



# Raw Water System Operations Modeling for NTMWD

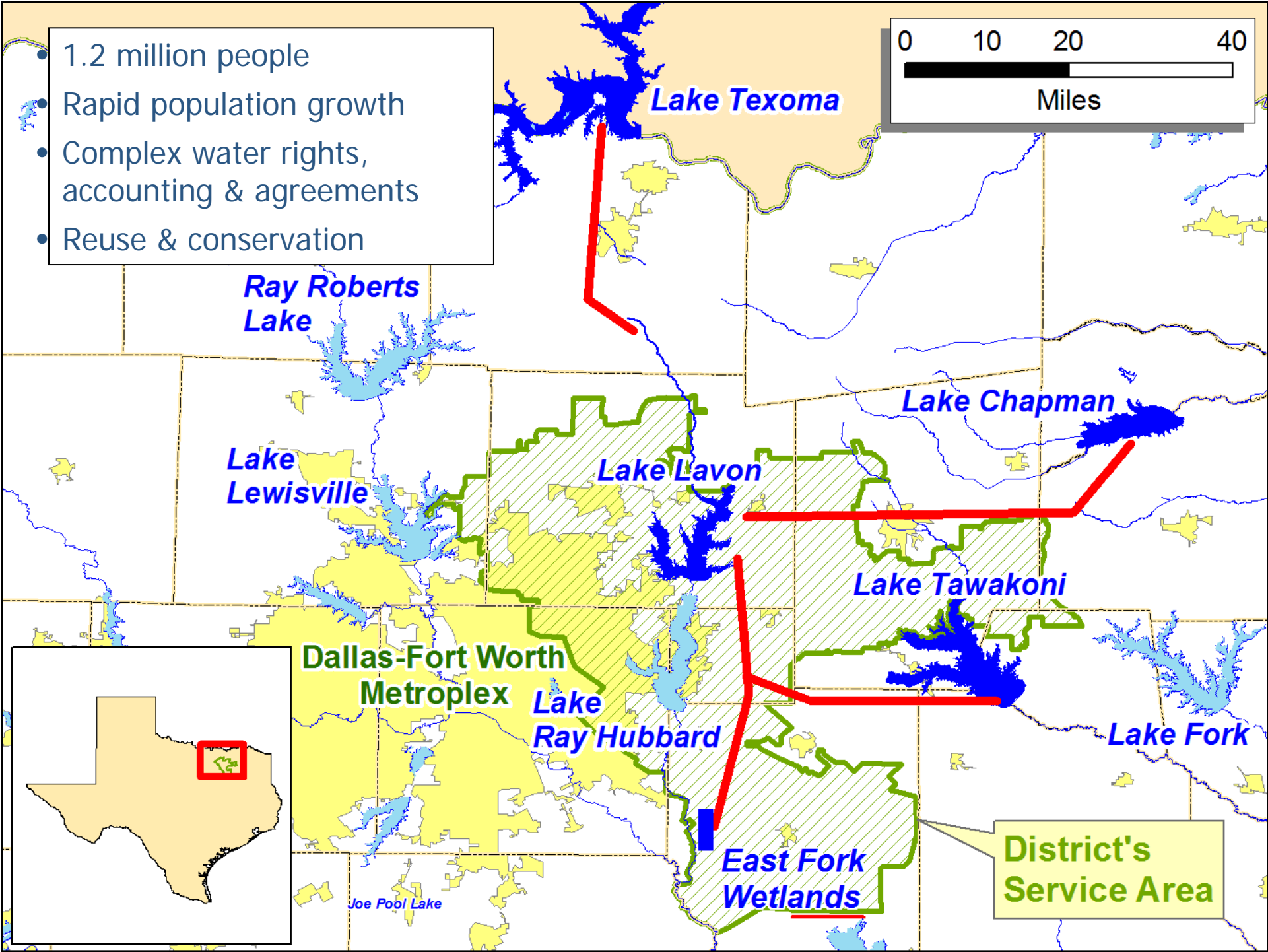
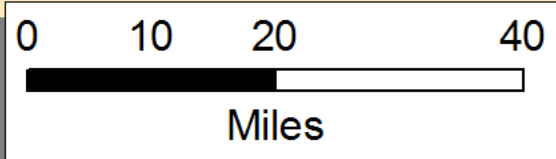
Andres Salazar, Ph.D., P.E.  
Jon Albright



