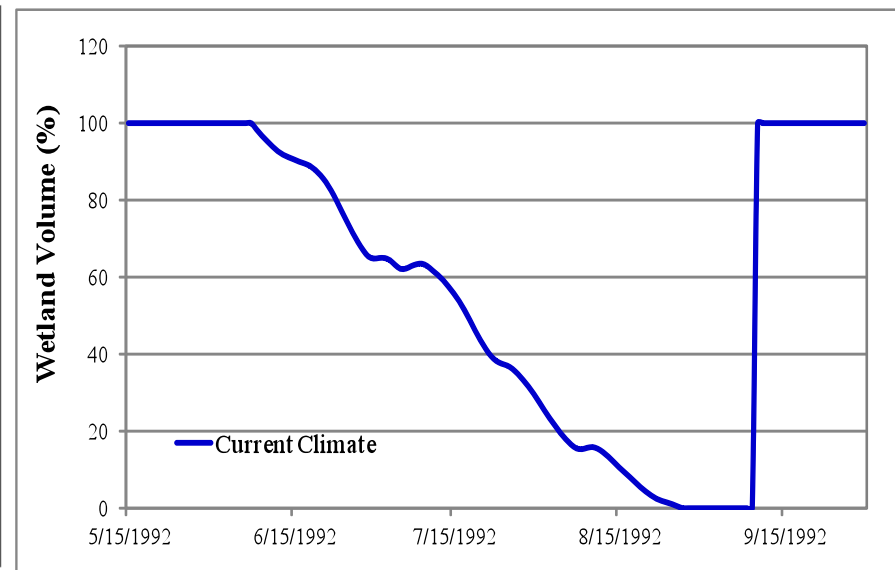
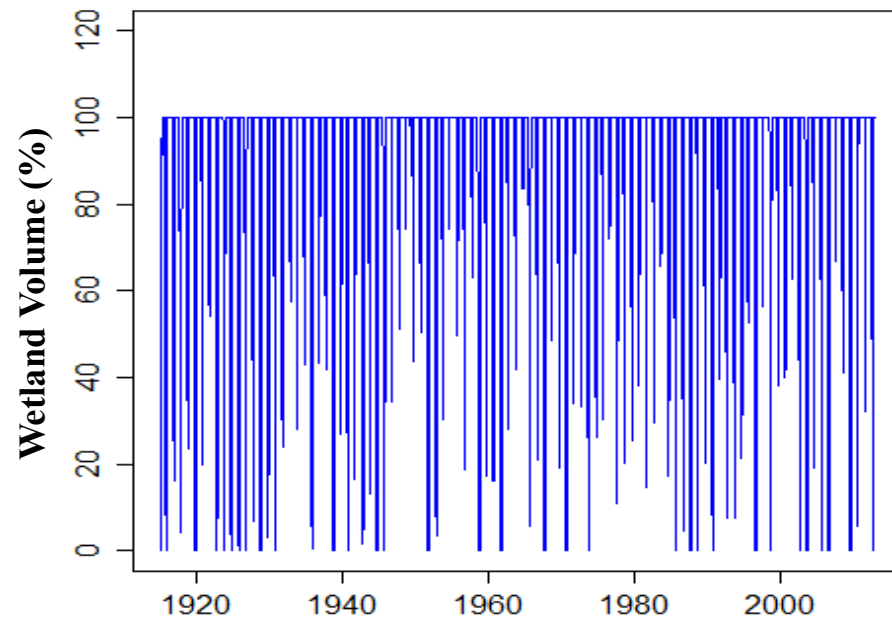


Evaluating Climate Change Effects on Wetlands with Field Surveys and Remote Sensing Techniques

Se-Yeun Lee

Dynamic of Montane Wetland

Current Climate



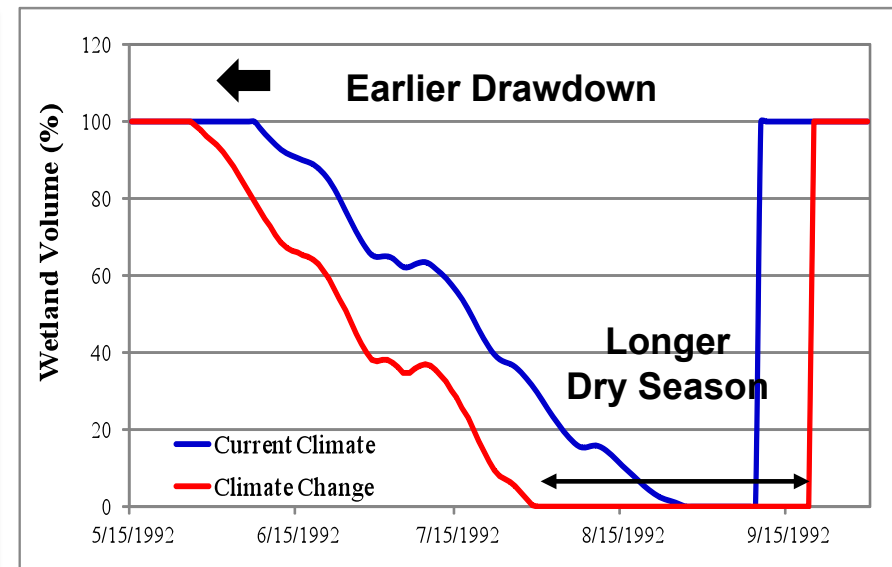
Dynamic of Montane Wetland

Current Climate



Climate Change

Reduced
snowpack
*
Earlier snow melt
*



Hotter and drier
summers

What We Need

- Understand how wetland hydraulic conditions have changed over time
- Evaluate how wetland hydraulic conditions would temporally and spatially change for climate change

Historical Data

Field Surveys



Pros: Get more specific information for each site

Cons: Expensive, limited only a few individual wetlands,

Remote Sensing Methods

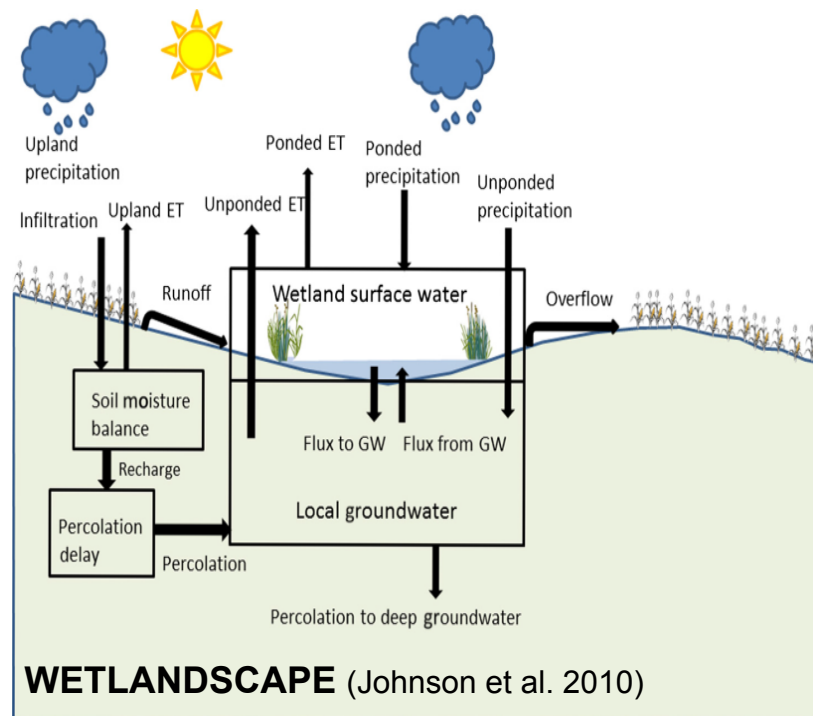


Pros: Capture the spatial extents of the wetland

Cons: Available only since 1970s and spatially and temporally limited due to cloud

Existing Modeling Approach

Sophisticated Simulation Model



Pros:

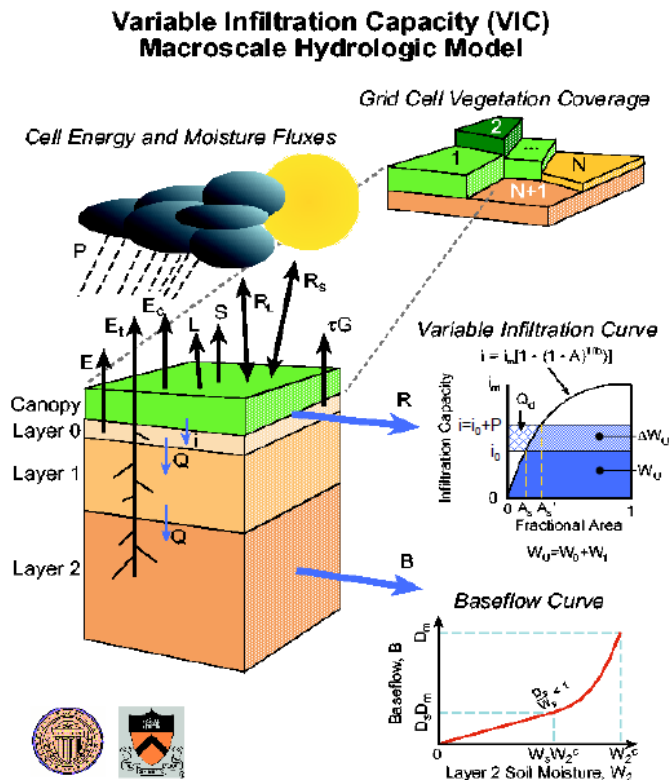
- fill temporal gaps
- make climate change projections

