Hydrologic Model Simulations

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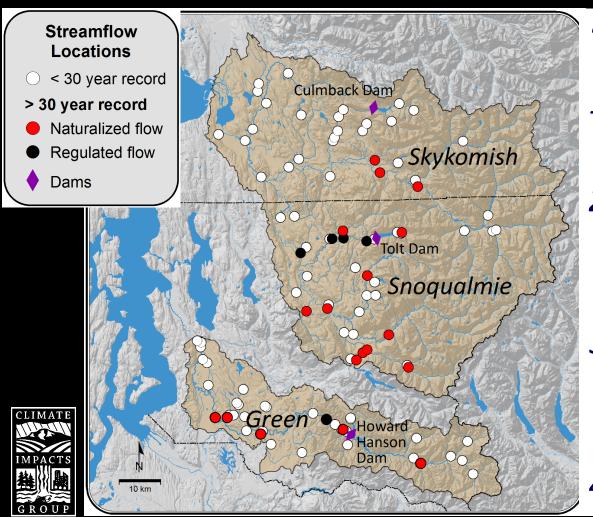




Purpose: Estimate the impacts of climate change on flooding and flood risks in King County rivers

Task 3 Recommendations Task 2 for Future Analyses Estimate Changes Task 1 in Streamflows Uncertainty in Precipitation Extremes

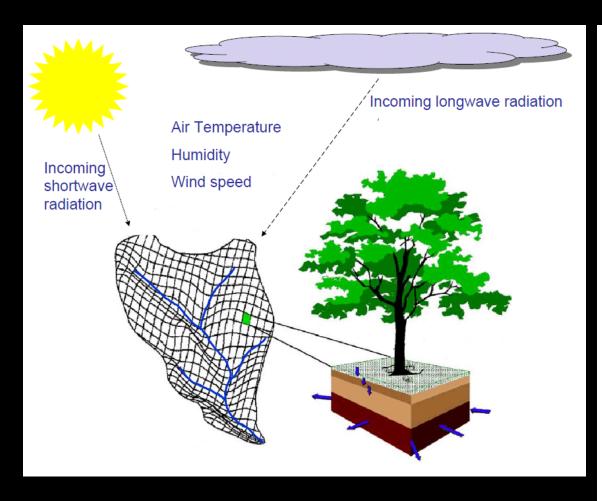
Purpose: Estimate the impacts of climate change on flooding and flood risks in King County rivers



Task 2

- Simulate naturalized/unregulated streamflow for all locations.
- **2. Bias-correct** naturalized streamflows for sites having +30 years of naturalized flows.
- 3. Simulate **regulated** flows for the Green (Howard Hanson Dam) and Sultan River (Culmback Dam).
- 4. Provide decision-relevant metrics.

Distributed Hydrology Soil and Vegetation Model (DHSVM)



Pros

- Physically based, distributed hydrology model
- Use **Fine Spatial** resolution (50 m to 200 m)
- Use Fine temporal resolution (sub-daily time step)
- Simulate water temperature and/or sediment load