# Presentation Outline

- NTMWD system
- Supplies and facilities
- Complexities of operations
- Riverware Model
- Scenarios
- Results

- 1.2 million people
- Rapid population growth
- Complex water rights, accounting & agreements
- Reuse & conservation



*Ray Roberts Lake*

*Lake Texoma*

*Lake Lewisville*

*Lake Lavon*

*Lake Chapman*

*Lake Tawakoni*

**Dallas-Fort Worth  
Metroplex**

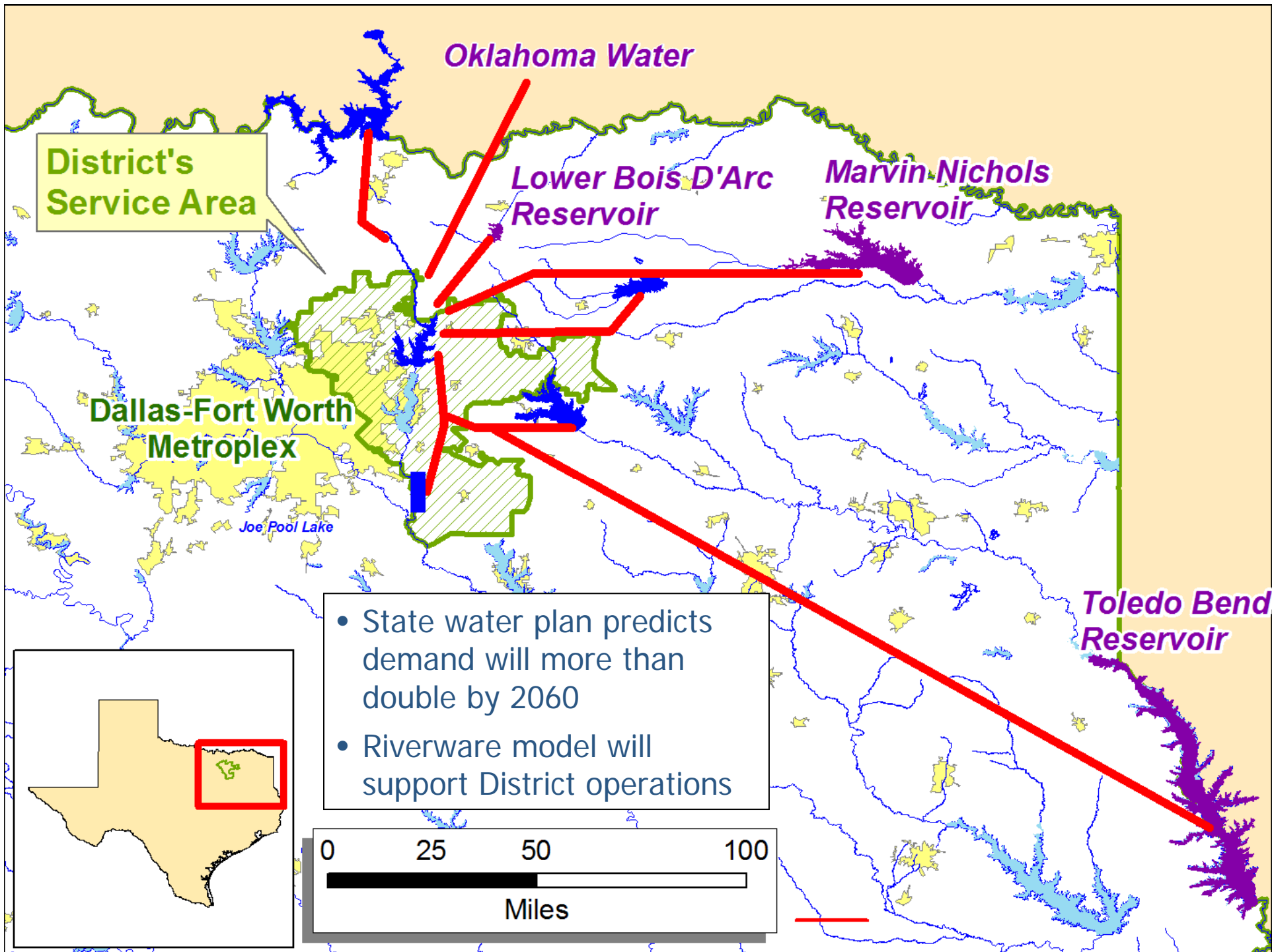
*Lake Ray Hubbard*

*Lake Fork*

*East Fork  
Wetlands*

**District's  
Service Area**

*Joe Pool Lake*



District's Service Area

Dallas-Fort Worth Metroplex

Joe Pool Lake

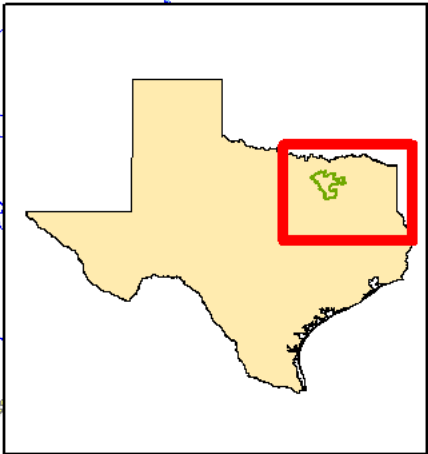
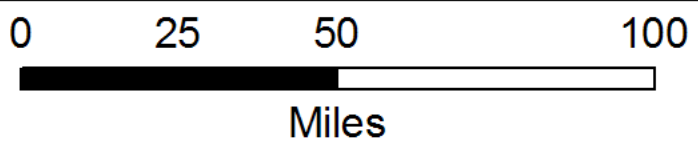
Oklahoma Water

