Modeling Climate Change Effects on the Hydrology of Pacific Northwest Wetlands

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Reduced snowpack

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Hotter, drier summers

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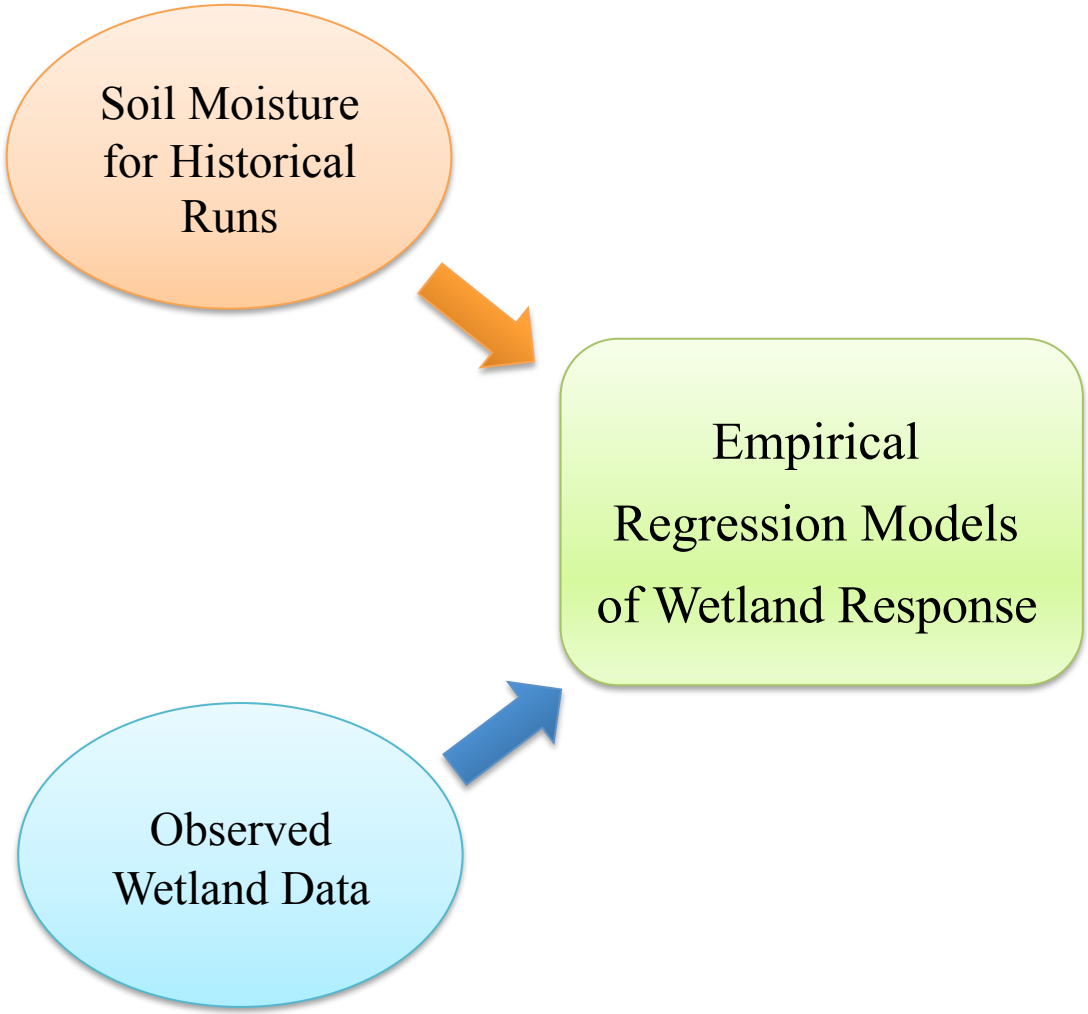
Reduced soil moisture

Changes in the timing and duration of water availability of wetlands

What we want to know

1. How will wetlands change?
2. Which kinds of wetlands are most vulnerable?
3. In which regions are wetlands most at risk?