Cons:

- require extensive data to set up
- computationally intense
- difficulty to apply over a broad area

New Modeling Approach

Simple Regression based model



Outputs from Hydrologic Model



Observed historical data

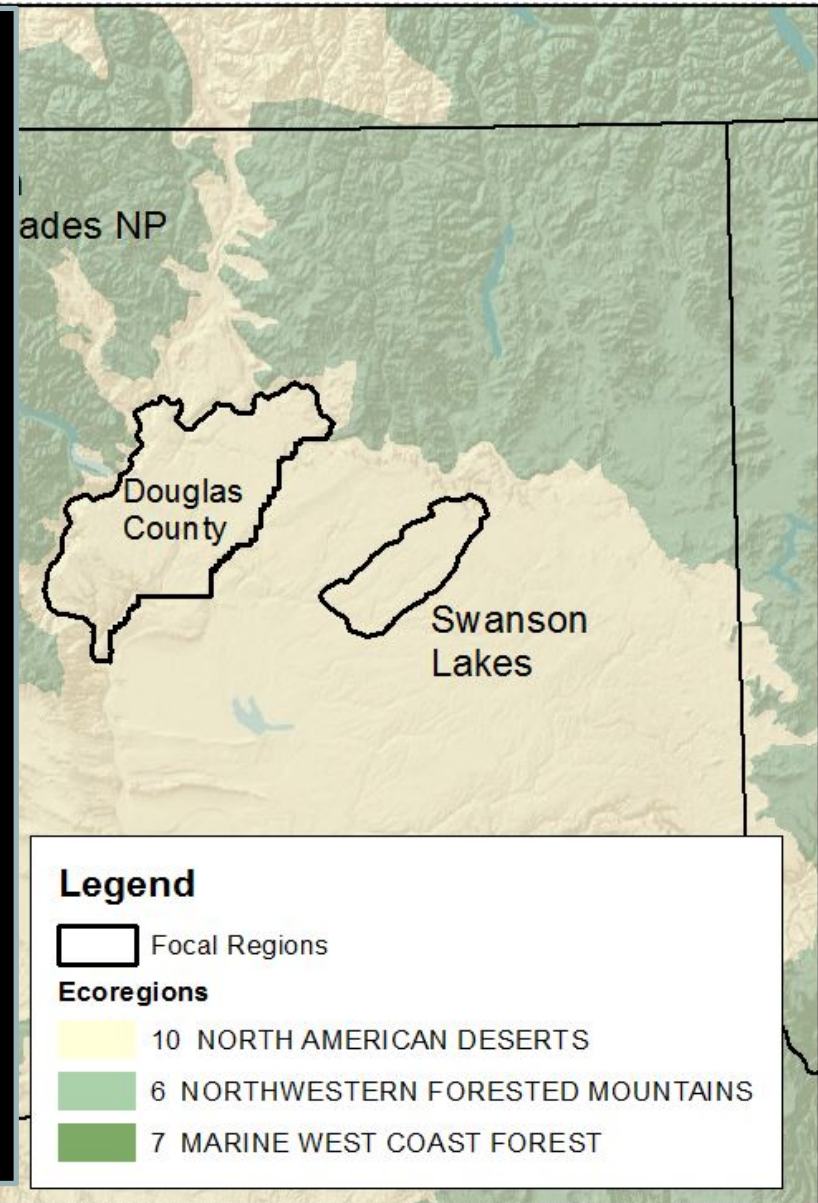
Study Area



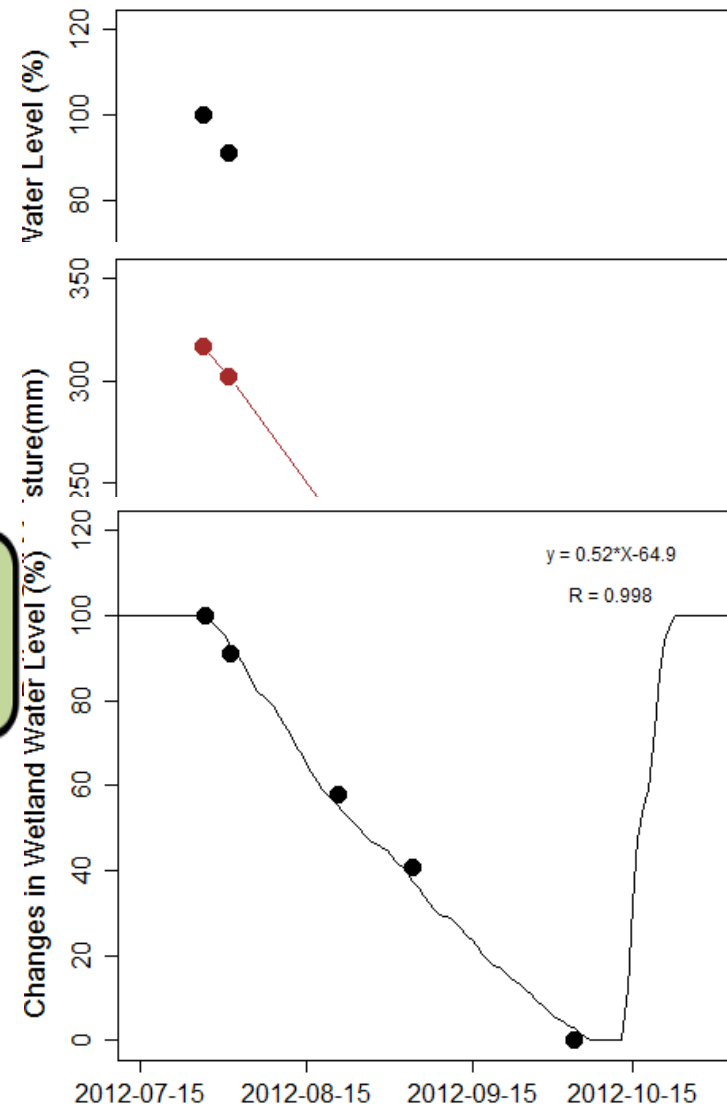
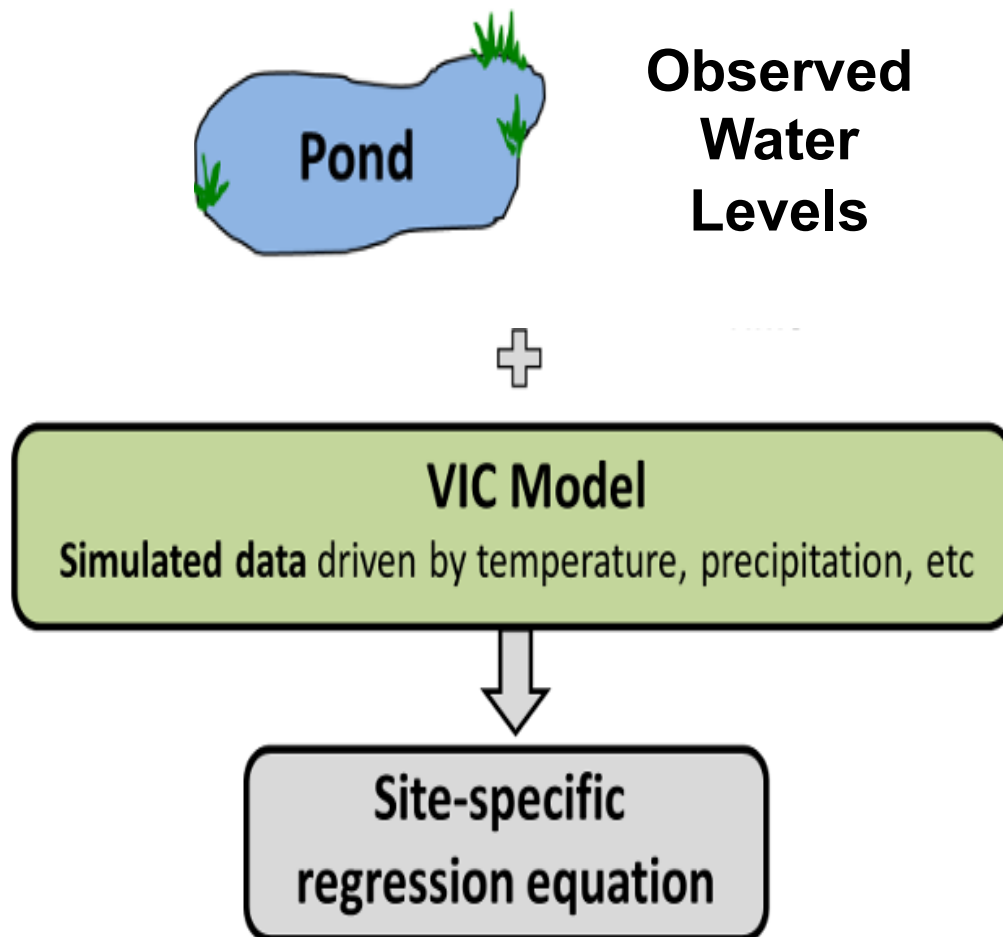
Study Area

