Kiamichi Watershed Agent-based Model: Assessing Impacts of Future Climate and Water Exports

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Kiamichi model

- Decision support needed when
  - Stakeholder interests conflict
  - Decisions create hydrologic ‘feedback’
  - Climate differs from ‘normal’
  - Management will involve ‘tradeoffs’
- Designed to help stakeholders answer

“What will happen to the things I care about?”

Kiamichi stakeholders

- OKC

STATE OF OKLAHOMA, CHOCTAW NATION OF OKLAHOMA,

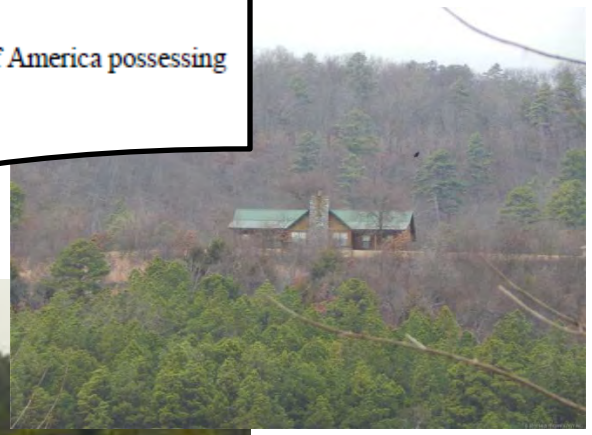
CHICKASAW NATION, CITY OF OKLAHOMA CITY WATER SETTLEMENT

AUGUST 2016

PREAMBLE

WHEREAS, the State of Oklahoma is a state of the United States of America possessing the sovereign powers and rights of a state;

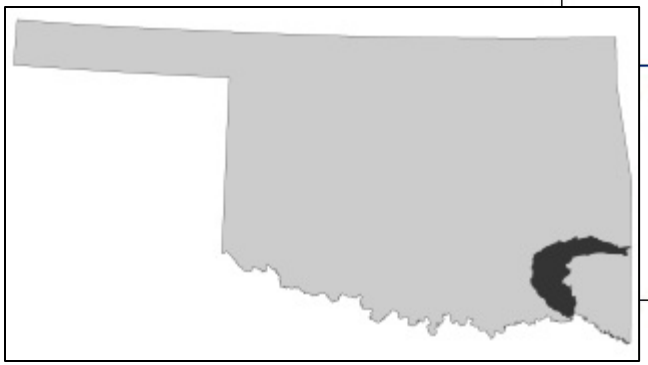
WHEREAS, the Chickasaw Nation is a federally recog