Lower Bois D'Arc Reservoir

Marvin Nichols Reservoir

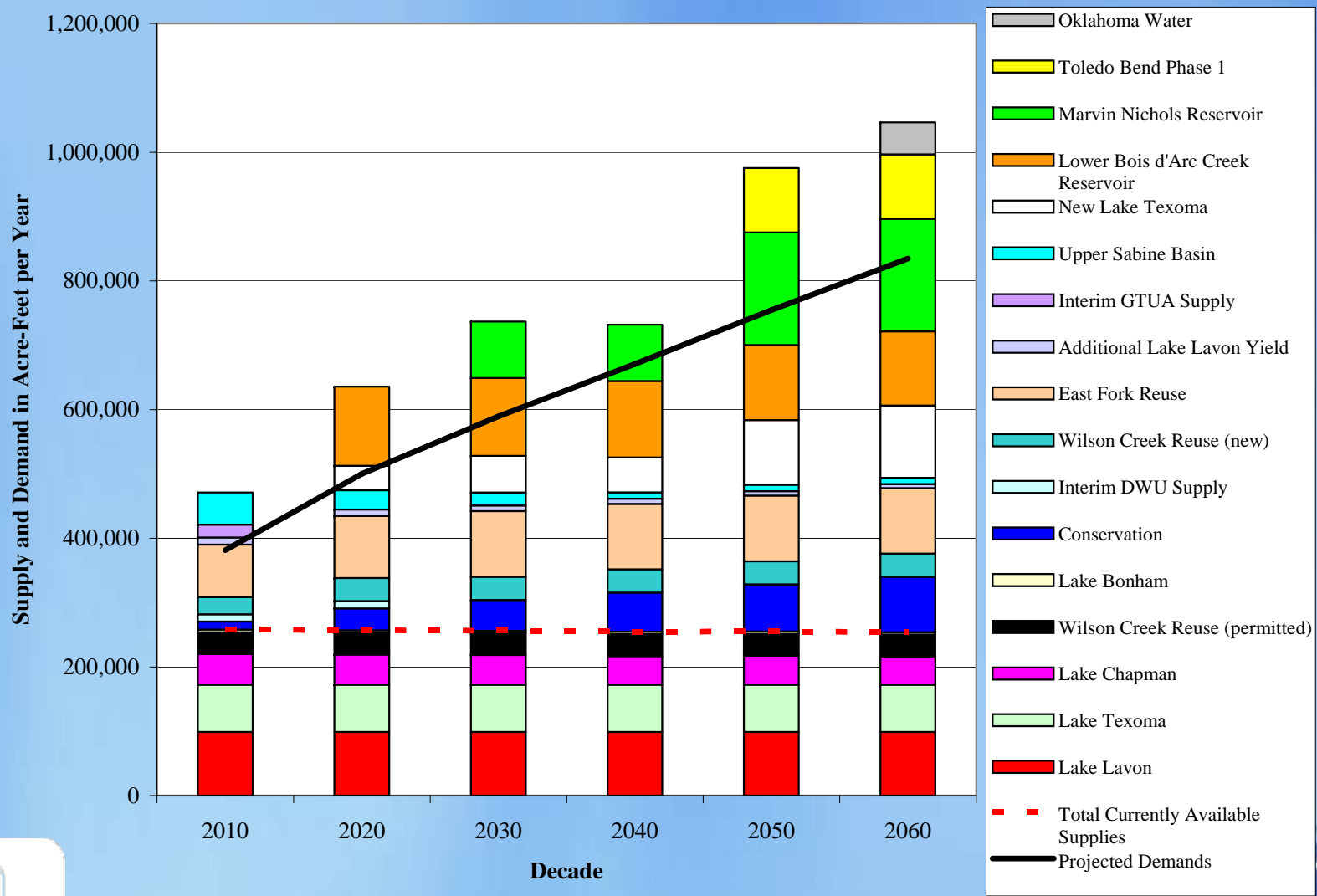
Toledo Bend Reservoir

- State water plan predicts demand will more than double by 2060
- Riverware model will support District operations





# Future Supply & Demand





# Complexities of Operations

- Pumping must balance conflicting factors
  - Too much
    - Losses due to increased evaporation/spills
    - Increased costs
    - Degrade water quality (Lake Texoma)
    - Deplete distant sources
  - Too little
    - Possibility of violating water right
    - Lower Lake Lavon levels



# Complexities of Operations

- Overdraft in lieu of pumping adds some flexibility, but should be used wisely
- Timing when pumping is possible has uncertainty