Remote Sensing Methods

Hydroperiod datasets for about 750 ponds from years 1984 to 2011

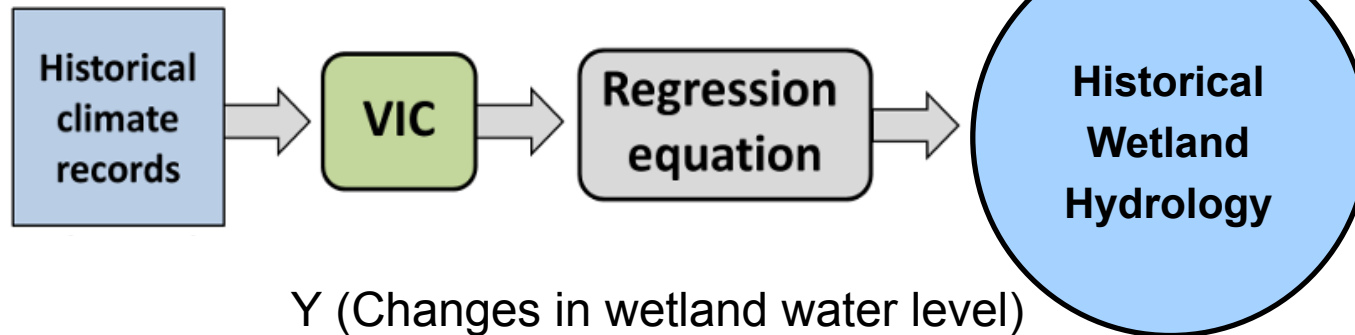


How a model is developed

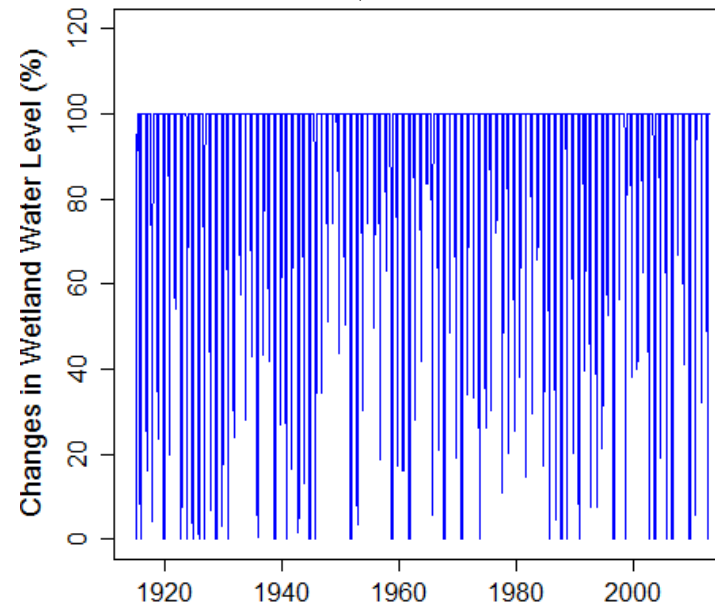
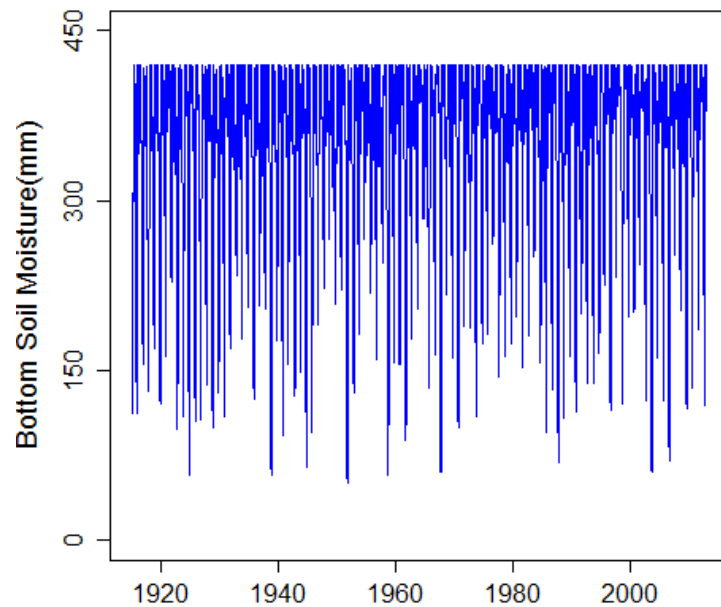


How a model is developed

HINDCAST

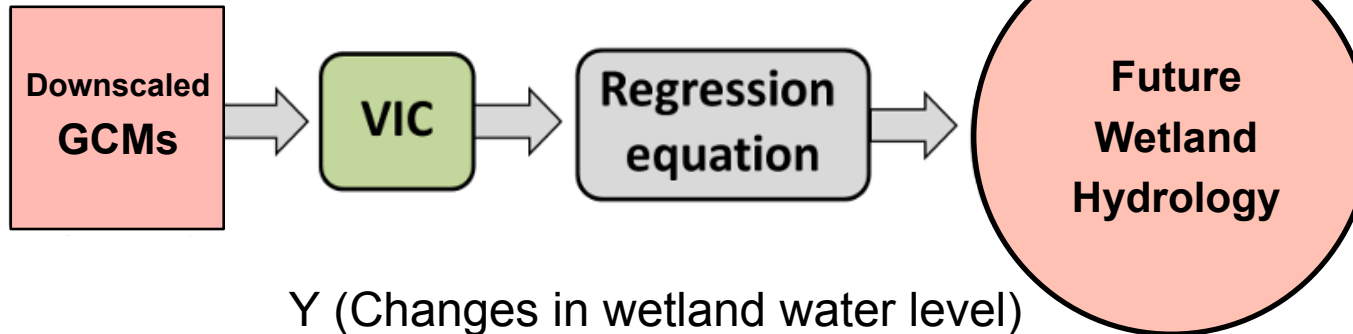


$$Y \text{ (Changes in wetland water level)} \\ 0.52 * (\text{bottom soil moisture}) - 64.9$$

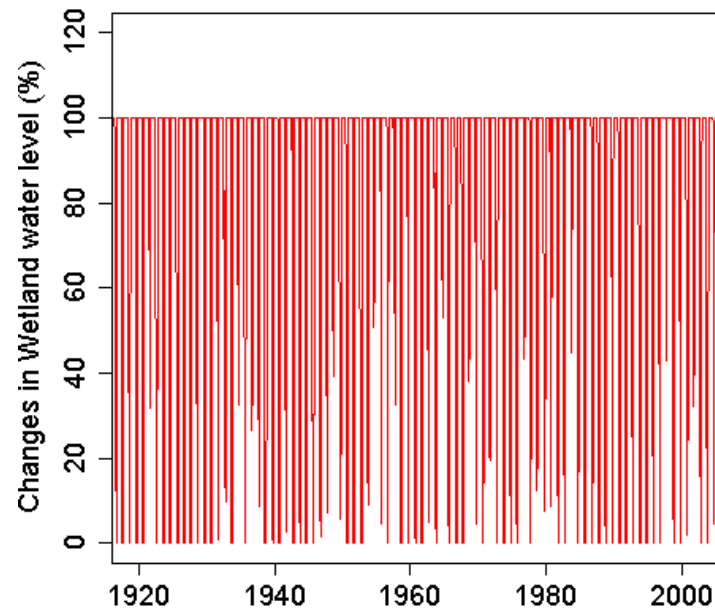
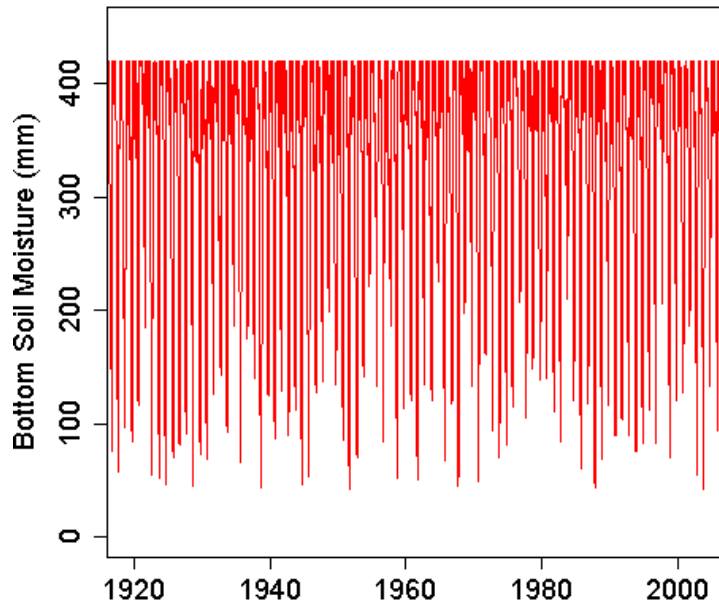