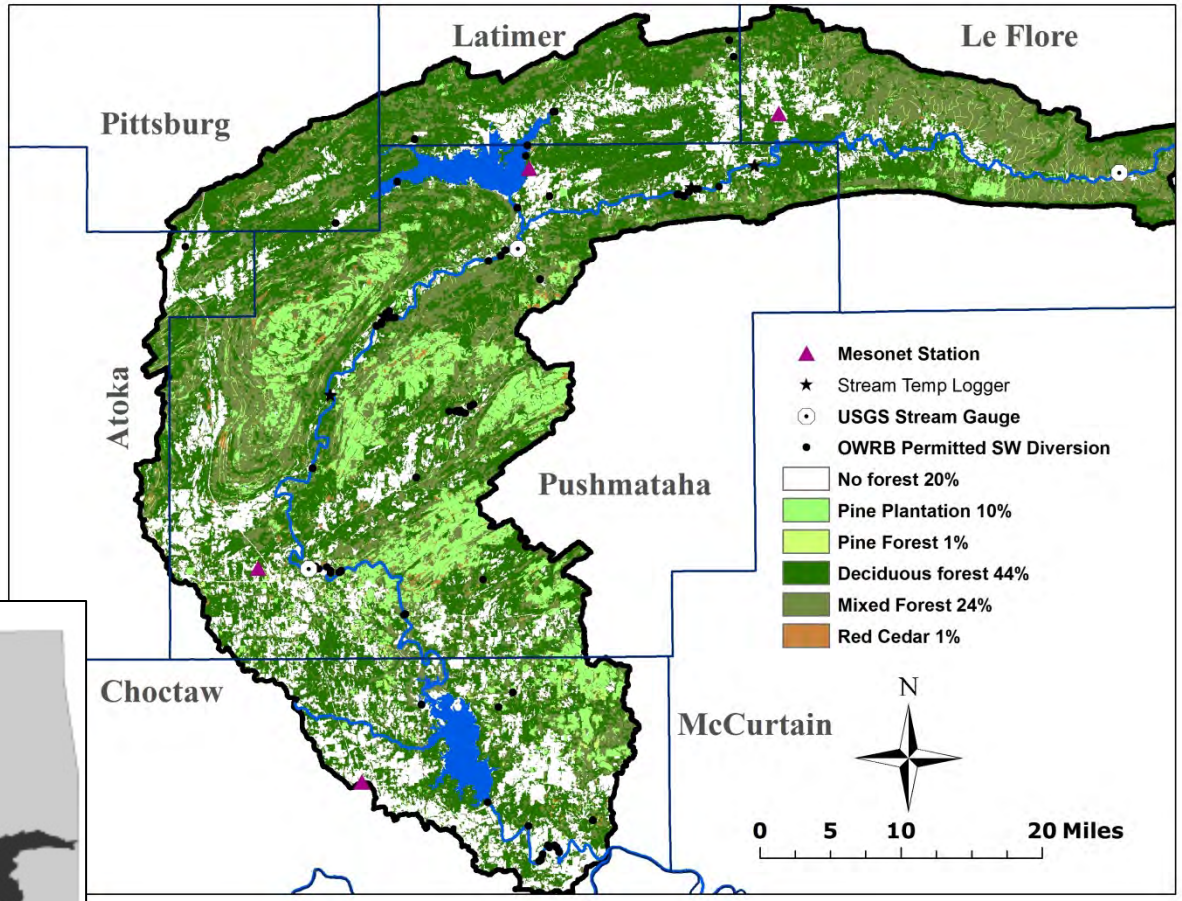


- Local interests
  - Development
  - Tourism

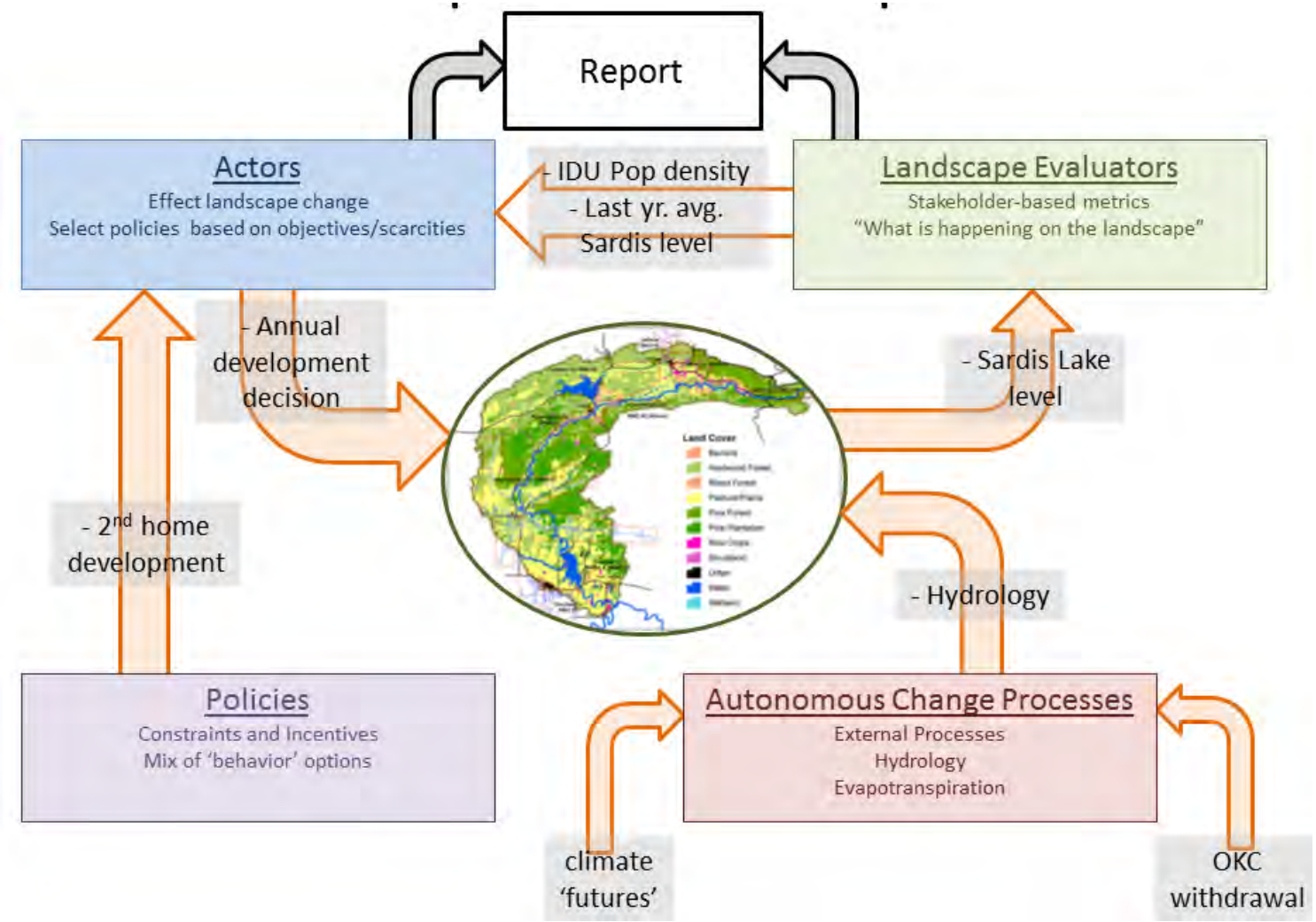
Kiamichi model components

- Landcover
- Hydrology
  - Kiamichi River