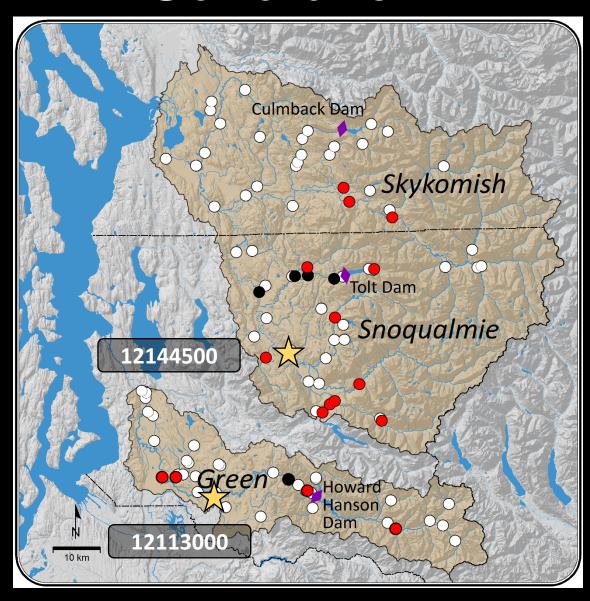
Cons

- Computationally intensive
- Can't simulate groundwater flow well

Calibration

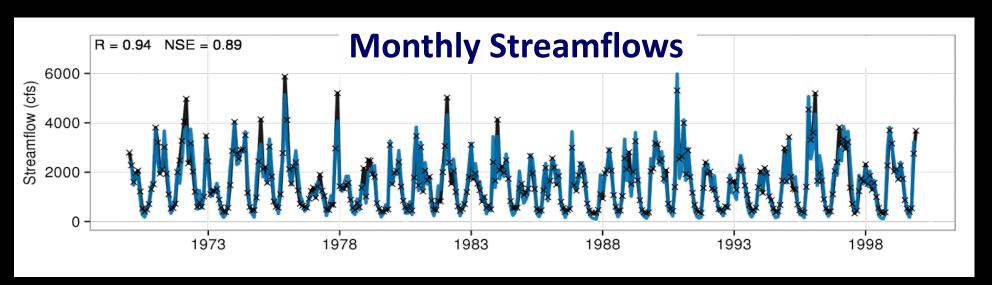
Streamflow Locations

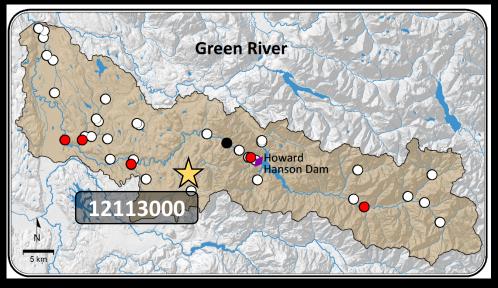
- < 30 year record
- > 30 year record
- Naturalized flow
- Regulated flow
- Dams