How a model is developed

FORECAST

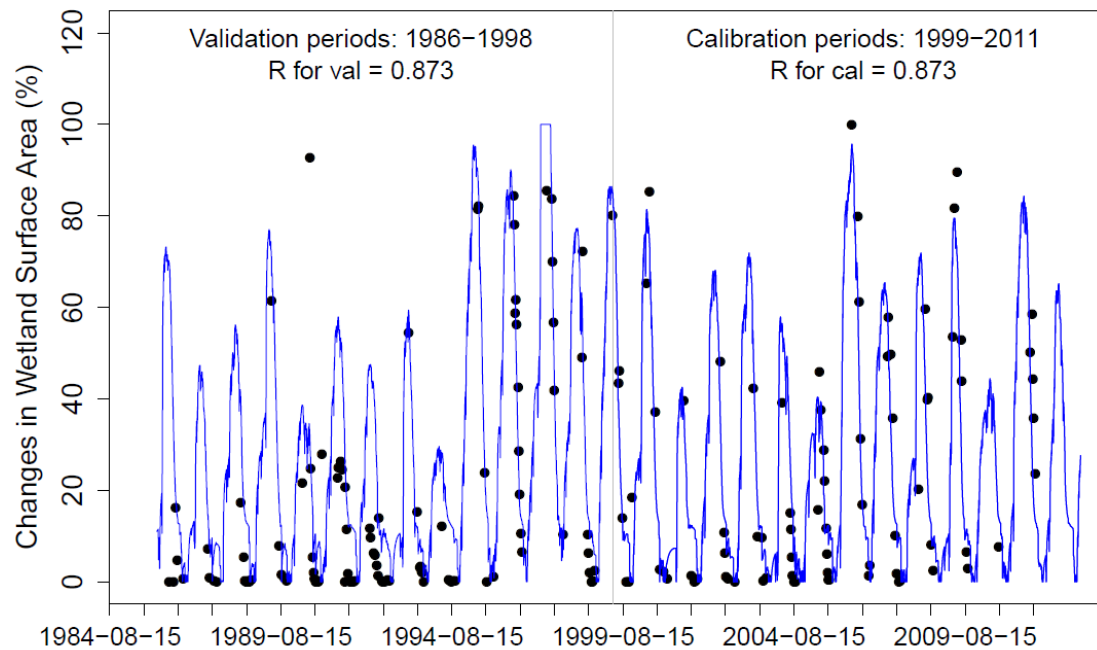
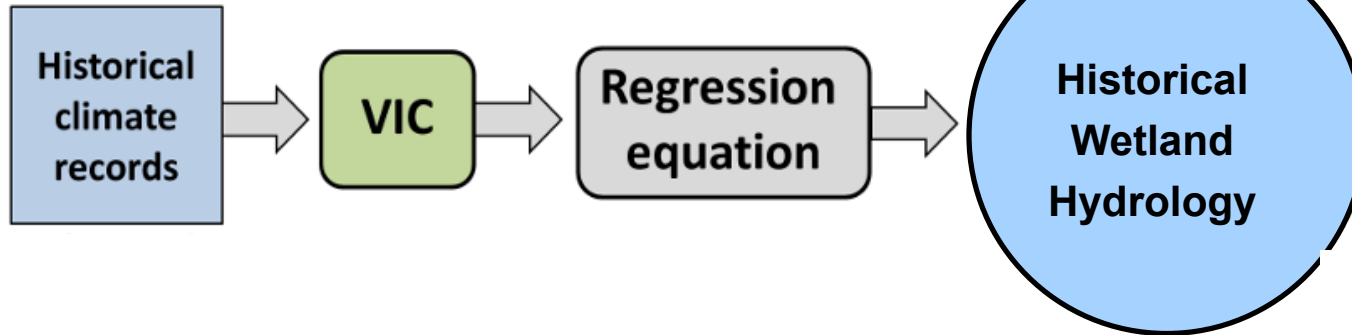


$$Y \text{ (Changes in wetland water level)} \\ = 0.52 * (\text{bottom soil moisture}) - 64.9$$



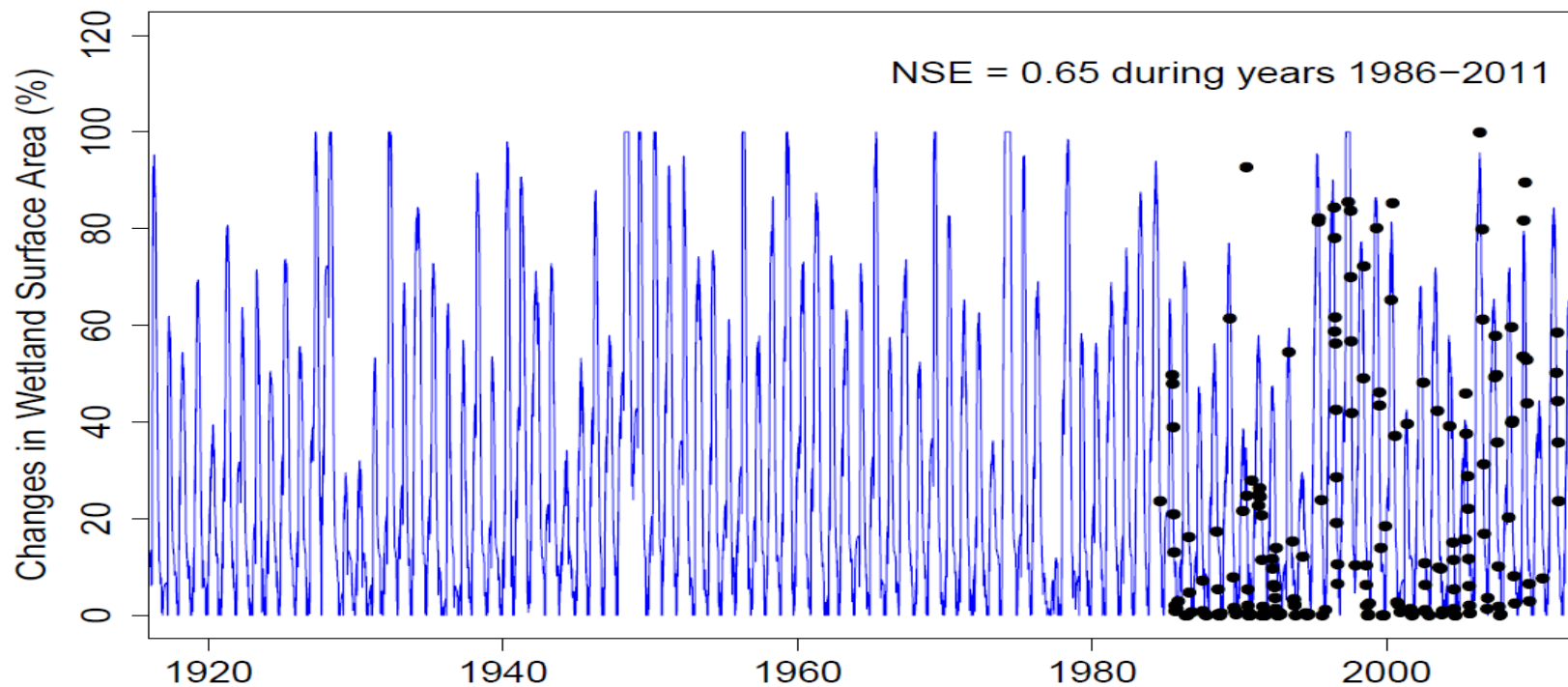
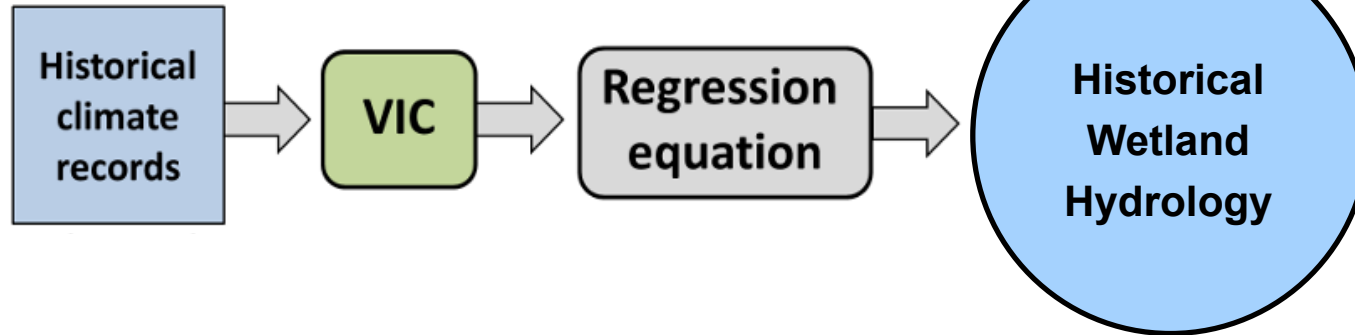
How a model is validated