  - Sardis Lake

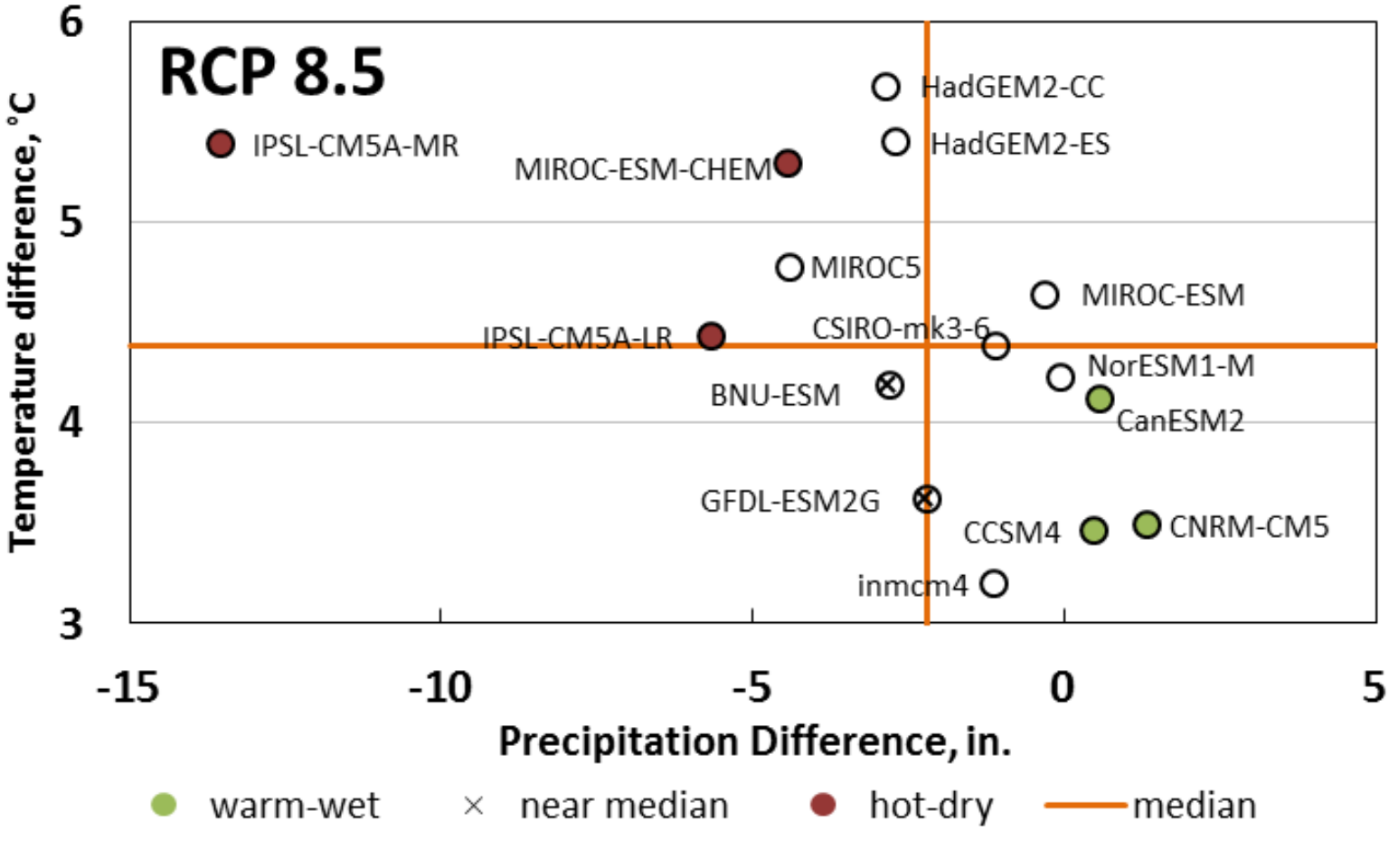




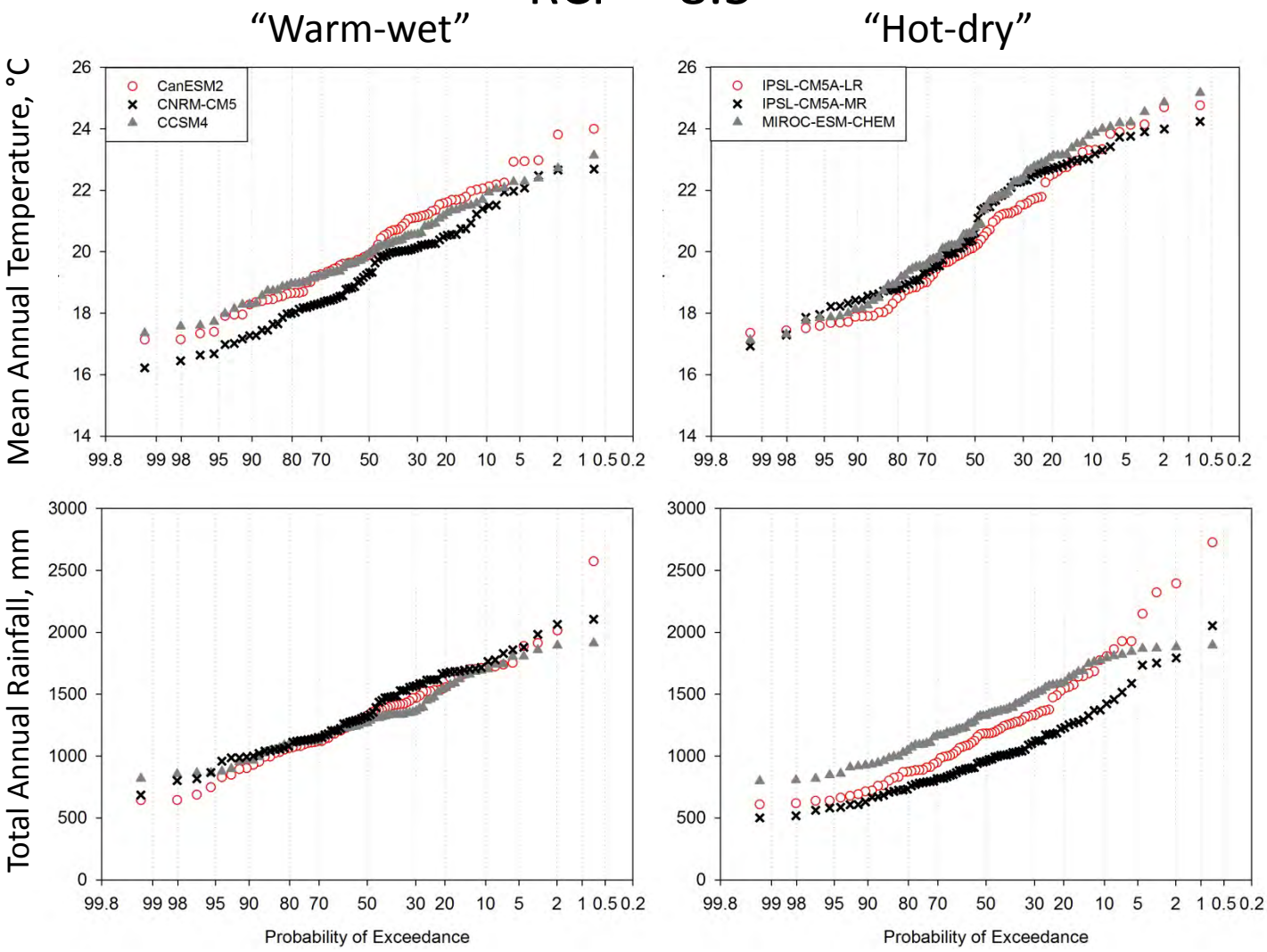
Kiamichi model interactions



Climate components

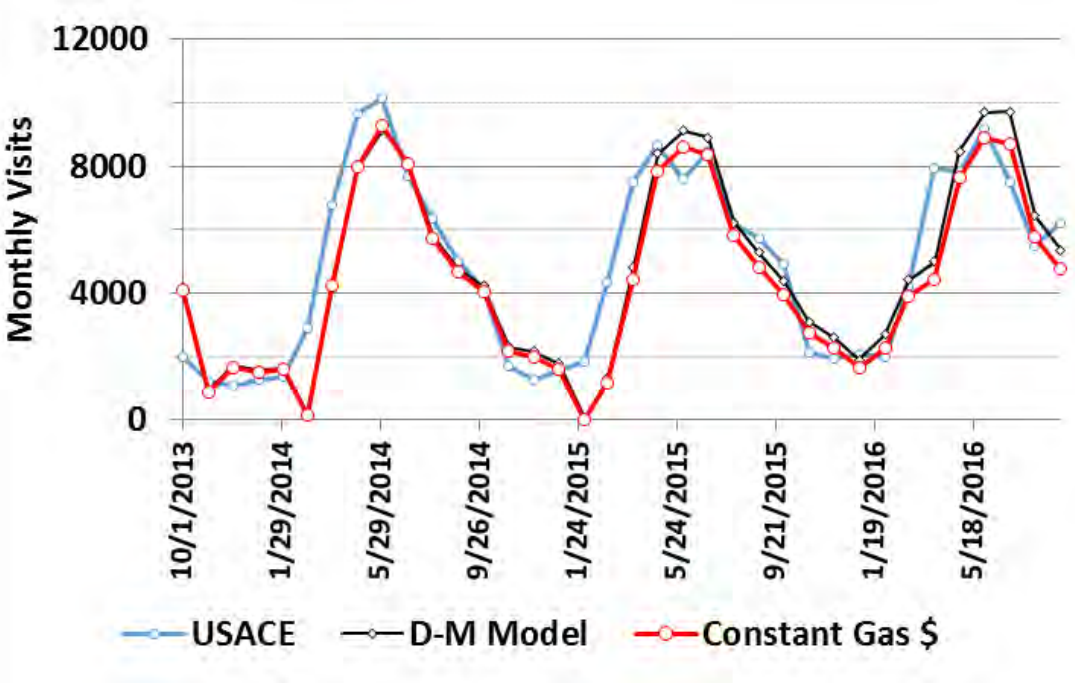