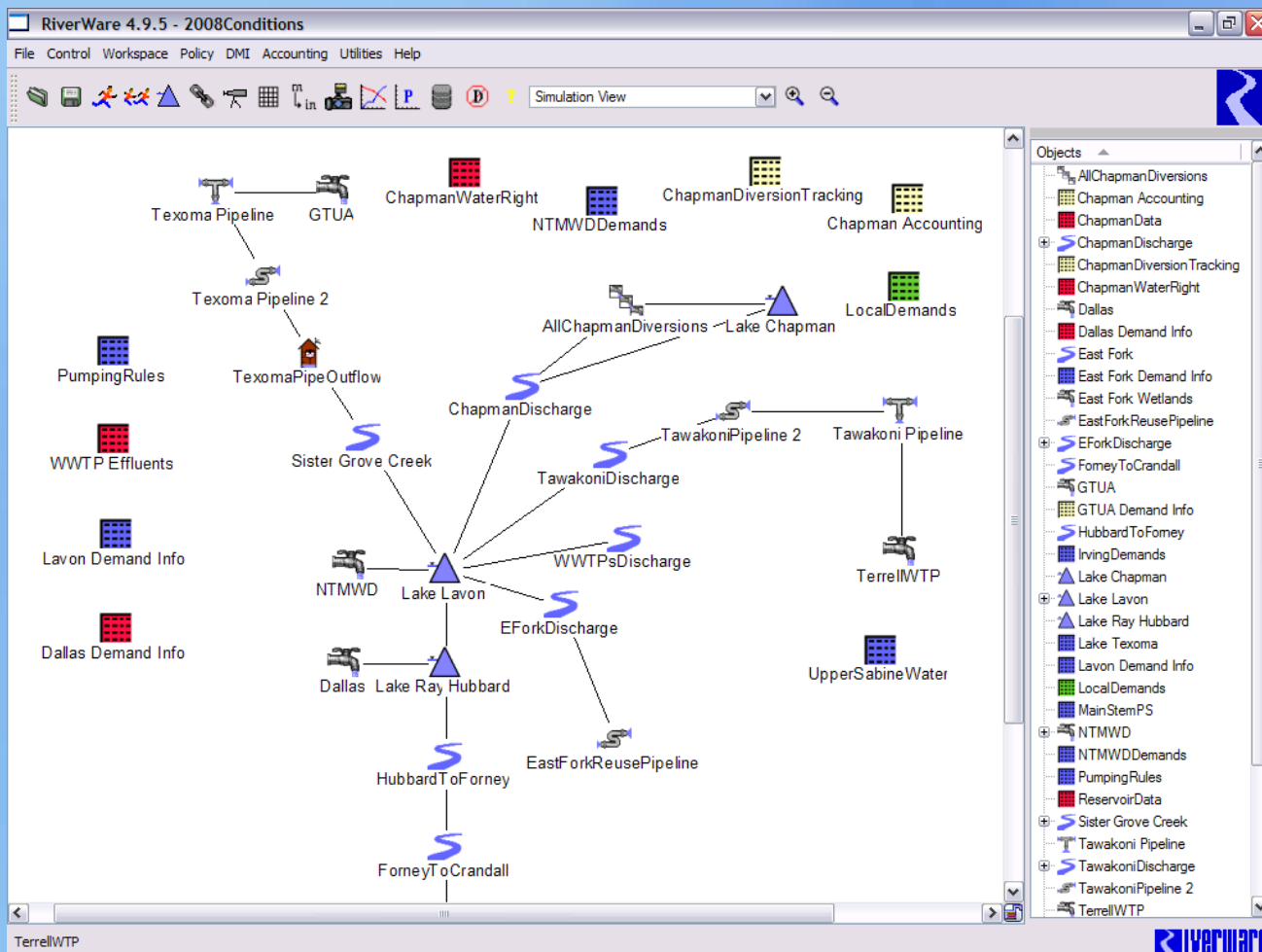


# Complexities of Operations

- Sources have different water quality
- Lavon accounting plan is complex
- Chapman water is not reliable