HINDCAST



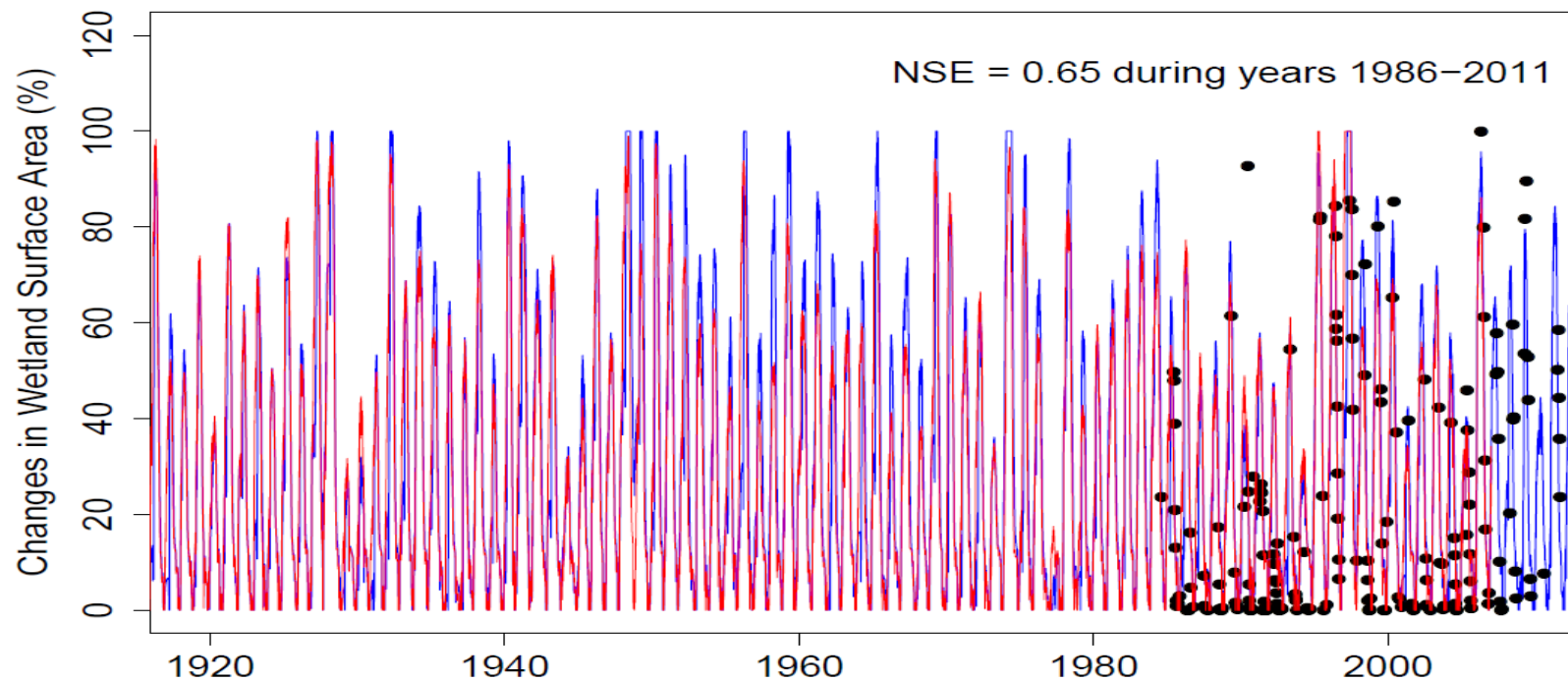
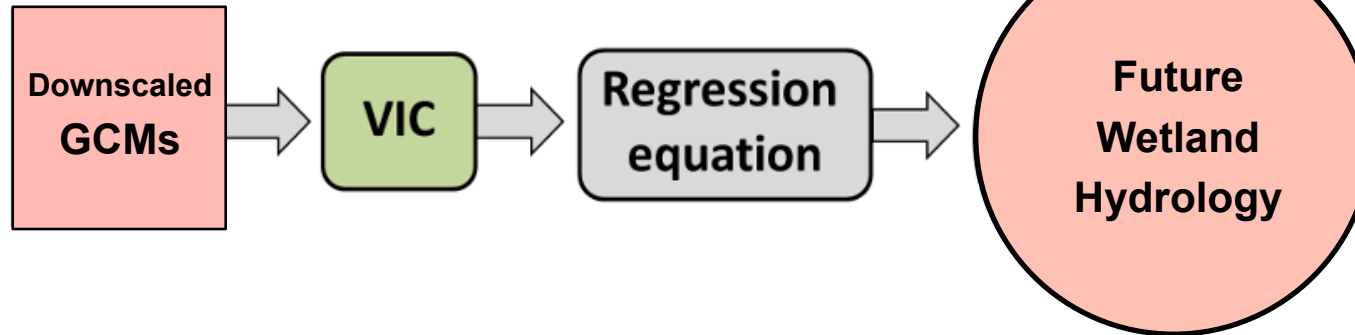
How a model is validated

HINDCAST

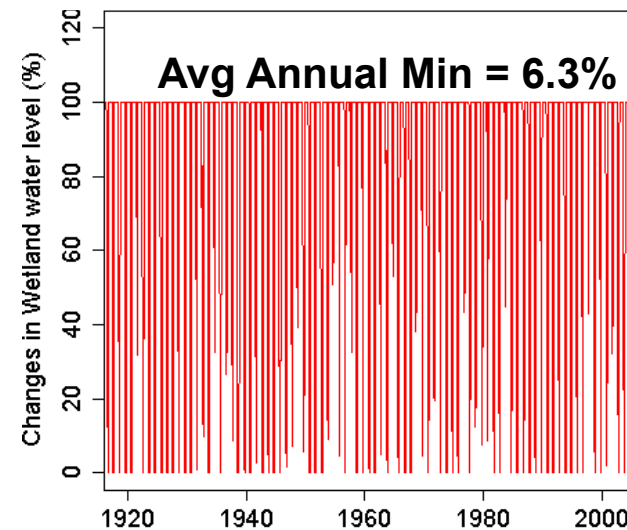
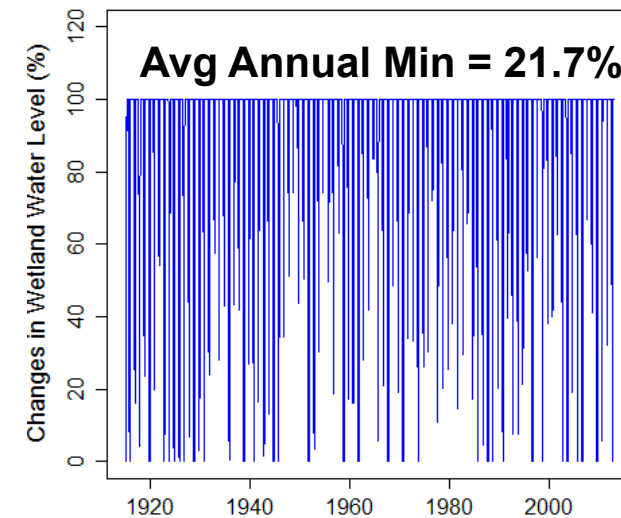
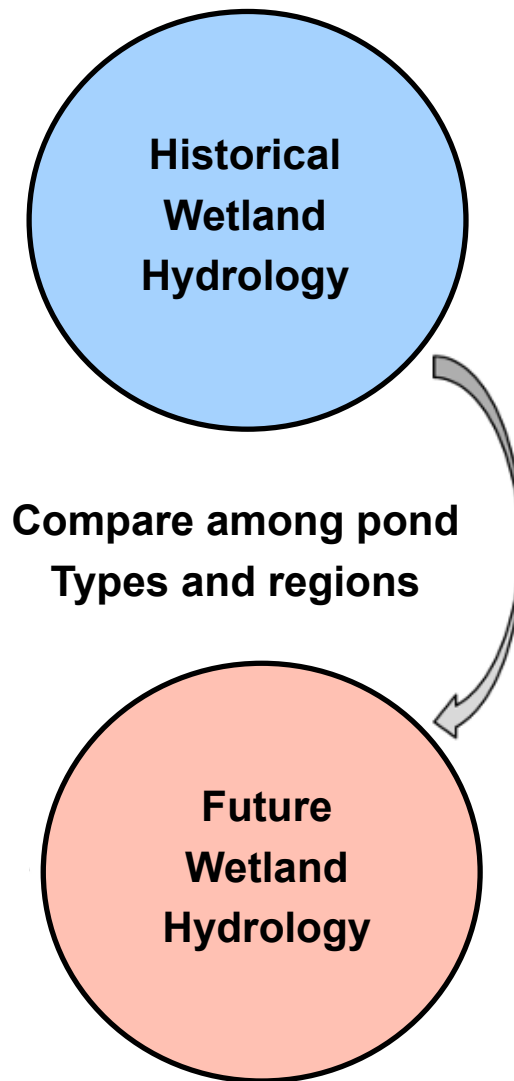