How a model is developed



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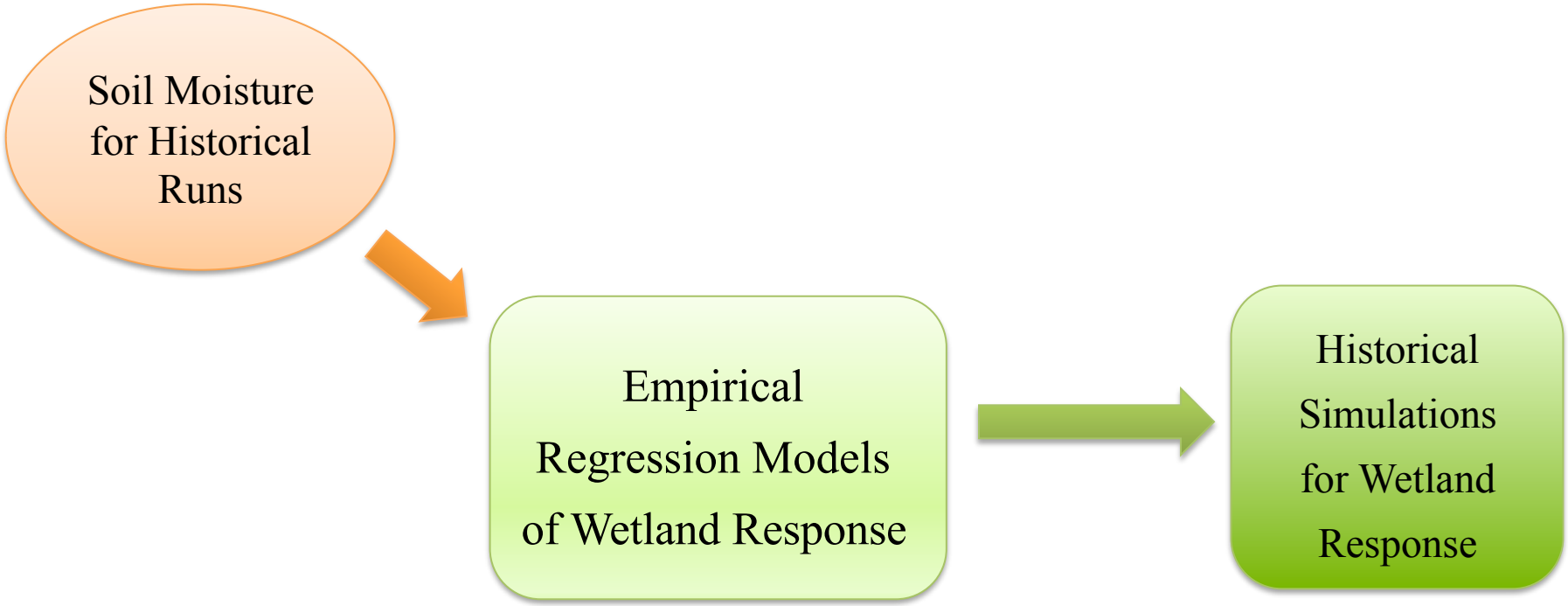