MACA downscaled climate ‘futures’ 2021 – 2099
RCP = 8.5



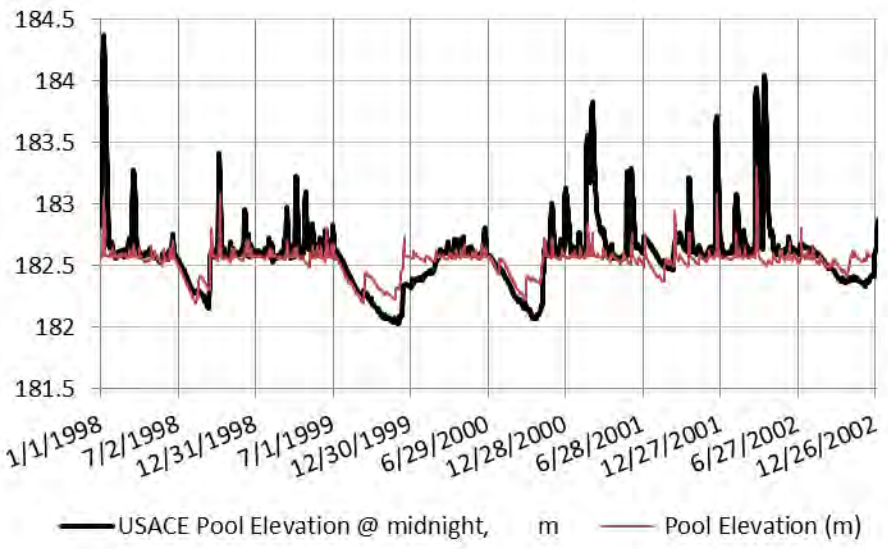
Model outputs

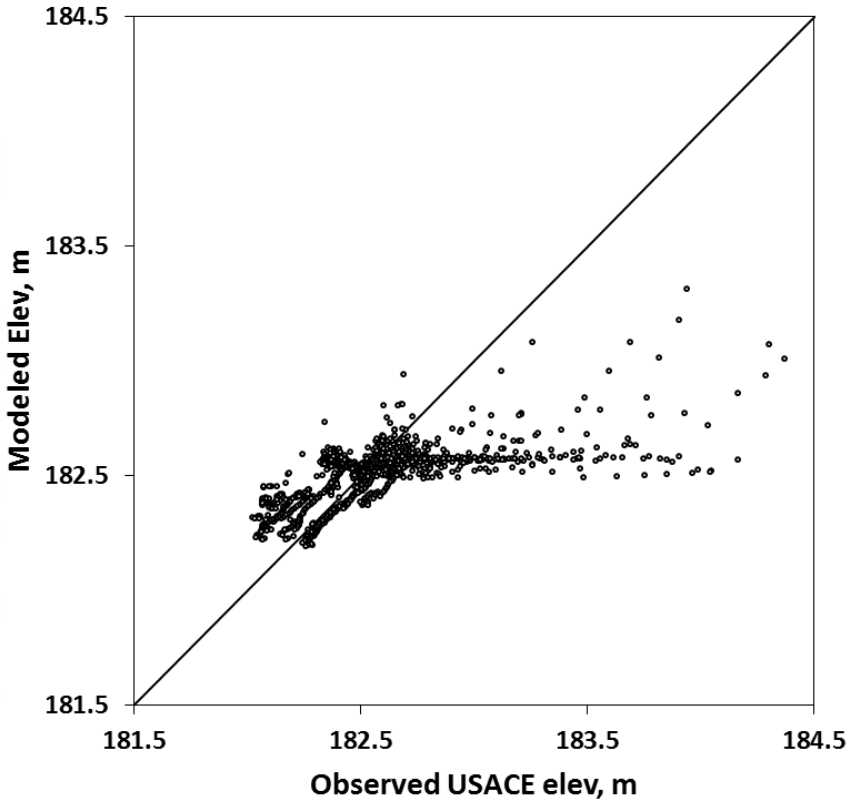
- Reservoir visits
  - Model by Daniels and Melstrom (2017)
  - Exponential model
    - Precipitation
    - Temperature
    - Lake levels
    - Gas $
    - Year, Month, Park
  - Adapted for ‘future’ by:
    - Constant Gas $
    - Constant ‘Year’