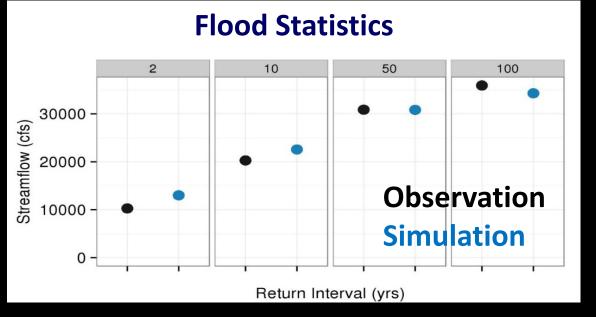




Green River near Auburn

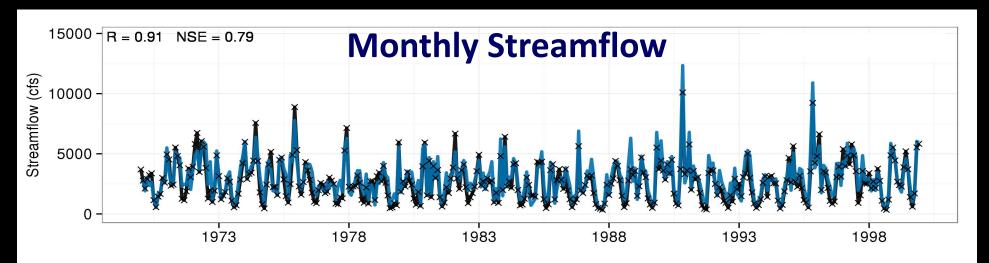


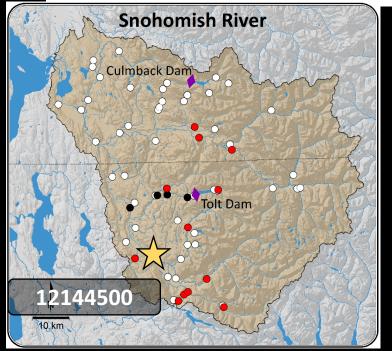


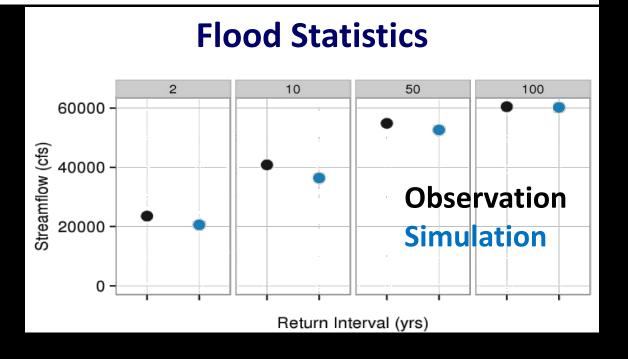




Snoqualmie River near Snoqualmie

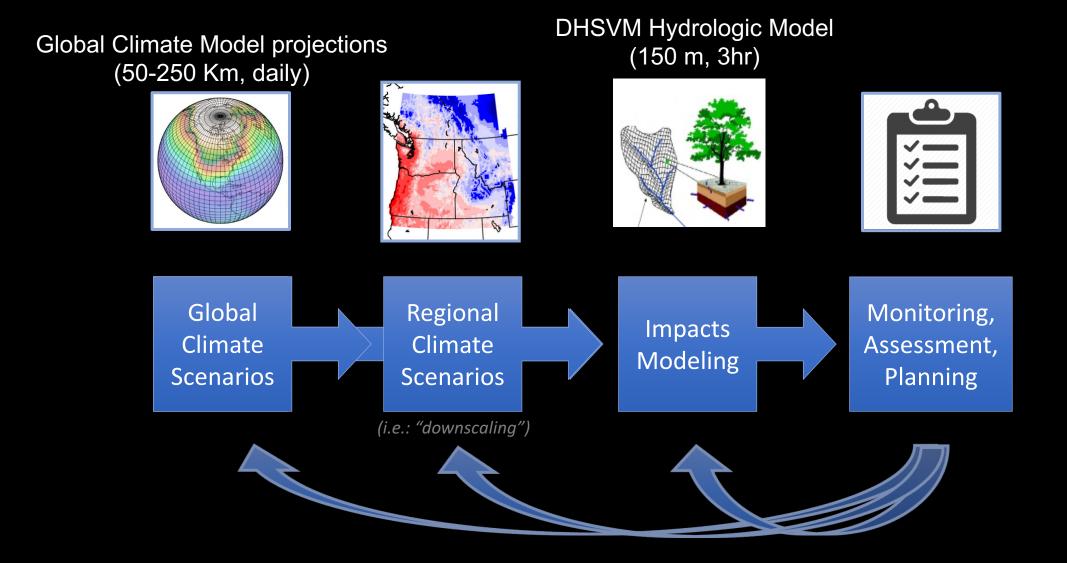