How a model is validated

FORECATE

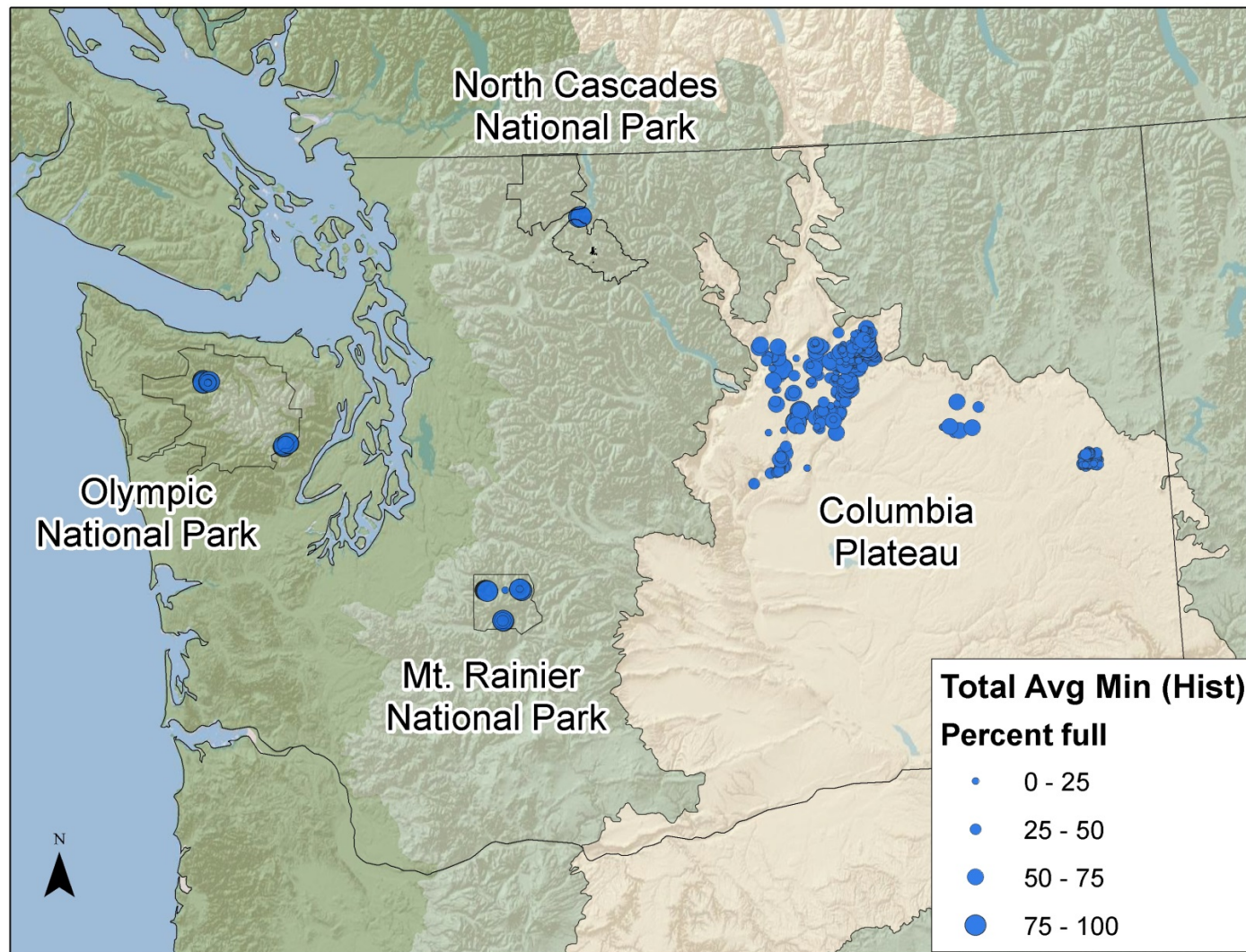


How to assess climate change impacts

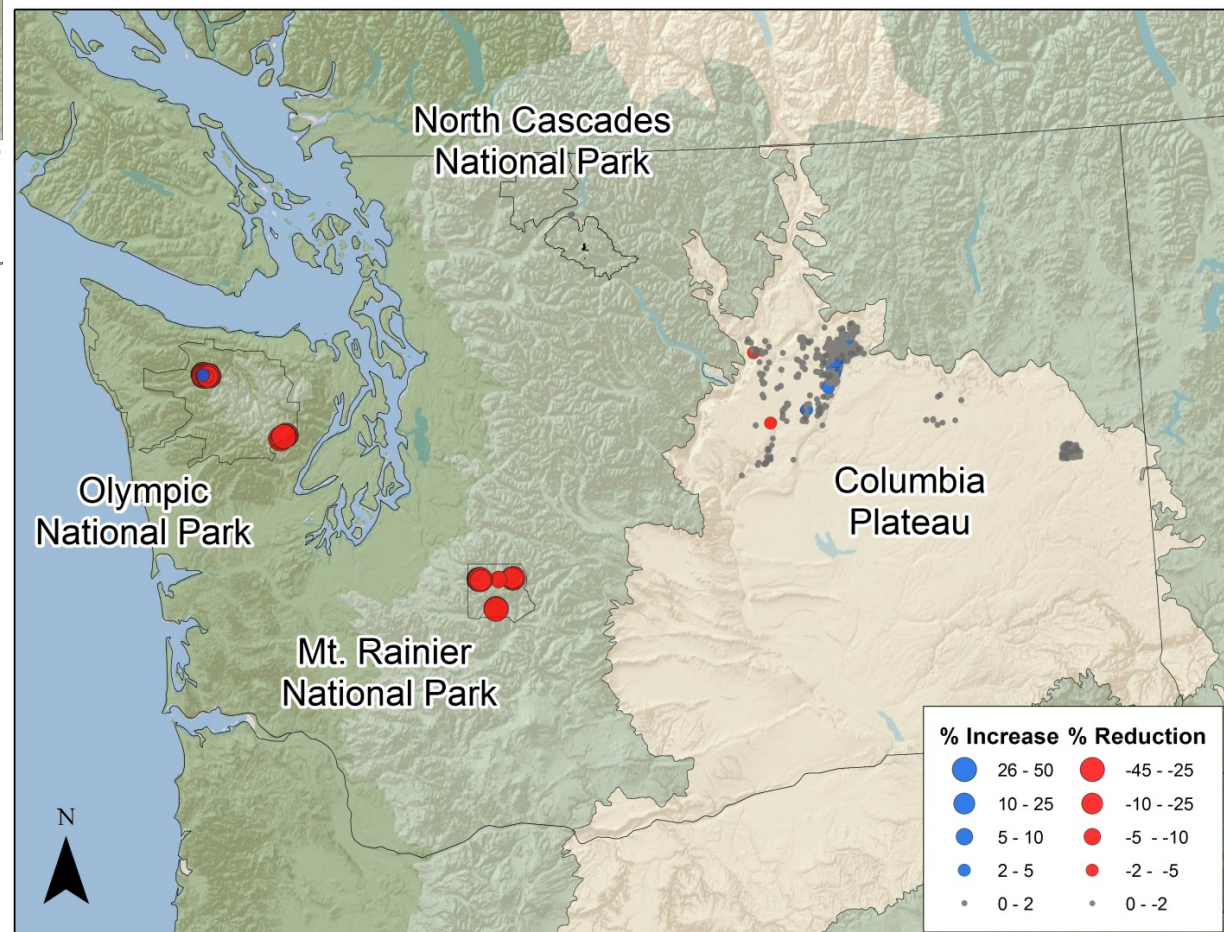
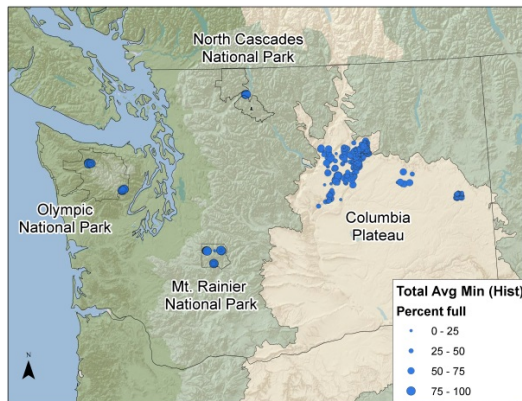