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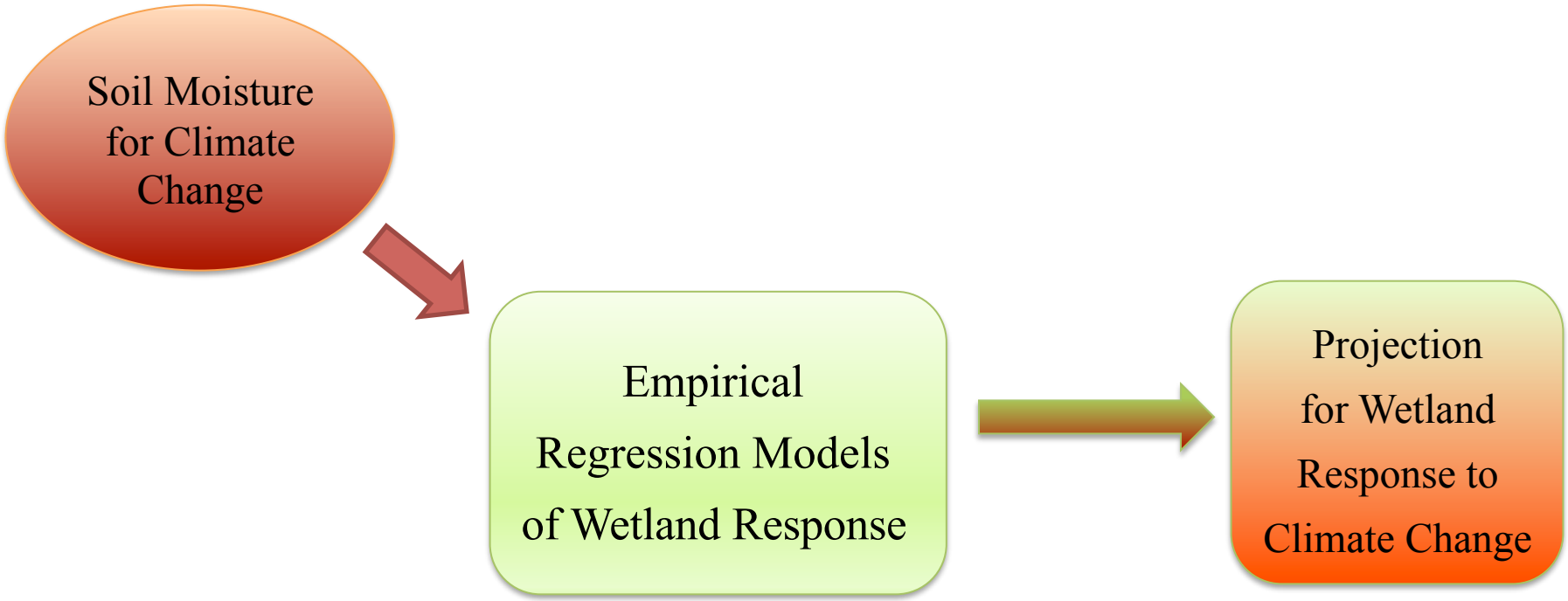

What the model does?

Step 1. Extend a few years of observation to 91 yrs (1915 to 2006) of simulation and project wetland response to climate change

We are able to classify the wetland type based on 91 yrs simulation

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We can know how individual wetlands respond to climate change

What the model does? (cont'd)

Step 2. Forecast the wetland response to climate change over a large geographic area where observed data are not available.

We can prioritize the susceptible region or type of wetland to climate change.