Model outputs

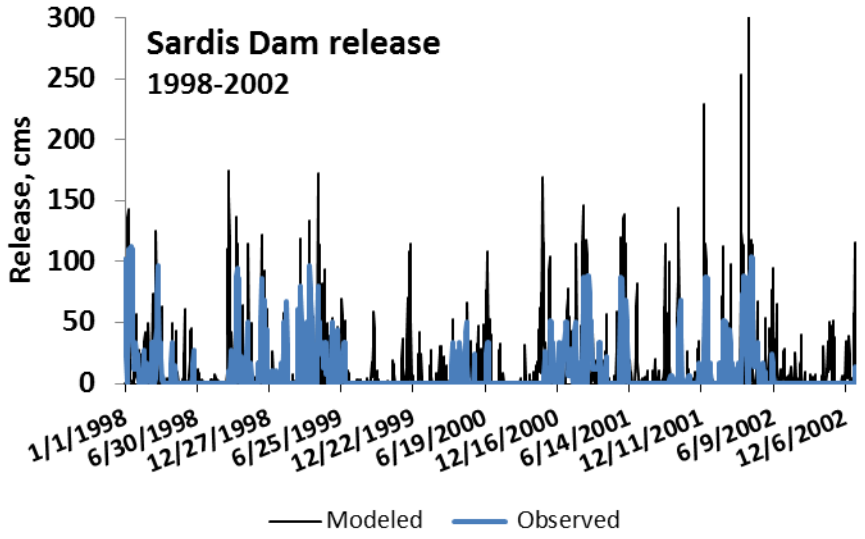
- Reservoir levels

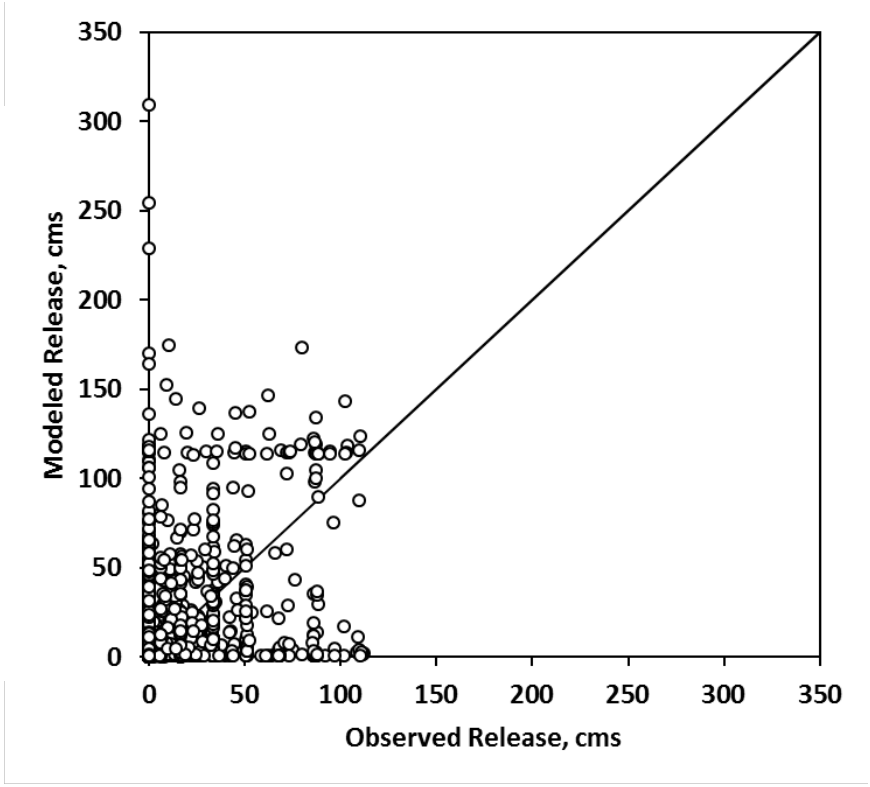




Model outputs

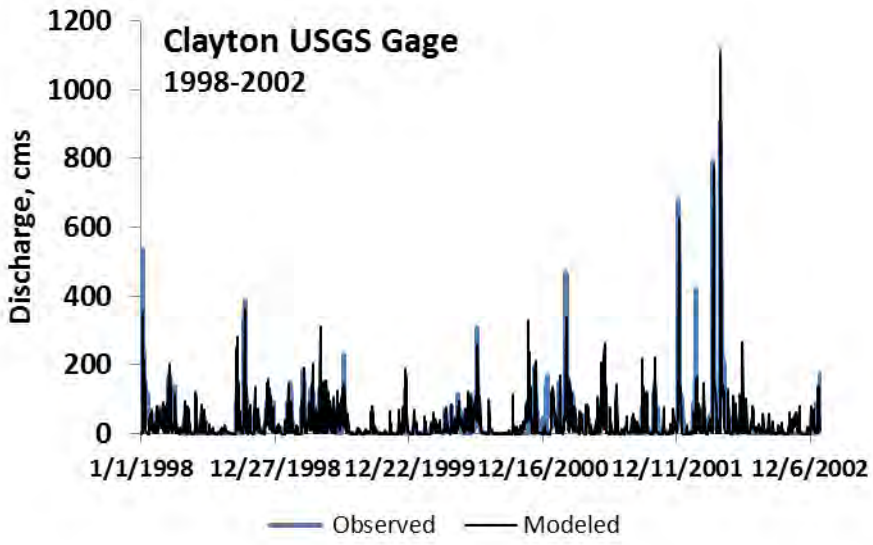
- Reservoir releases

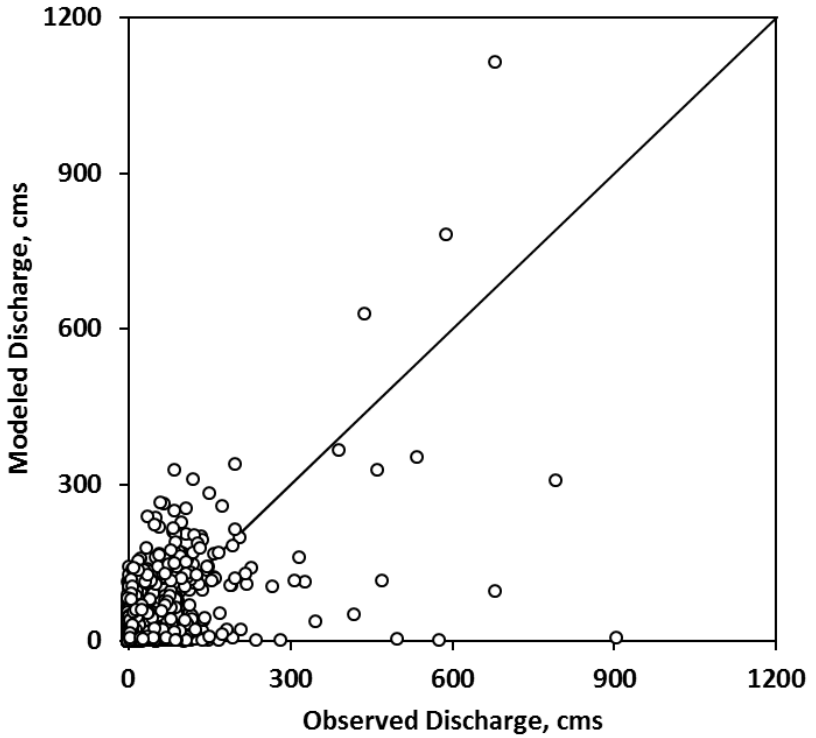




Model outputs

- Flow at USGS gage





Decision tool…

- Shows
  - ‘Trade-offs’ between stakeholders’ needs/desires
    - Water delivery vs. Reservoir visits
  - Climate component allows assessment of management thresholds
    - If/When will conflicts become a critical issue?
- Not
  - A detailed prediction ‘on this day…’
  - No ‘right answer’