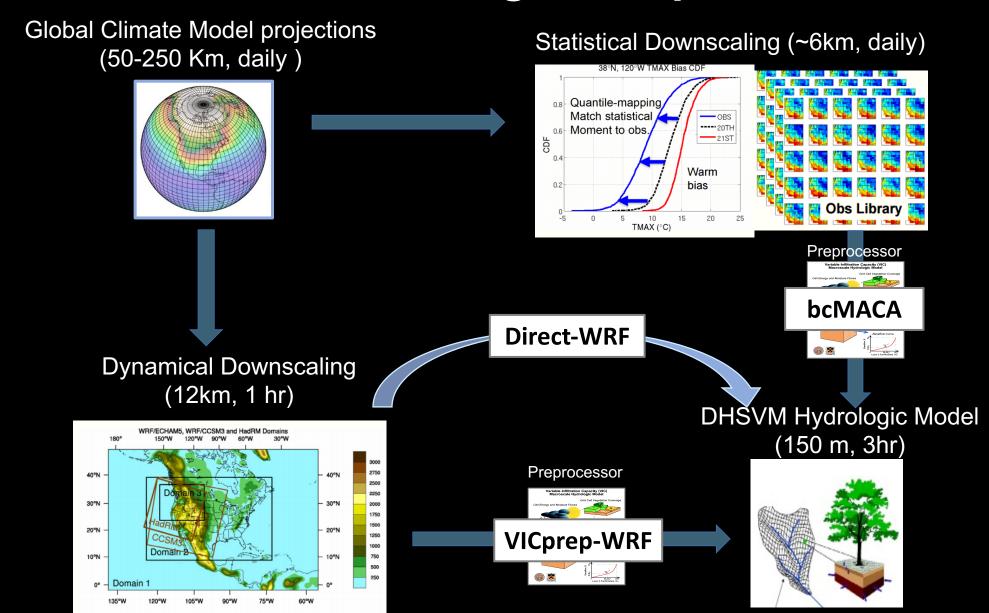


Meteorological Inputs



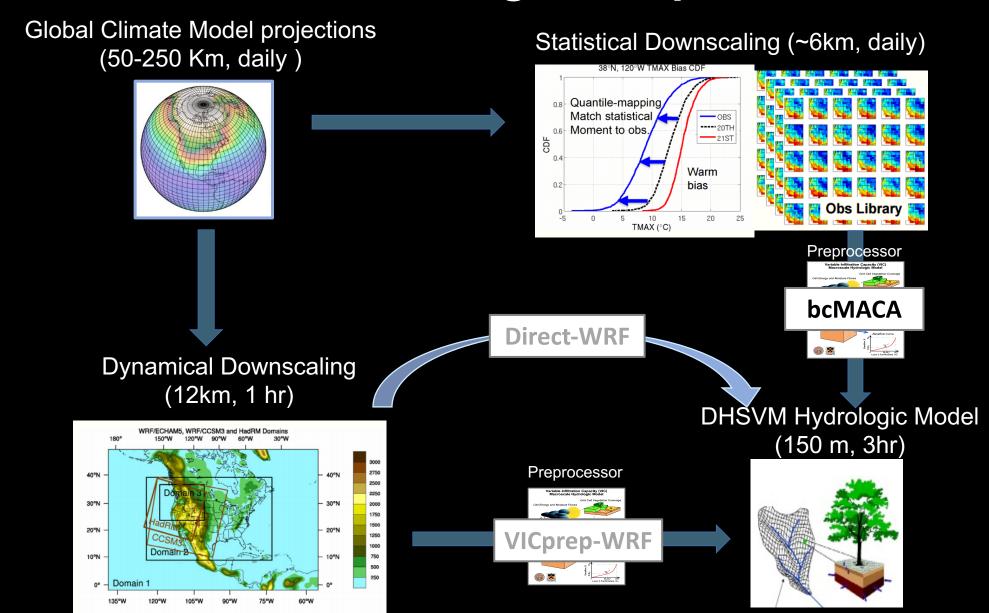


Meteorological Inputs





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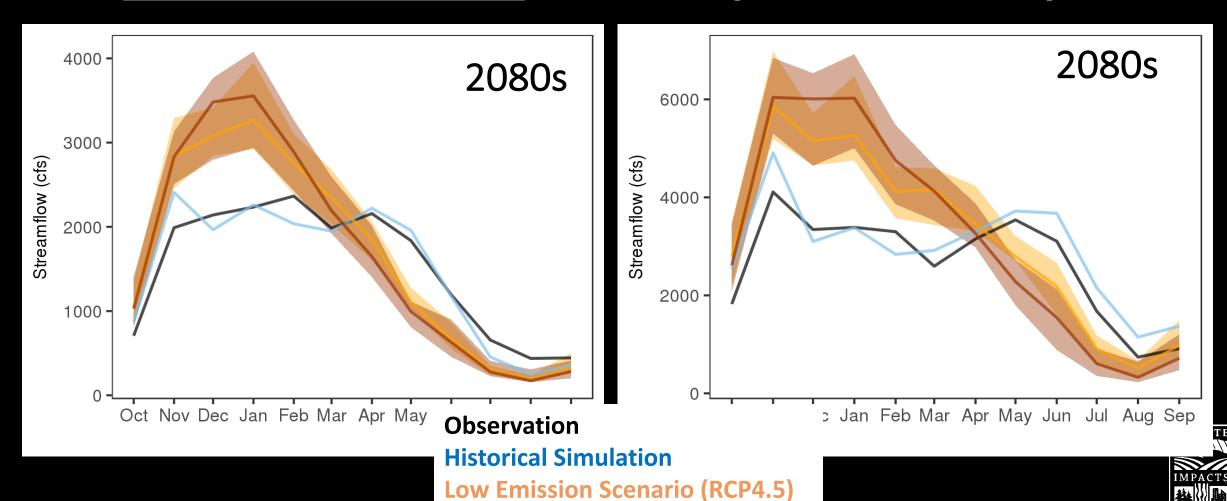




Monthly Avg. Flows (bcMACA)