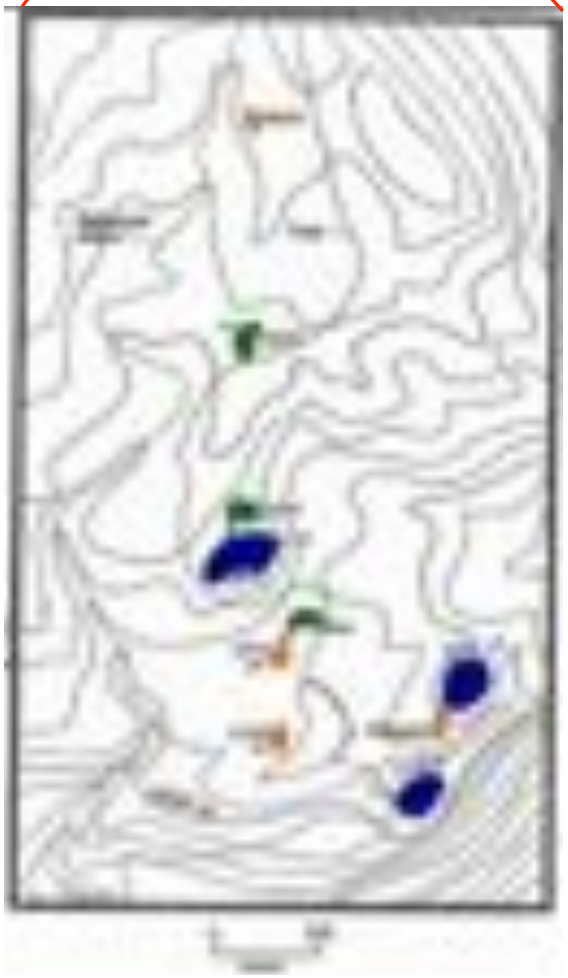
Short hydroperiod

Intermediate hydroperiod

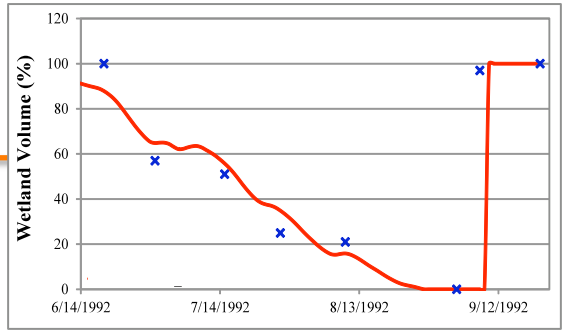
Perennial wetland

Permanent wetland

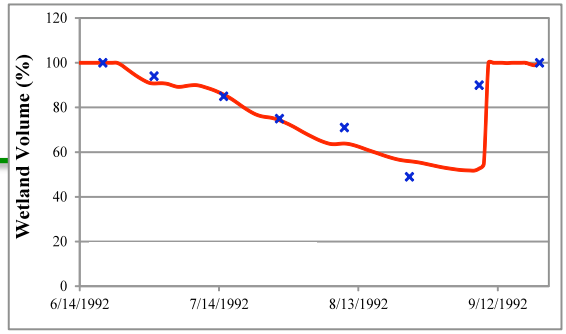
Generate models to mimic historical wetland response