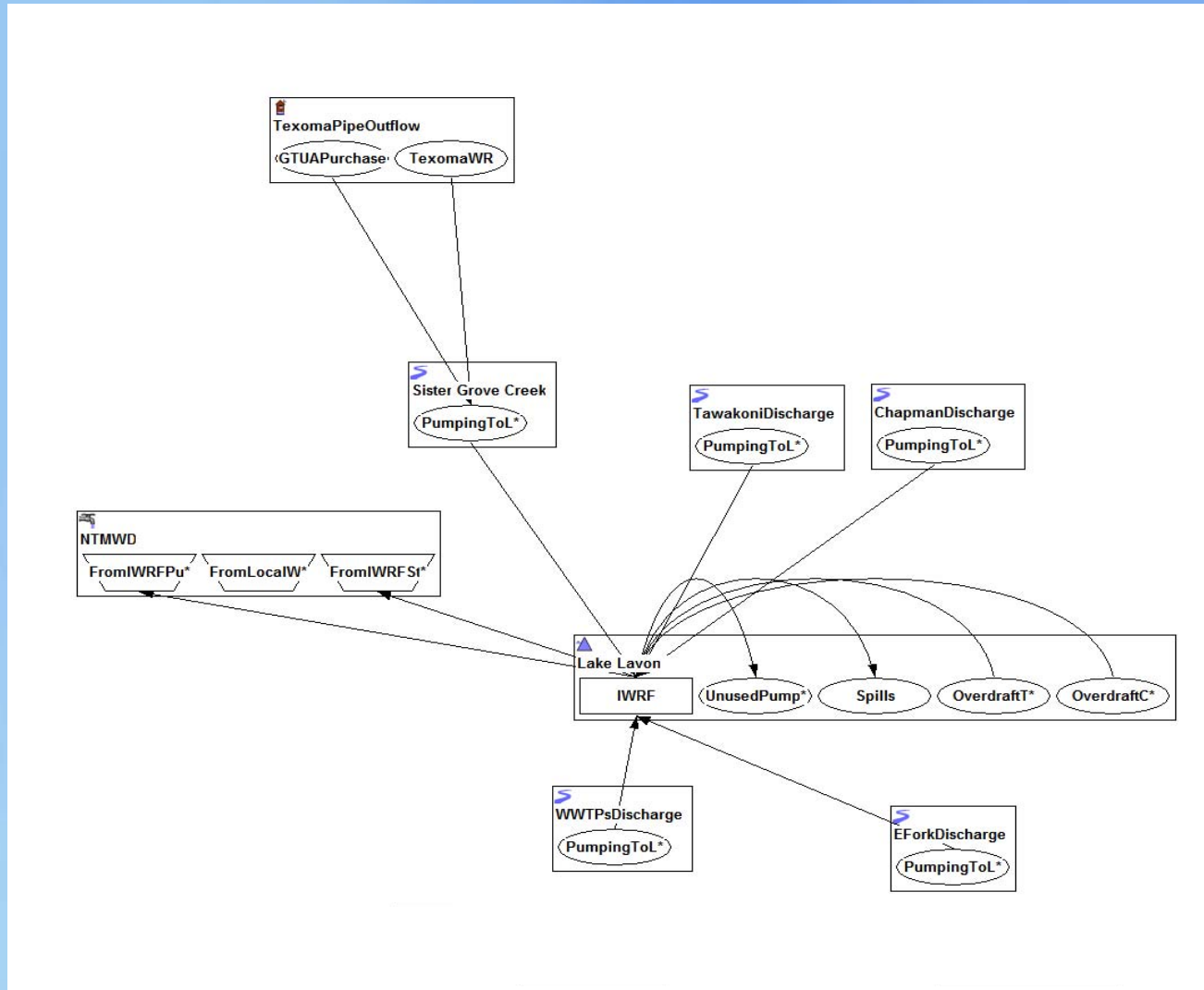


# Riverware Model



- Rule based
- Accounting
- Water Quality

# Accounting Objects





# Water Quality Modeling

- Internal Riverware WQ routines replaces previous spreadsheet models
- Multiple bugs were found
  - Inline simulation not working
  - Slot not available
  - Others
- CADSWES staff was responsive to fix problems



