Strengthening Work Products through Collaboration in Oklahoma

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Project

• Title: Building tools for the assessment of the impacts of climate change on the water resources of the Canadian River Basin

• SC CASC Funded through September 2023

- Partners:
 - Chickasaw Nation
 - Choctaw Nation of Oklahoma
 - Oklahoma Water Resources Board
 - University of Oklahoma

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Background

- Choctaws and Chickasaws historically not involved in water permitting
 - "Stakeholder" rather than govt-govt sovereign nation
- OWRB makes decisions on permits based on average annual flow
- The historic Water Settlement gives the tribes a seat at the table
- Requires an "Adequate Hydrologic Model" for decision-making
- This project helps turn that adversarial relationship on its head





Objectives and Process

 Identify communities vulnerable to surface water supply shortages across Southeastern Oklahoma and quantify the shortfall in the water demand-supply curve they should expect in the near future.





Climate Projections and VIC Model

- Nine CMIP5 Climate Projection Scenarios (1981 - 2099):
 - CCSM4, MIROC5, MPI ESM LR
 - RCP 2.6/4.5/8.5
- Daymet for historical baseline condition
- VIC Rainfall-runoff model
 - Gridded based model
 - Calibrated to USGS gages
 - Naturalized "like" streamflow •
 - No anthropogenic effects







07194500: 01/01/2003 - 12/01/2005



RiverWare Modeling

- Water availability/accounting model
 - Legal water permits: diversions, return flows
 - Reservoir operations
- Hydrology
 - Streamflow, local inflows
 - Net evaporation
 - Conveyance gains/losses, routing
 - Reservoir levels, storage

Canadian Basin Model:

- Daily timestep: 1981-2099
- Nearly 700 water permits
- Nearly 60 reservoirs
- Conveyance gains/losses
- Travel time/routing



Partner Engagement Approach

- Regular meetings and progress reports
 - Technical methodology
 - Model development
 - Draft results
 - Reporting
- Methodology development
 - Scalable for entire basin, not individually chosen
 - Driven by study's objectives: reasonable for project's scope/budget/timeline
 - Build a model that can be useful for future applications
 - Ultimately want partners to support and stand behind models and results





Partner Engagement – Technical Methodology (1)

- Flow input locations
 - How frequent? At every permit?
 - Not feasible for basin size, prj budget/objective
 - Optimize resources, focus on public water providers, reservoirs, large users
- More detailed approach for primary model region

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Partner Engagement – Technical Methodology (2)

• Water rights

- OWRB review/cleaning
- Identifying single diversion point per water right
- Relative priority order development

Priority	Domestic Use	OWRB Permits				2060 Domand	Reservoir
		Regular	Term	Unappropriated Reservoir Yield	Pending	Increase Users	Storage Accounts**
Highest							
Lowest							
** A reservoir's storage does not have a priority date nor an OWRB permit, but the <u>RiverWare</u> model will include							
one to utilize full model functionality. Since it is the most junior priority it will not impact other users or permits							
in the basin.							



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Partner Engagement – Technical Methodology (3)

- Domestic use set-aside
 - Highest priority
 - No estimate of actual need/use
 - Estimate of use per area (6 ac-ft per 160 acres)
 - Pseudo permit representing domestic use in RiverWare



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Partner Engagement – Technical Methodology (4)

- Modeled Reservoirs
 - Used for public water supply?
 - Minimum size threshold if not for PWS
 - Elev-area-capacity data from OWRB and other sources
 - Includes remaining unappropriated yield as diversions
- Reservoir WRs operating policies
 - No priority date for reservoir storage, only permits on a reservoir
 - Q: When can a reservoir's water rights curtail upstream juniors?
 - Undefined curtailment process, no legal precedent in OK



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Partner Engagement – Technical Methodology (5)

When can a reservoir's water rights curtail upstream junior water rights?

- When a reservoir's conservation pool drops below full
 - Most protective, highest reliability
- Reservoir volume drops below 1 yr of storage for existing permits
 - OWRB proposed
 - Disconnected to Firm yield, inconsistent between reservoirs
- Reservoir volume is zero (active shortages)
 - Least protective, lowest reliability for WRs





Partner Engagement – Technical Methodology (6)

- Demand Scenarios
 - Full Authorization
 - 2060 demand increases
 - Basin fully appropriated
- Most demand data prepared and reviewed by OWRB

Other engagement activities

- Full RiverWare model review/QAQC
- Representation of specific reservoir/diversion interactions
 - Canton Lake releases for OKC
 - Wister water quality yield releases

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Current Status and Next Steps

- Internal RiverWare model review
- Running scenarios (48)
 - Nine climate projections
 - Three demand configurations
 - Three reservoir operating policies
- Processing model results
 - Changes in WR reliability / reservoir levels
 - Visualizing model results (lots of available data)
- Funding/timeline
 - Extension through Sept 2023
 - Additional funding to model all scenarios
 - Desire to present on collaboration and submit write-up to journal

Conclusions

- OWRB buy-in on model results and use of the model for future decision-making on water right applications in treaty territory
- Choctaws sponsored a series of workshops on the RiverWare software
 - Chickasaws, OWRB and Kaw Nation
- OWRB considering that they need a more sophisticated approach to considering water right applications
 - Flow reliability
 - Protections of existing water rights (especially reservoirs)
 - Instream flows
 - Climate change
 - Unique scenarios
- More collaborative environment for future state-tribe discussions

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