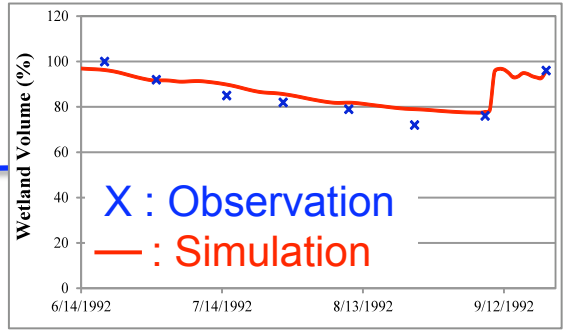
Intermediate hydroperiod



Perennial wetland



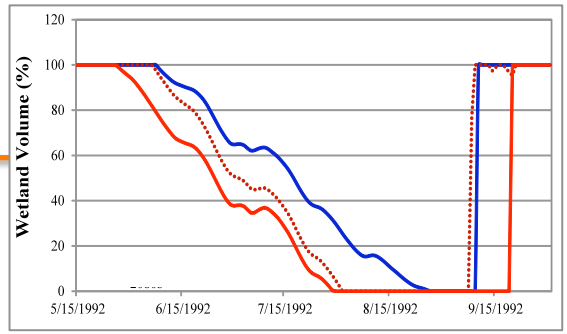
Permanent wetland

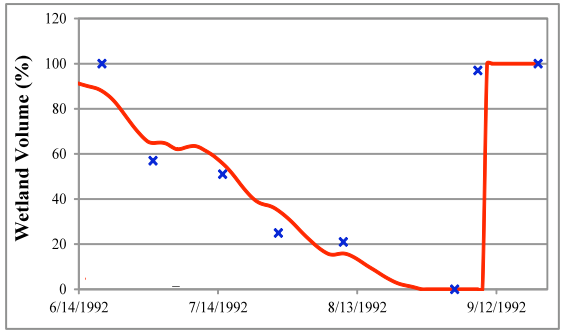


Forecast wetland response to climate change

Generate models to mimic historical wetland response

Intermediate hydroperiod





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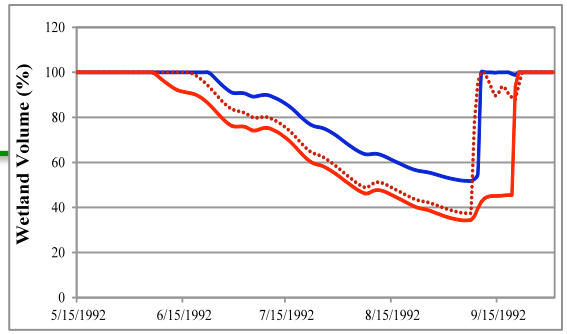
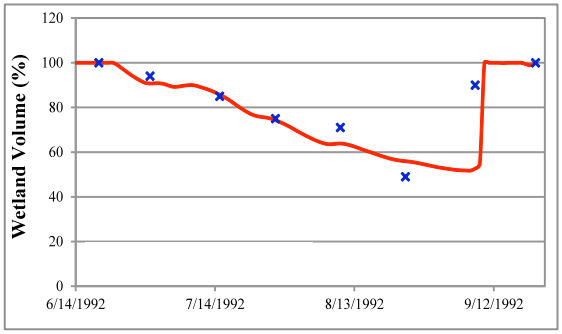
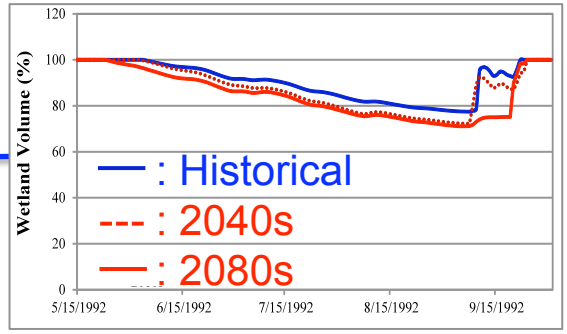
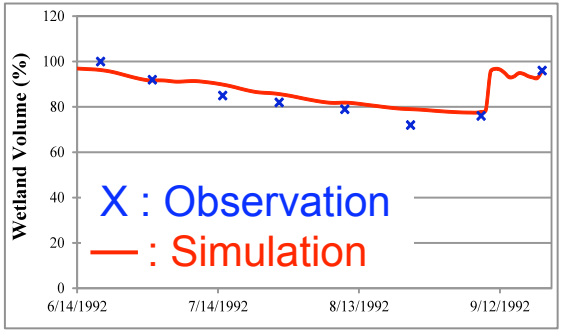




Permanent wetland





Forecast wetland response to climate change

Generate models to mimic historical wetland response

Probability of Pond Drying for Historical

Ponds dri
13 out of 9
(14 %)

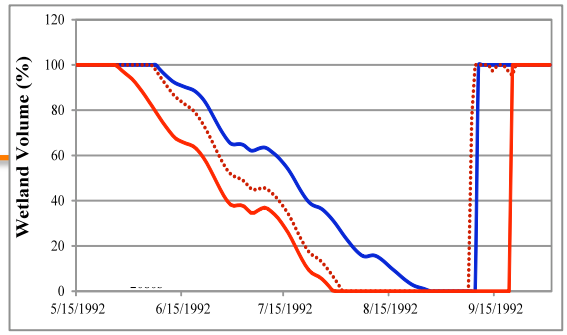
Ponds dry
79 out of 91 yrs
(85 %)