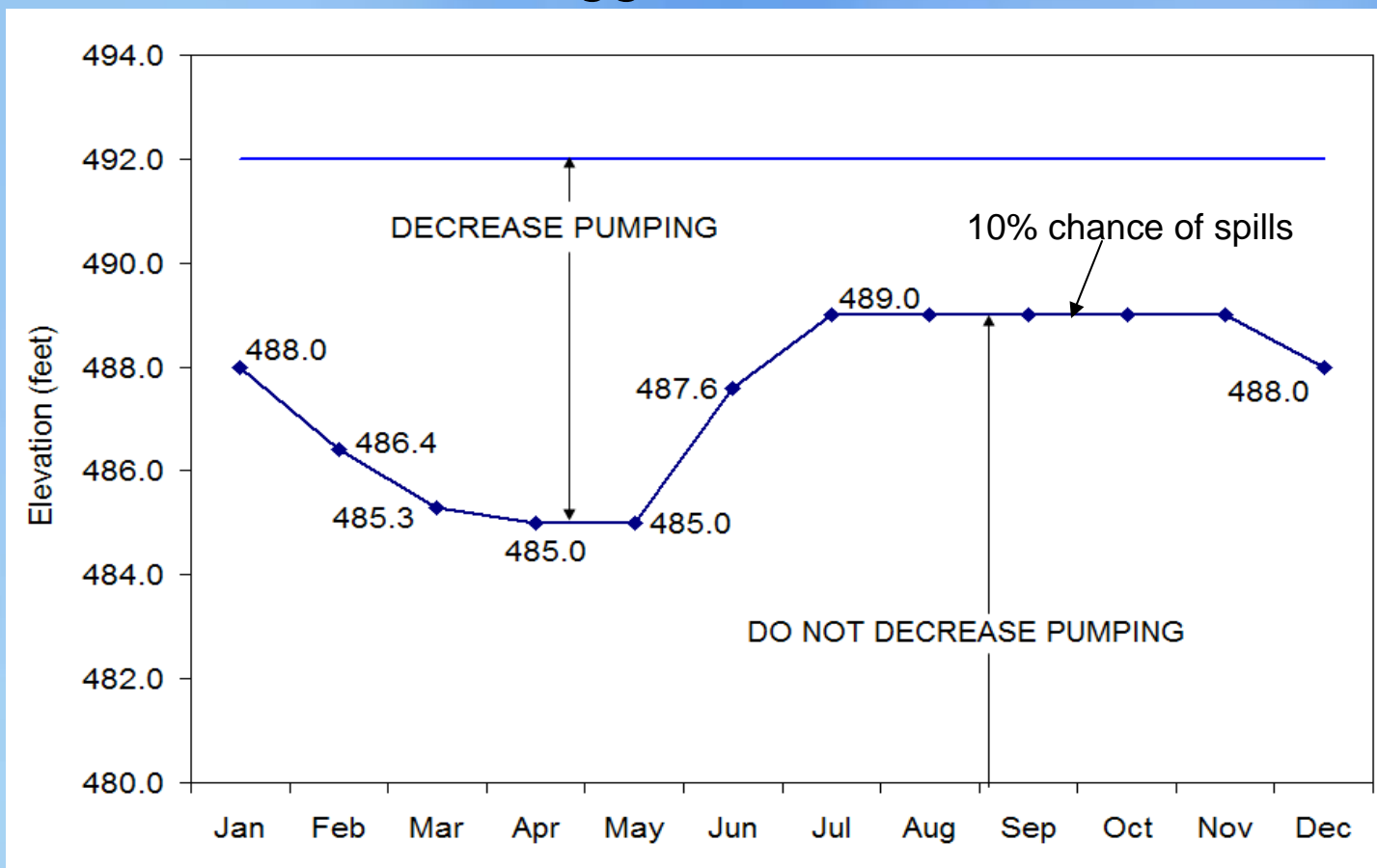
# Operation Policies Analyzed

1. Maximum pumping
2. Reduced pumping
3. Maximum pumping early in the year, decreasing at the end

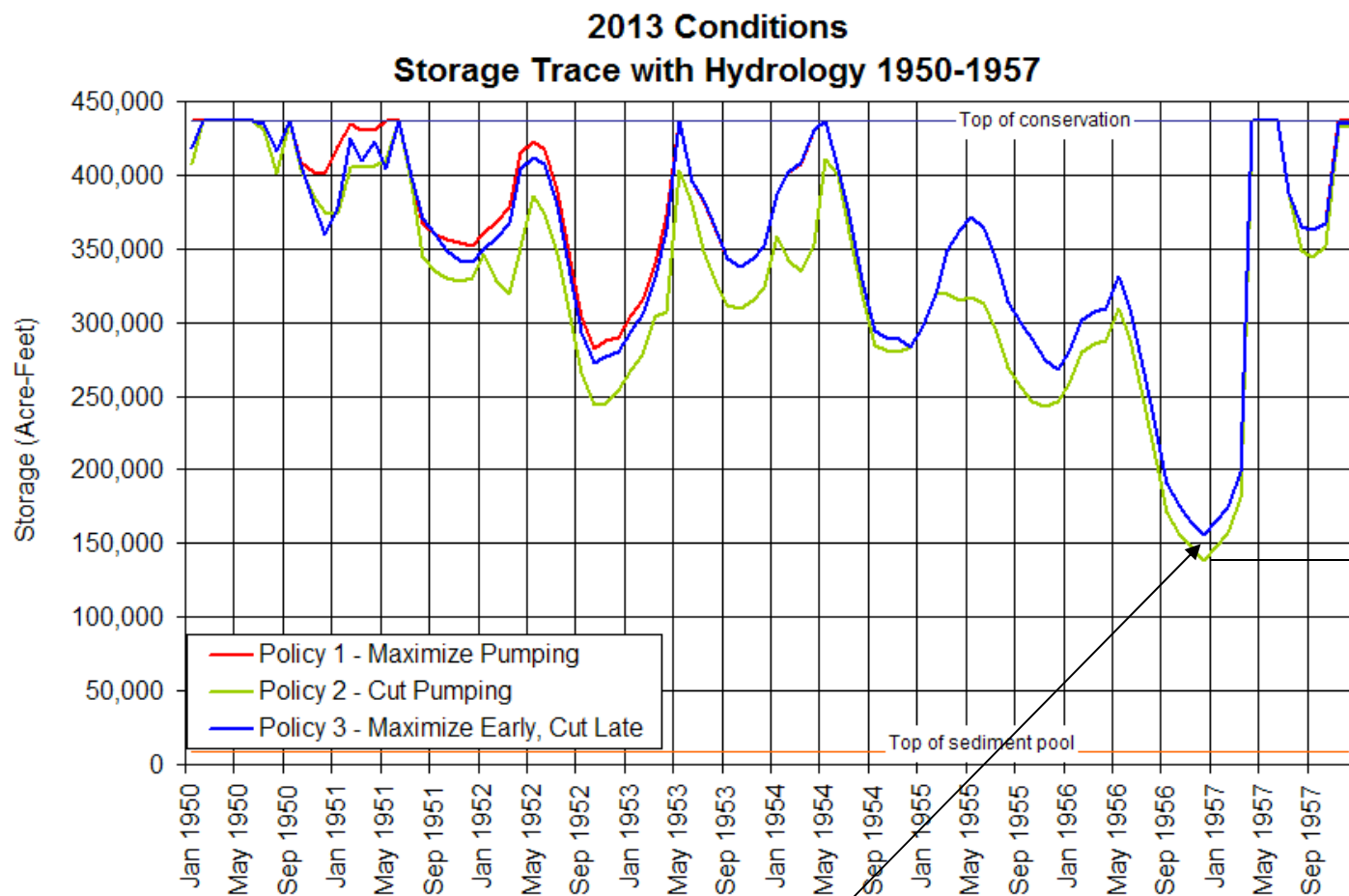


