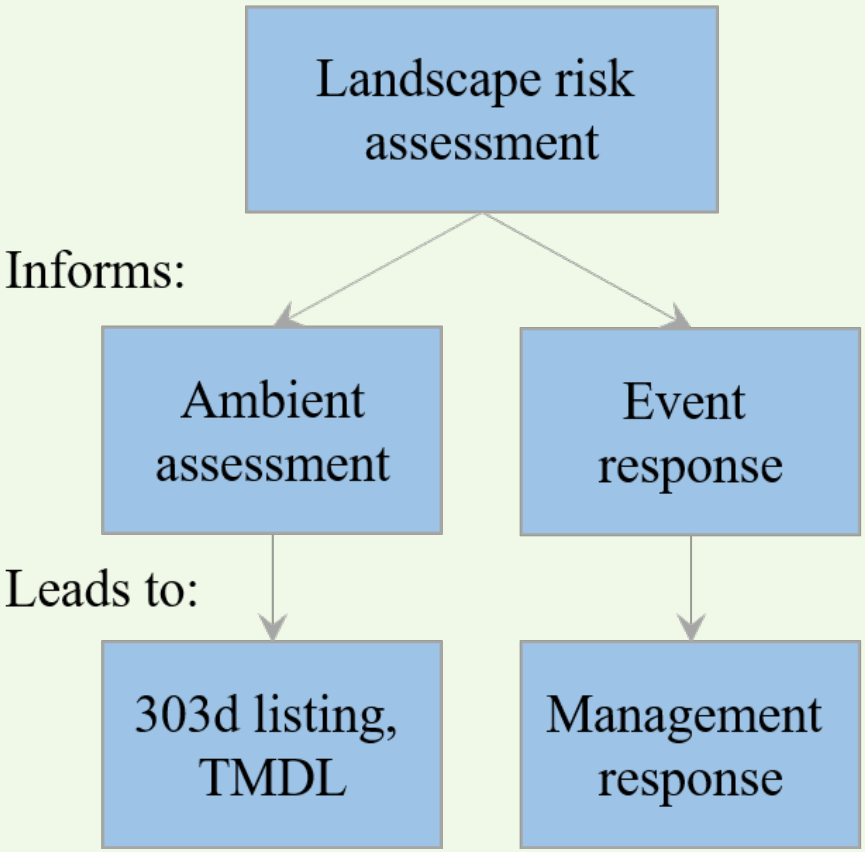

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- Leads to informed decisions for developing bioassessment program

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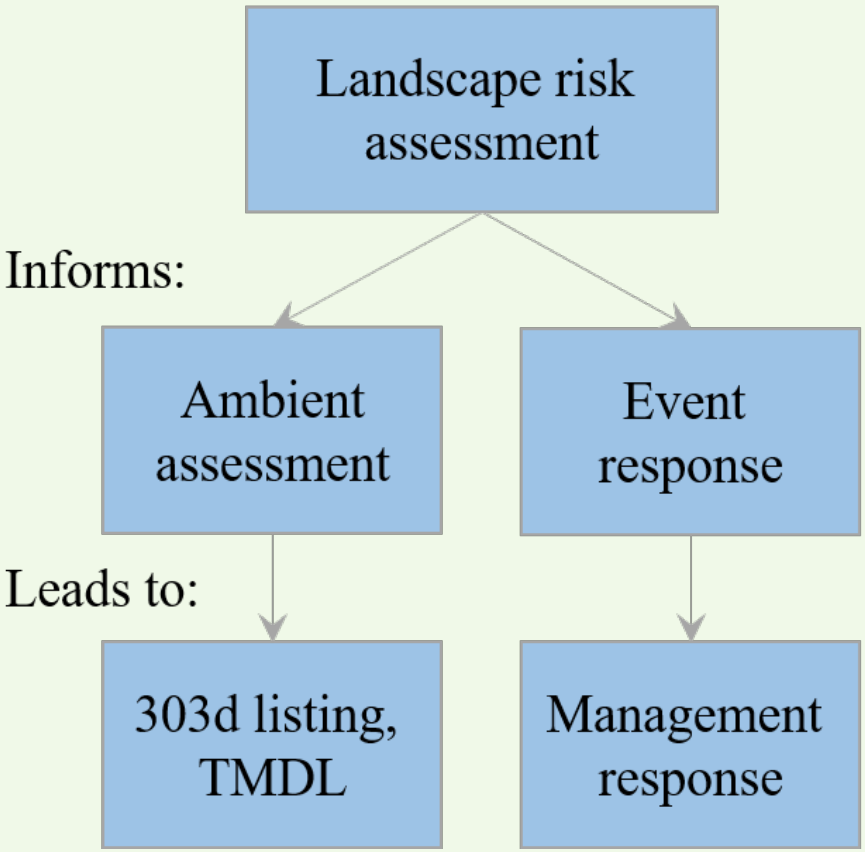

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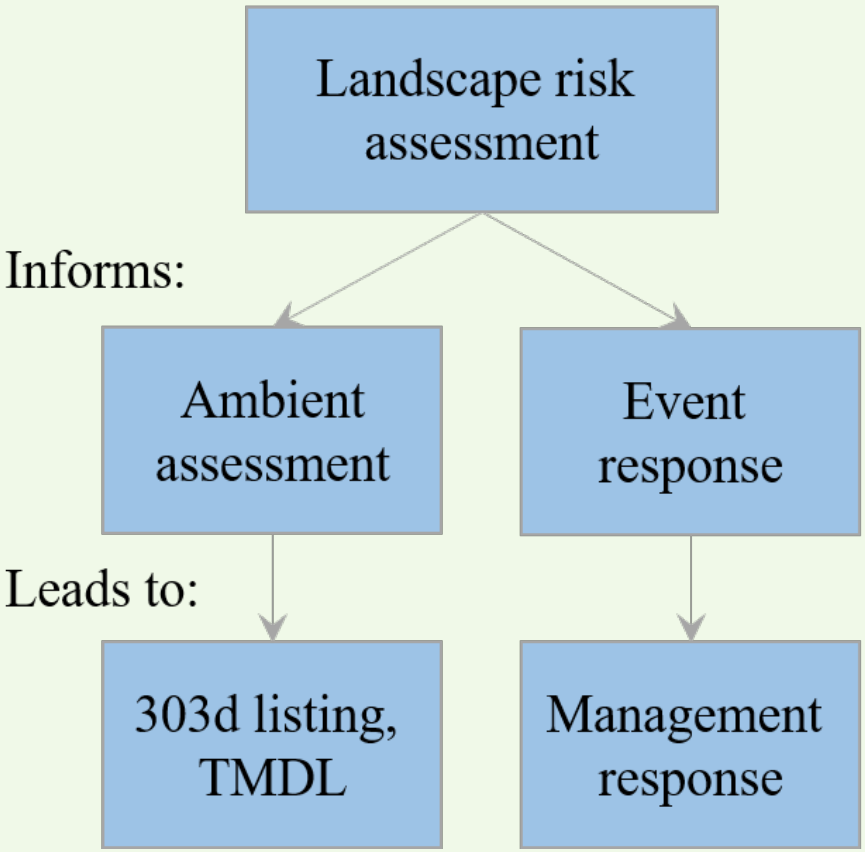

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- Landscape position is a powerful predictor
- A potential for data poor situations

Acknowledgments:

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Ryan Hill (USEPA, ORISE) for LakeCat data

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Funding sources and contact:

marcusb@sccwrp.org, 7147553217

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

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

Twitter: @fawda123

References

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