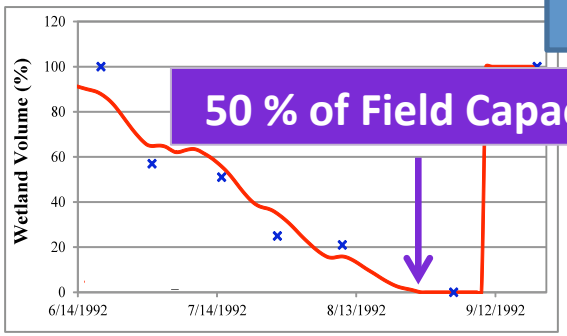
50 % of Field Capacity

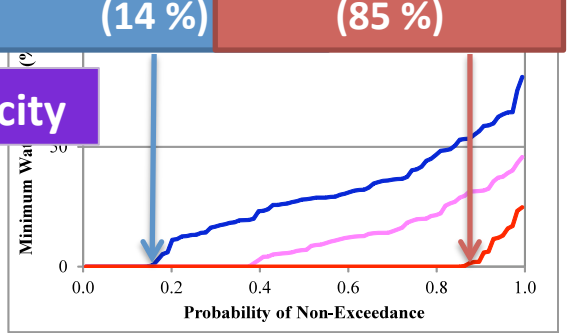
Intermediate hydroperiod

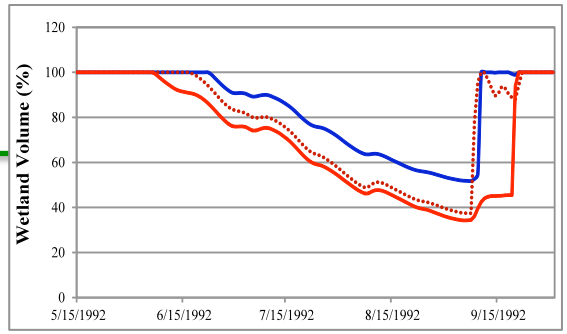
Perennial wetland

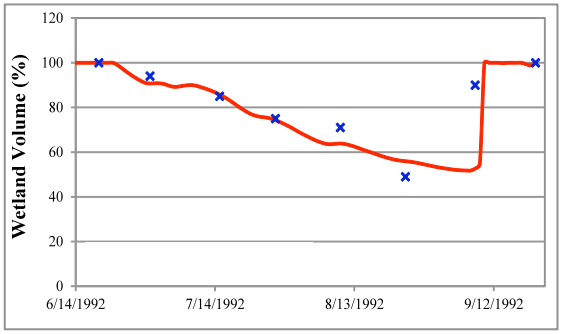
Permanent wetland

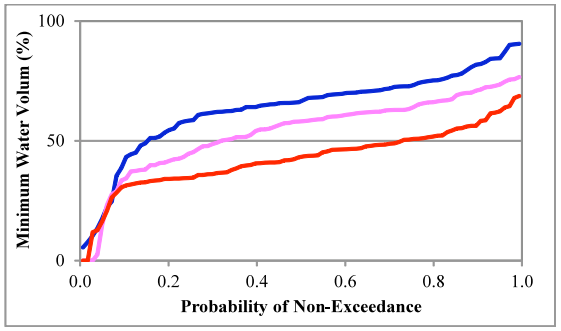


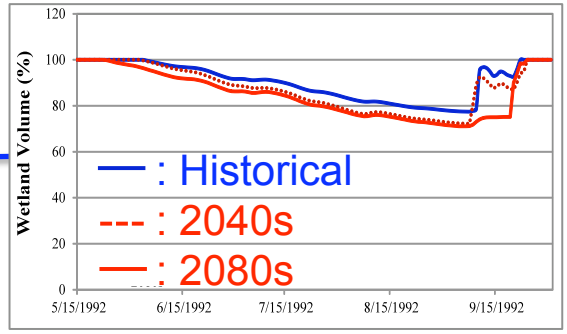


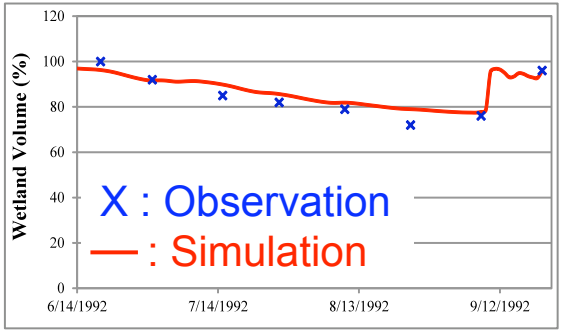


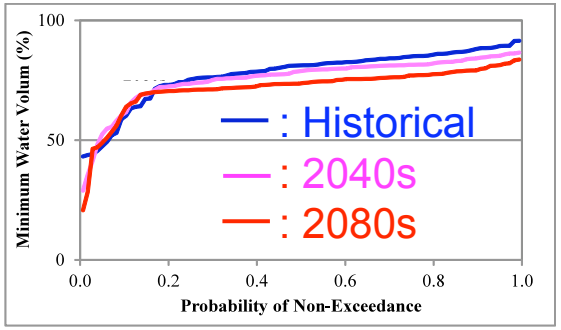




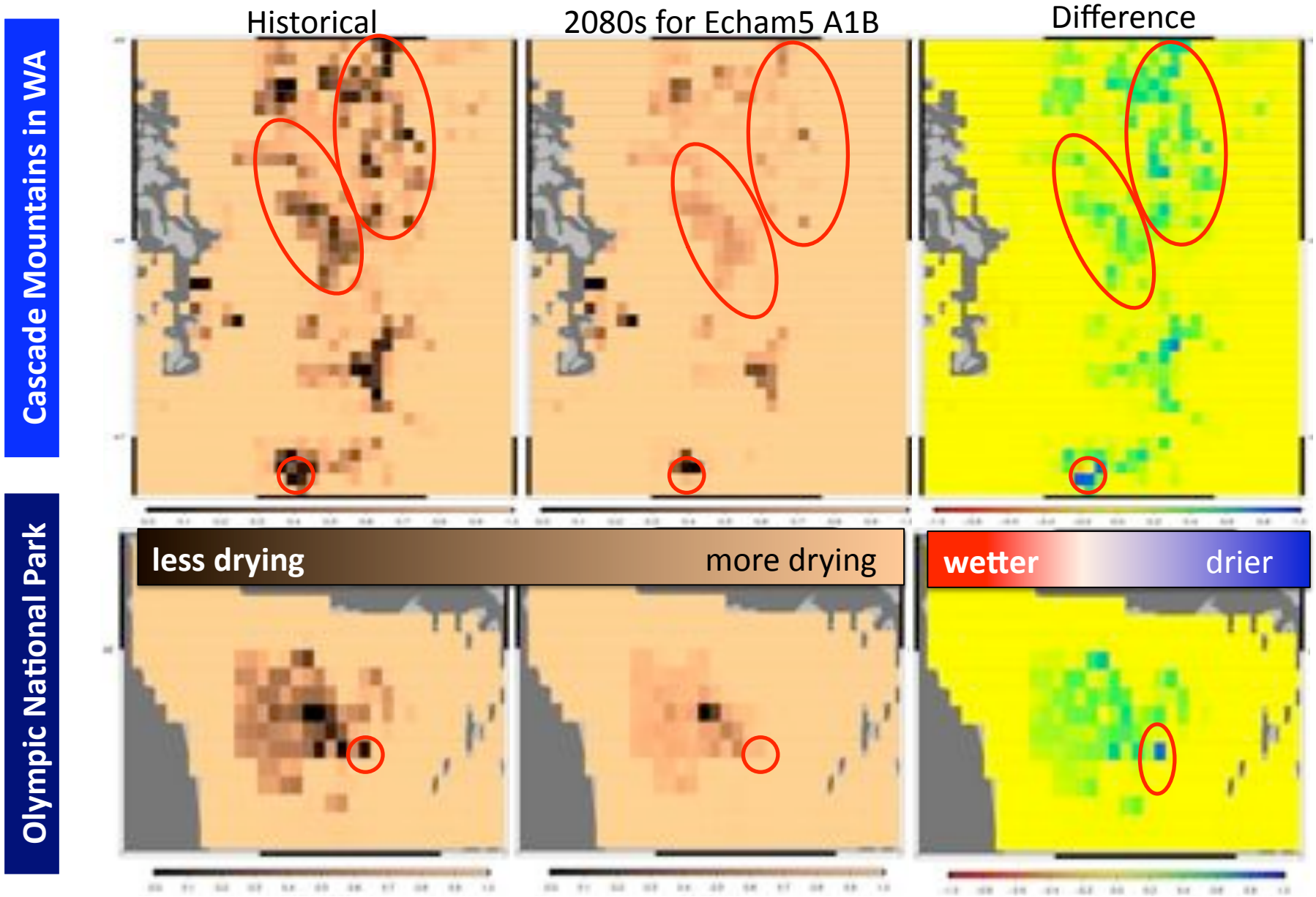








Probability of Pond Drying



Conclusions

- The models developed here reproduce historical wetland response quite well overall.
- The models show that climate change is likely to cause earlier drawdown, a more rapid recession rate, reduced water levels and longer dry season in summer.
- Intermediate hydroperiod wetlands in mountain environments are likely to be the most sensitive to climate change
- The geographical map allows us to identify the susceptible regions.

Questions?

Photos: Adult female Cascades frog (Rana cascadae), aquatic garter snake (Thamnophis atratus) captured in Echo Lake basin, Trinity Alps Wilderness, CA. (Photos: J. Garwood)