Green R. near Auburn

<u>Snoqualmie R. nr Snoqualmie</u>

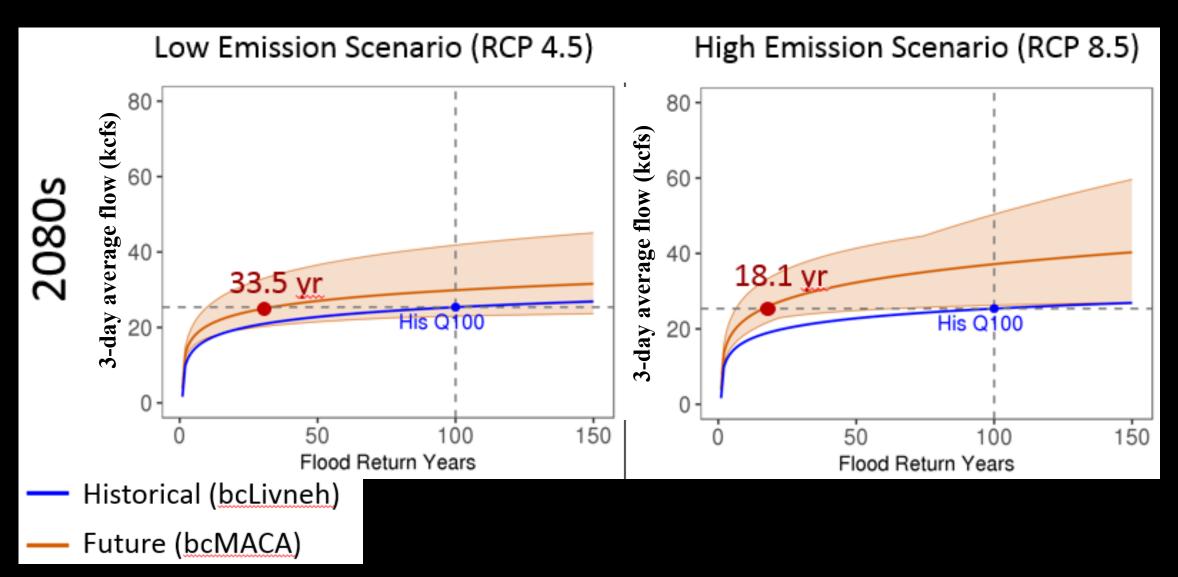


High Emission Scenario (RCP8.5)

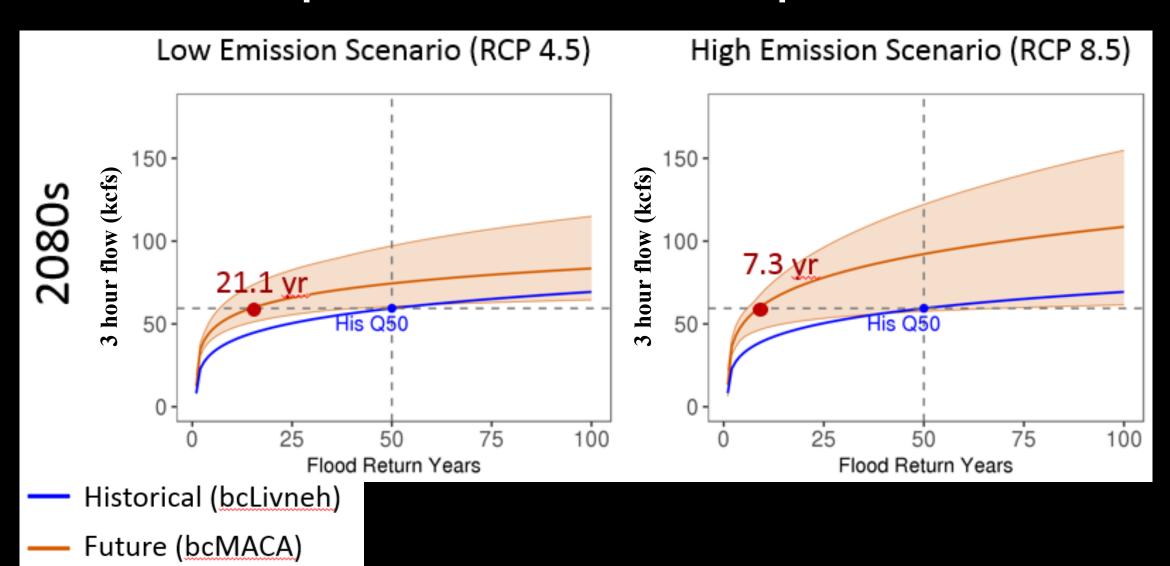
Decision-Relevant Metrics

- Green River: Frequency of exceeding 25 kcfs (100 year flood) and 28 kcfs (200 year flood) at the Green River near Auburn in 3-day average naturalized flow
- Snoqualmie River: Frequency of exceeding ~48 kcfs (20 year flood) and 59 kcfs (50 year flood) at the Snoqualmie River near Snoqualmie in 3 hour naturalized flow

Return Flood Frequency for the Green River near Auburn (bcMACA)



Return Flood Frequency for the Snoqualmie River near Snoqualmie (bcMACA)



Summary

Based on Statistical downscaling method

- Mixed rain and snow watersheds will become raindominant watersheds due to warm winter temperature
- On the Green, historical 100 year flood could be happening possibly more than 5 times as often by 2100
- On the Snoqualmie, historical 50 year flood event could be happening as often as every 7 years by 2100

Next Steps

- 1. Run Hydrology Model with Two WRF Scenarios
- 2. Run Reservoir Simulation Models
- 3. Compute Historical and Future Stream Statistics
- 4. Write Report



Questions?

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