Difference : $21.7 - 6.3 = 15.4$ % Decrease

Wetland Water Level for Historical Runs



Wetland Water Level for Climate Change



Ephemeral
hydroperiod



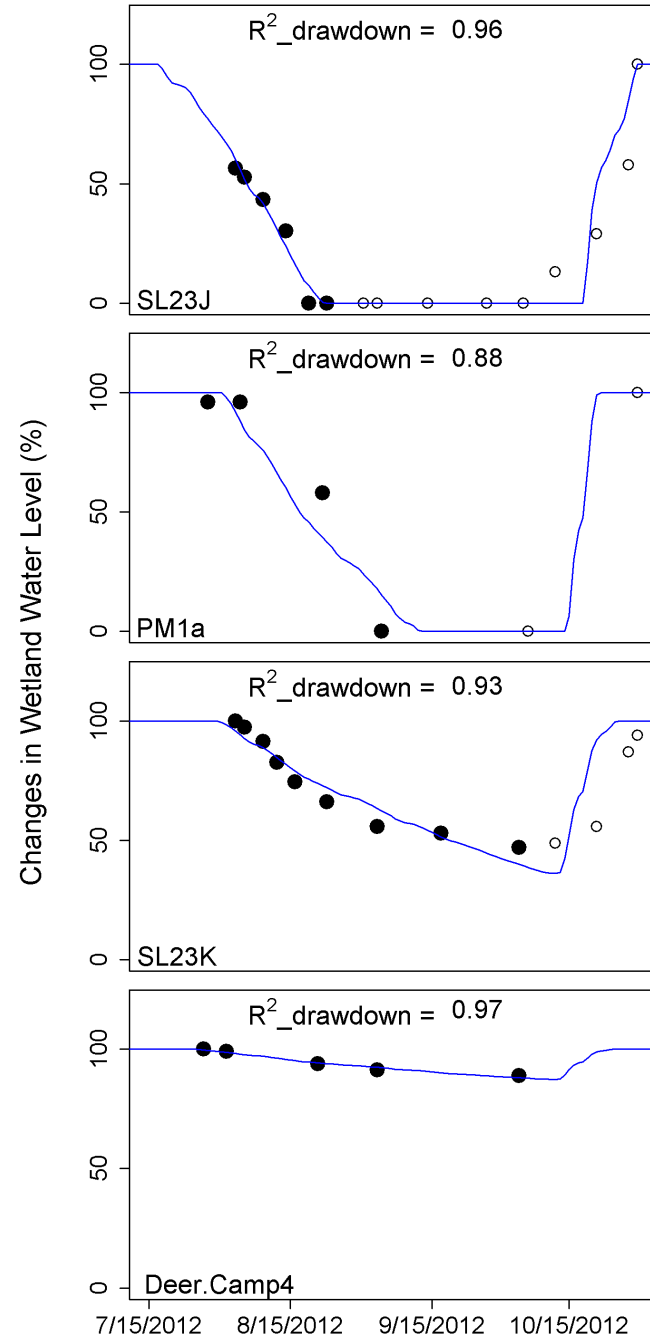
Intermediate
hydroperiod



Perennial
wetland

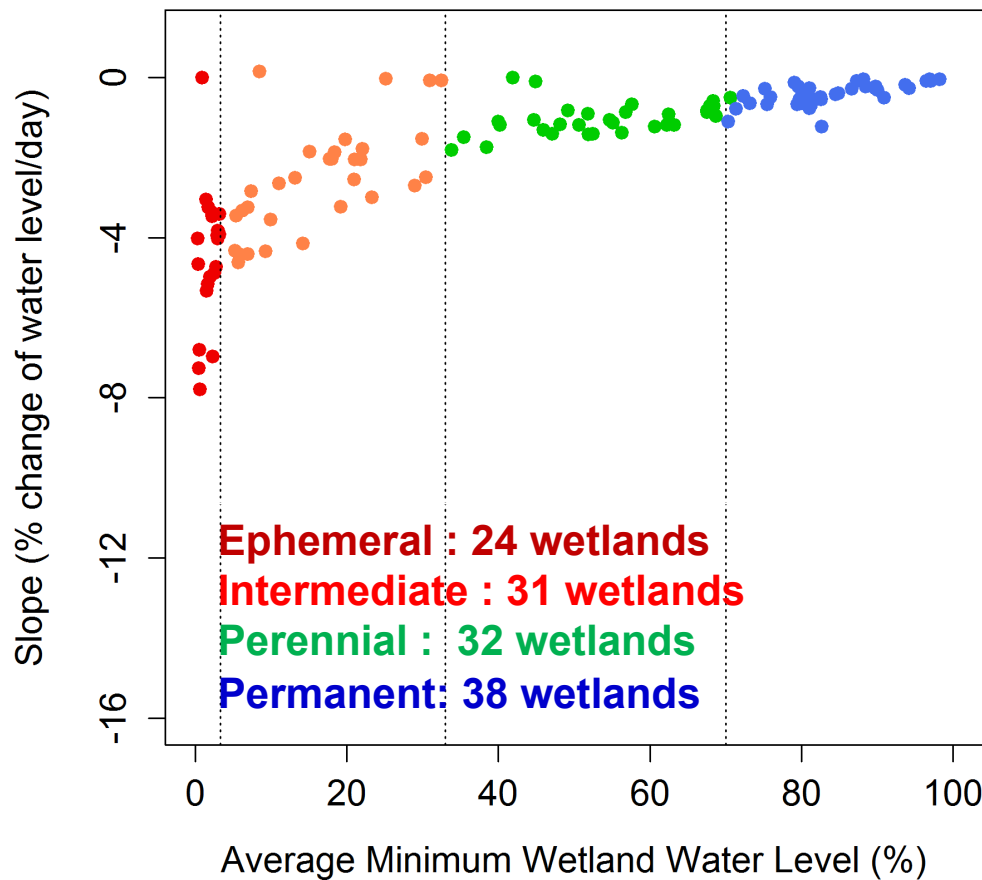


Permanent
wetland



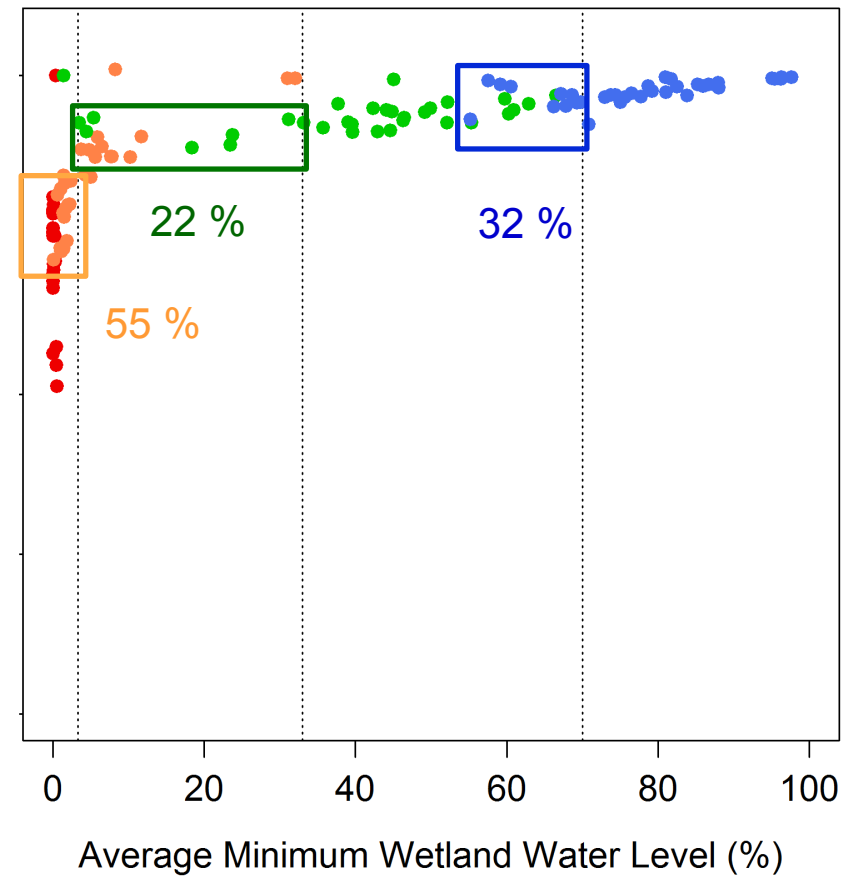
Impacts of Climate Change on Pond Type

Current Climate



Future Climate

(the 2080s)