# Reduced Pumping

## Trigger Level



# Lake Lavon Storage

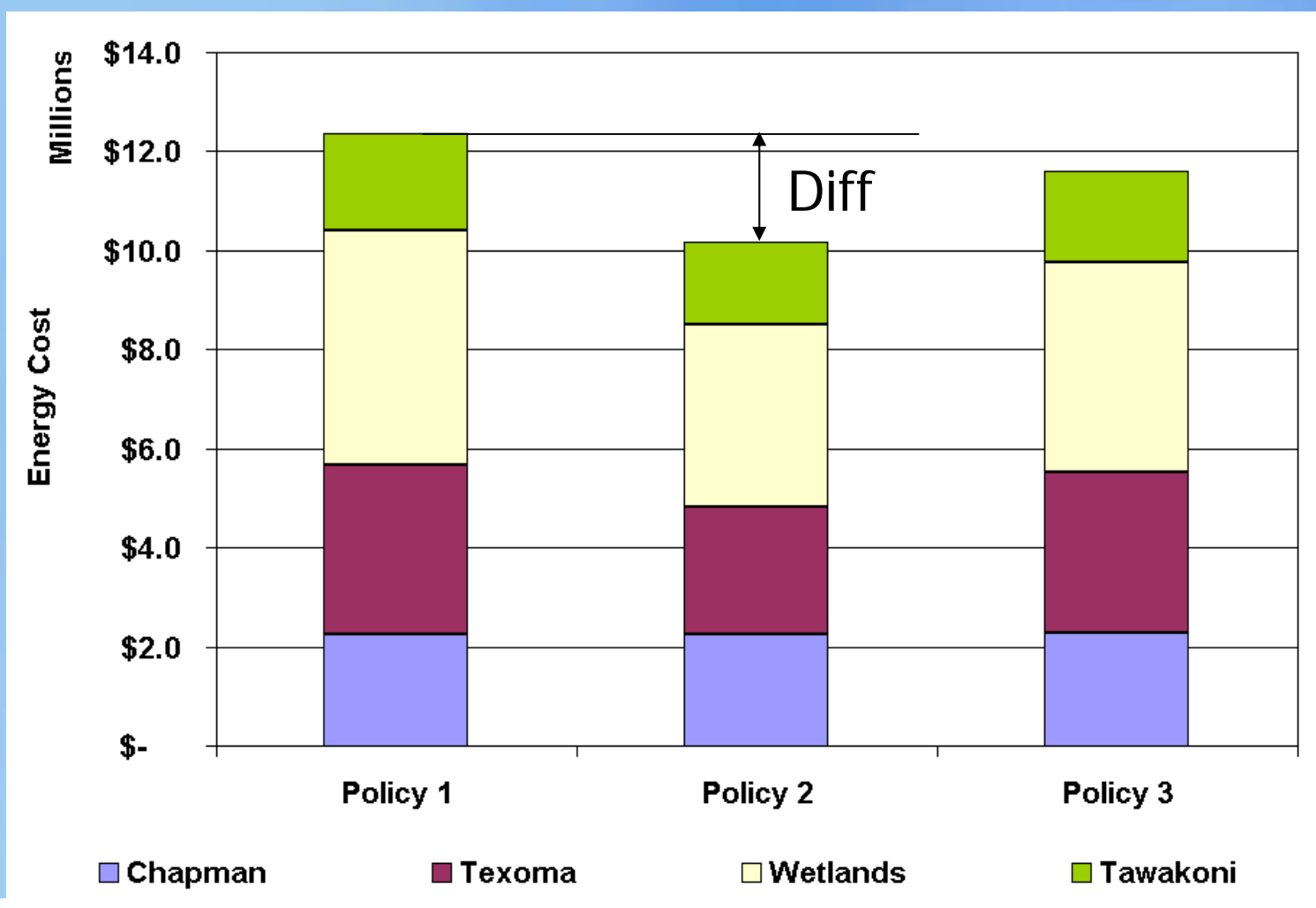


473.78'

Difference = 17,072 acre-feet (or 1.41' feet)



# Energy Cost - 2013



Difference = \$ 2.0 Million/Year



# Conclusions

- Riverware model replaces older, difficult to maintain NTMWD models
- Model will support planning and operations
- Riverware water quality routines were updated





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