Acknowledgements

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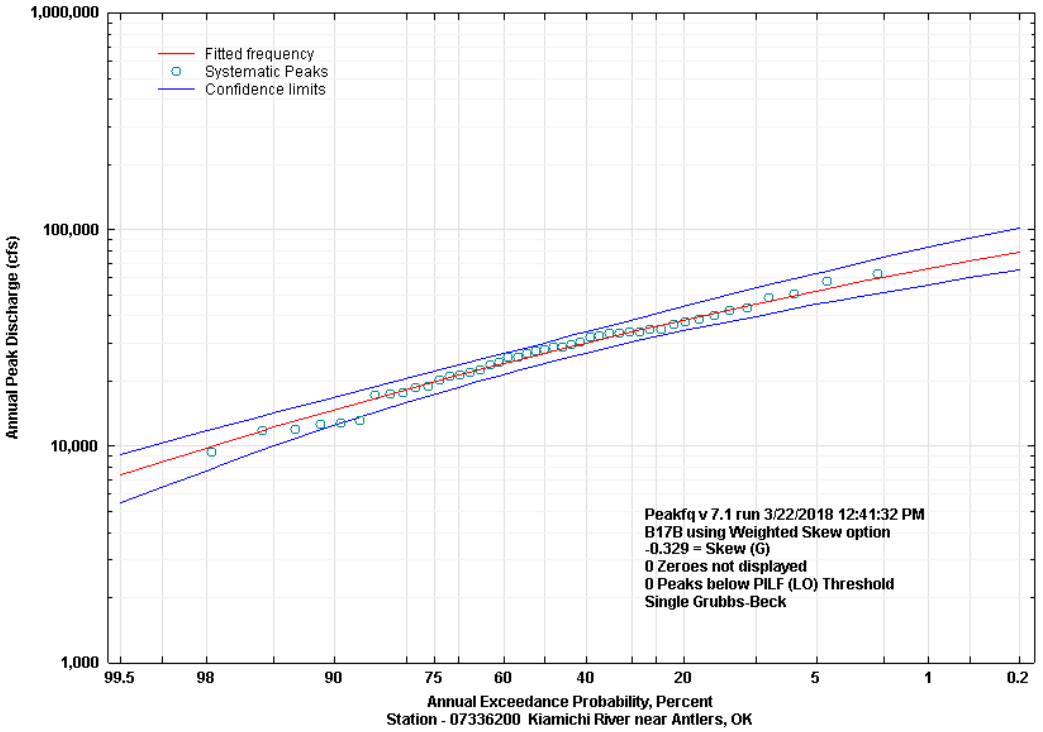
Questions…

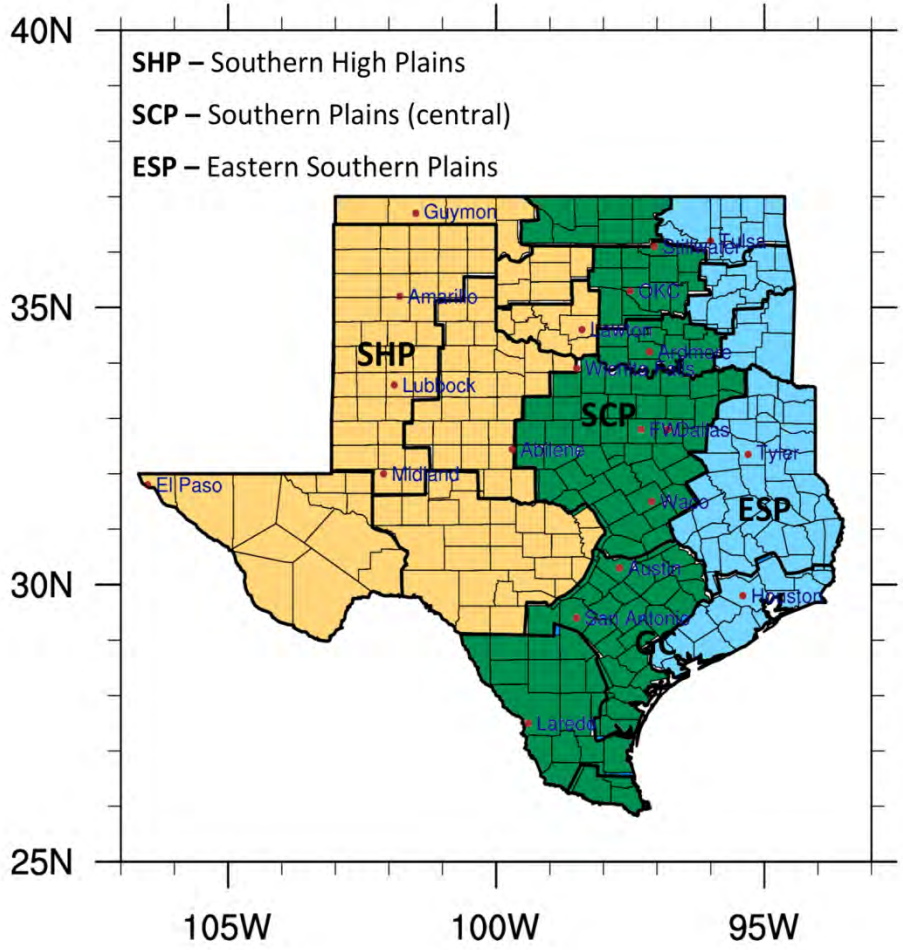
Watershed models

- All watershed models are ‘practical’
  - Answer questions about hydrologic responses
  - Design flood frequency, How much water in lake



Climate components

- Downscaling zones



HBV Parameters ↔ Streamflow ↔ Release Rules