Agenda

- Why is the OWRB using stream water allocation models?
- Are other States using similar models?
- What is a stream water allocation model?
- How are the models being used by the OWRB?
- Relevance and future work
Why stream water allocation models?

The OWRB Stream Water Allocation Modeling Program was initiated in 2009. Models are implemented as a comprehensive water planning tool for the adjudication and effective management of water rights in Oklahoma.

In Oklahoma stream water is publicly owned and subject to appropriation by the OWRB.

The OWRB evaluates applications based on:

1. A present or future need for water must exist.
2. Amount of water requested must be available.
3. Use of water must not interfere with other water rights or uses.

Stream Water Allocation Modeling

The statewide program allows estimating water reliability & identifying potential interference of water rights under various flow conditions.
Why stream water allocation models?

**Traditional Approach**

- Availability relies on averaged *runoff from the 1980's*
- Does not identify *interference between water rights*
- Provides *limited information* to permit holders and applicants

**OWRB Stream Water Allocation Modeling**

Provide scientific-based information to managers and citizens to answer:

- Is there water *available* in the amount needed?
- How *reliable* is the flow on a *seasonal or monthly* basis?
- Which *water rights are affected* when water is scarce?
- Are there any *fully appropriated areas* in the basin?
- Is there enough water to approve an *inter-basin transfer*?
Are other States using similar models?

**TEXAS**
Water Availability Model (WAM) for water-rights management (2001)

**DELWARE**
Used in limited form for stream water management

**IDAHO**
Bureau of Reclamation, management of reservoirs on Snake River

**COLORADO**
Colorado River management; many cities & irrigation districts

**CALIFORNIA**
Imperial Valley irrigation district

Allocation models have also been used by cities, small neighborhood coalitions, private and government hydropower operators, conservation and environmental groups, and others
Active stream water rights

Stream water allocation models facilitate the management of active permits and the evaluation of new permit applications to ensure a reliable supply to all permit holders.
What is a stream water allocation model?

Software: **Central Resources Allocation Model (CRAM)**

Network-flow-algorithm in Microsoft Excel® that simulates management of water under a **priority-based** water allocation system.
Data included in the models

**Inflow**

Naturalized Flows* = Gauged Flows + Water Use

- Statistical analysis of gauge data
- Separate baseflow and runoff
- Use NHD to distribute baseflow and runoff

- Reported water use from surface water rights (QA/QC)
- Convert annual values to monthly using consumptive patterns (OCWP)
- Reservoir effective evaporation and releases
- Return flows from consumptive uses
Features and data included in the models

Inflow
- Naturalized flow

Demands
- Permit ID
- Purpose
- Amount Permitted
- Reported Use
- Other Details

Reservoirs
- Reservoir ID
- Storage Capacity
- Volume-Area Curve
- Seasonal Evap Rate
- Other Details

Pipelines
- Inter-basin transfers
- Intra-basin transfers

Others
- Instream Flows
- Inter-state Compacts
- Groundwater usage

Other Details
- Seasonal Evap Rate
- Other Details
ExcelCRAM interface and applications

Input Controls

Evaluate new permit applications

Simulation Results: Tables, graphs and maps
Scenario 2:
All water rights use their maximum permitted amount every year (1950-2011)
Water is distributed in the system based on priority
(water is supplied to senior permits first, then to junior water rights)
Scenario 4:
All permits use maximum permitted amount every year (1950 - 2011)
Water is distributed in the system from upstream to downstream, **not priority-based**

Map of Potential Shortages
Middle Canadian, Lower Canadian and Little River Basins
Shortages reflect active water rights under historic flow conditions (1950 - 2011)
Model simulations use historic flows and active water rights to identify potential shortages that permit holders would experience under the specified flow conditions.

Observed flows at the USGS gauge show similar flow conditions in 2006 and 2011. Similarities allow the OWRB to identify water rights that could potentially experience water shortages, to prevent interference and encourage water-use efficiency.
The OWRB is using stream water allocation models to:

1. **Perform location-specific analysis**
   - Determine **water reliability** at any location in the basin
   - Evaluate **new permit applications**

2. **Manage the resource during low-flow conditions**
   - Identify **potential shortages** for water rights
   - **Pre-drought warning** for water rights to manage interference between senior and junior water rights
   - Ensure **reliability** and prevent over-allocation of water

3. **Evaluate water policy scenarios**
   - Inter/intra basin transfers
   - Inter-state stream Compacts
   - Instream flows
2012 OCWP recommendation for the State Legislature on water supply reliability:

“Develop stream water allocation models on all stream systems within the state to assess water availability at specific locations, manage junior/senior surface water rights under various drought scenarios, anticipate potential interference between users, and evaluate impacts of potential water transfers”