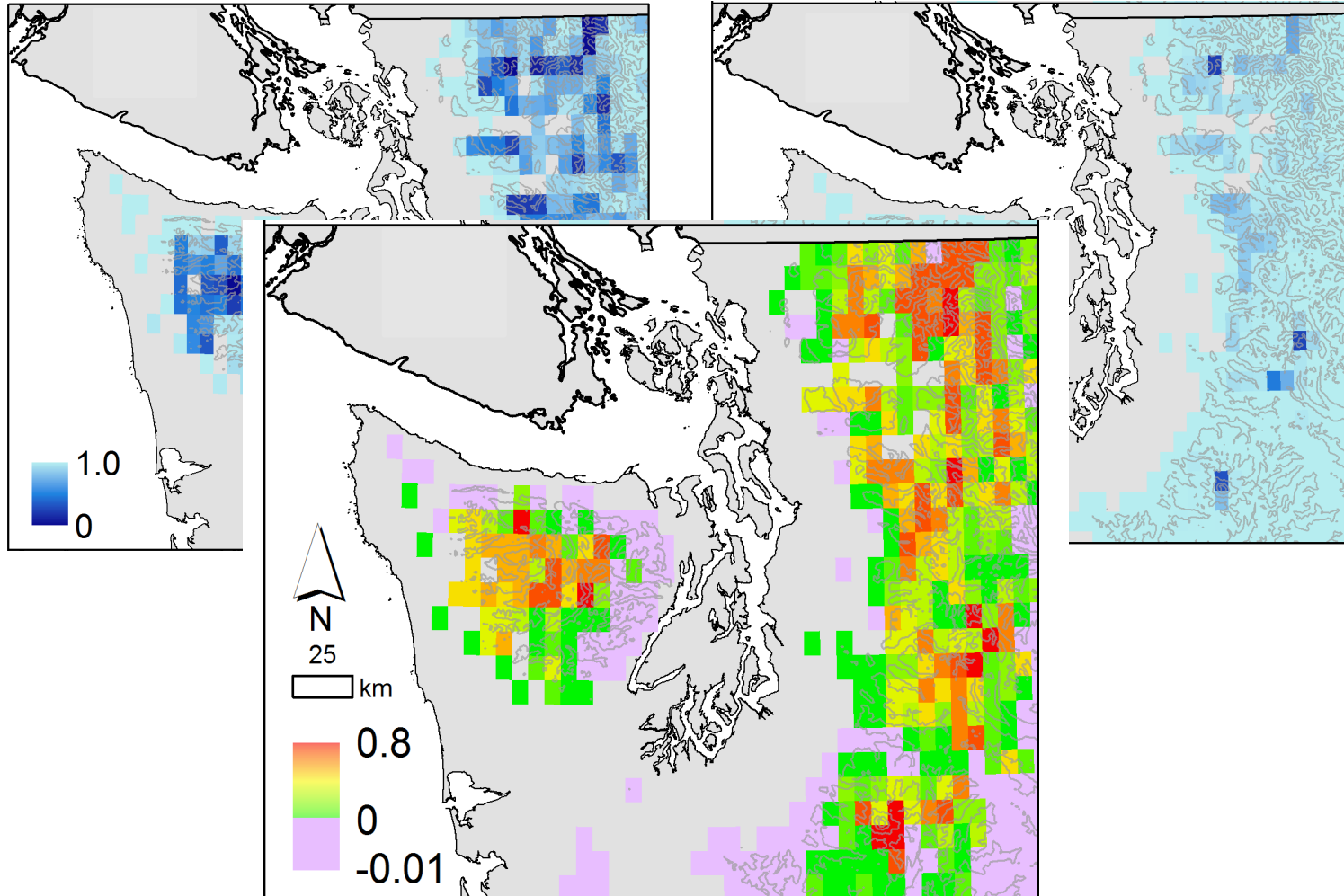


Probability of Wetland Drying

Historical Runs

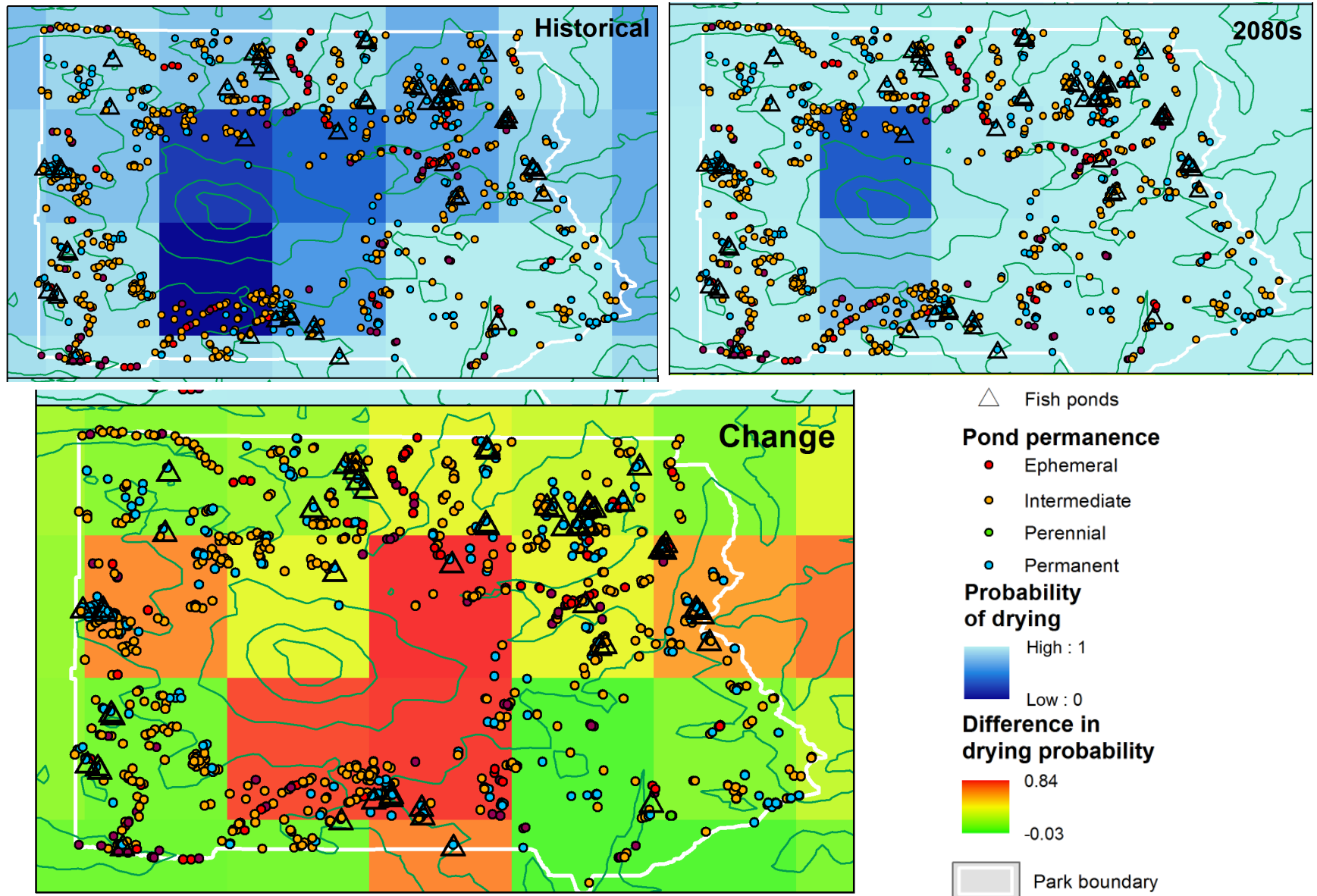
2080s

Intermediate hydroperiod



Example of how to use the projection

Intermediate hydroperiod



Future Work

- We want to extend our approaches over different ecoregions, additional wetland types, and across a longer time series to confirm the robustness of our approach.
- We need to work closely with managers so our results could support the development of a climate-informed management plan.