Drought Response Modeling in the Dallas-Fort Worth Metroplex

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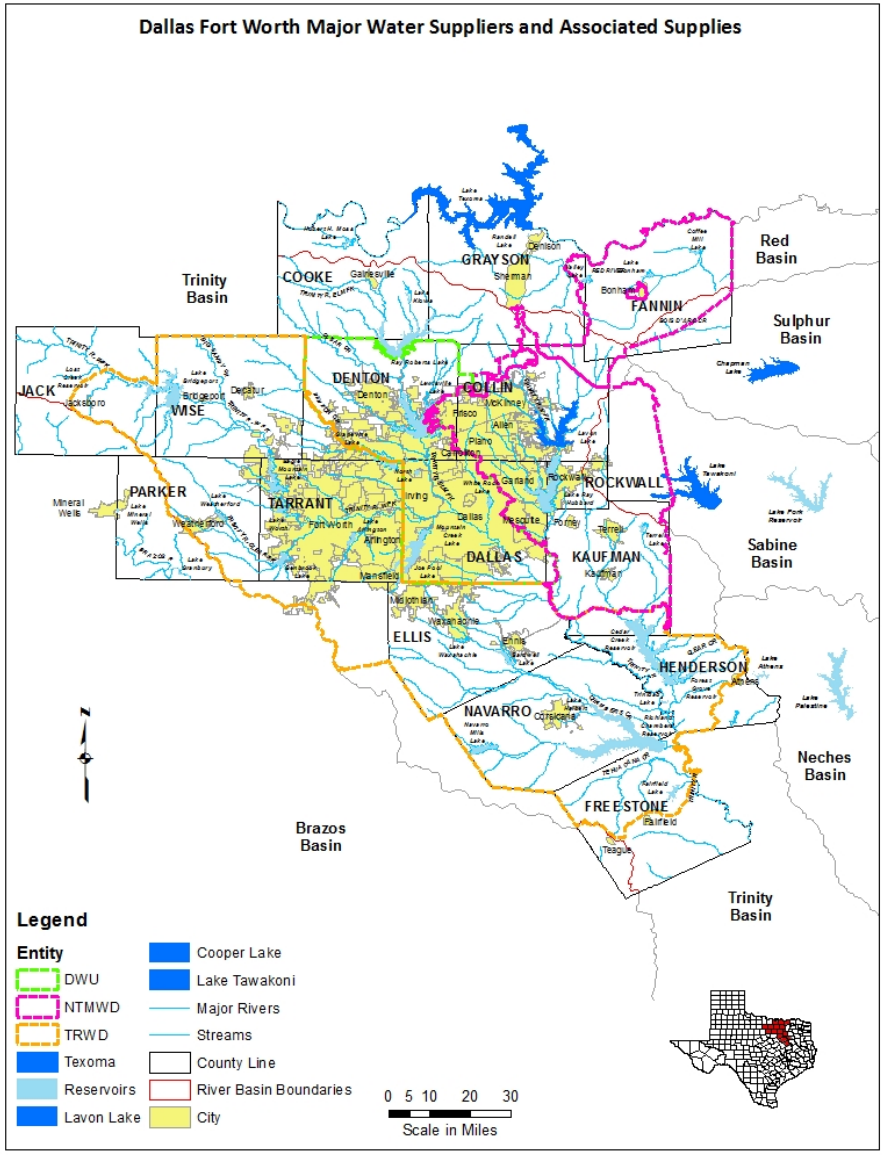
Overview

- D-FW Metroplex
  - Approximately 6.4 million people
  - Three Major Wholesale Providers
    - Dallas Water Utilities (DWU)
    - North Texas Municipal Water District (NTMWD)
    - Tarrant Regional Water District (TRWD)
  - Additional Regional Providers
    - Upper Trinity Regional Water District (UTRWD)
    - Trinity River Authority (TRA)



Unprecedented Drought

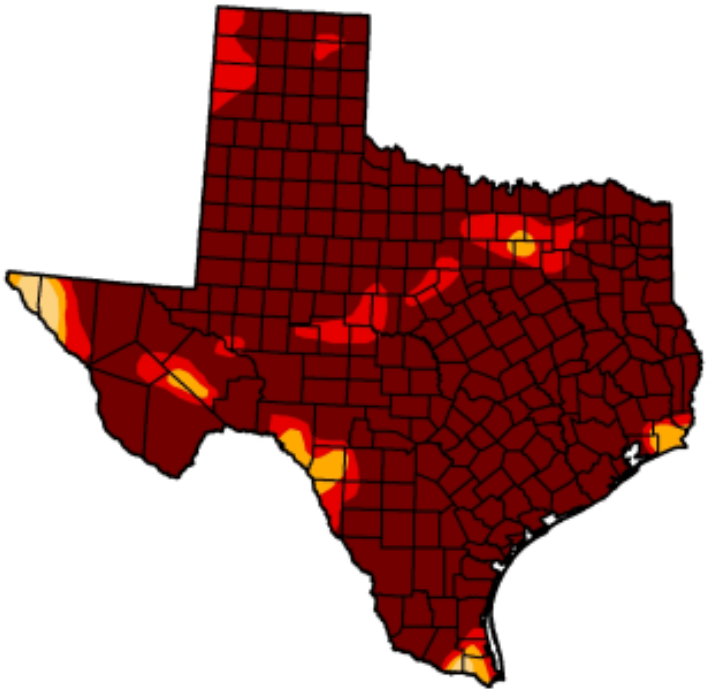
U.S. Drought Monitor

September 13, 2011
Valid 7 a.m. EST

Texas

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	99.17	96.75	87.83
Last Week (09/06/2011 map)	0.00	100.00	99.93	99.01	95.68	81.06
3 Months Ago (06/14/2011 map)	1.97	98.03	96.53	94.77	88.57	64.78
Start of Calendar Year (12/28/2010 map)	7.89	92.11	69.43	37.46	9.59	0.00
Start of Water Year (09/28/2010 map)	75.57	24.43	2.43	0.99	0.00	0.00
One Year Ago (09/07/2010 map)	69.60	30.40	5.25	1.51	0.00	0.00



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

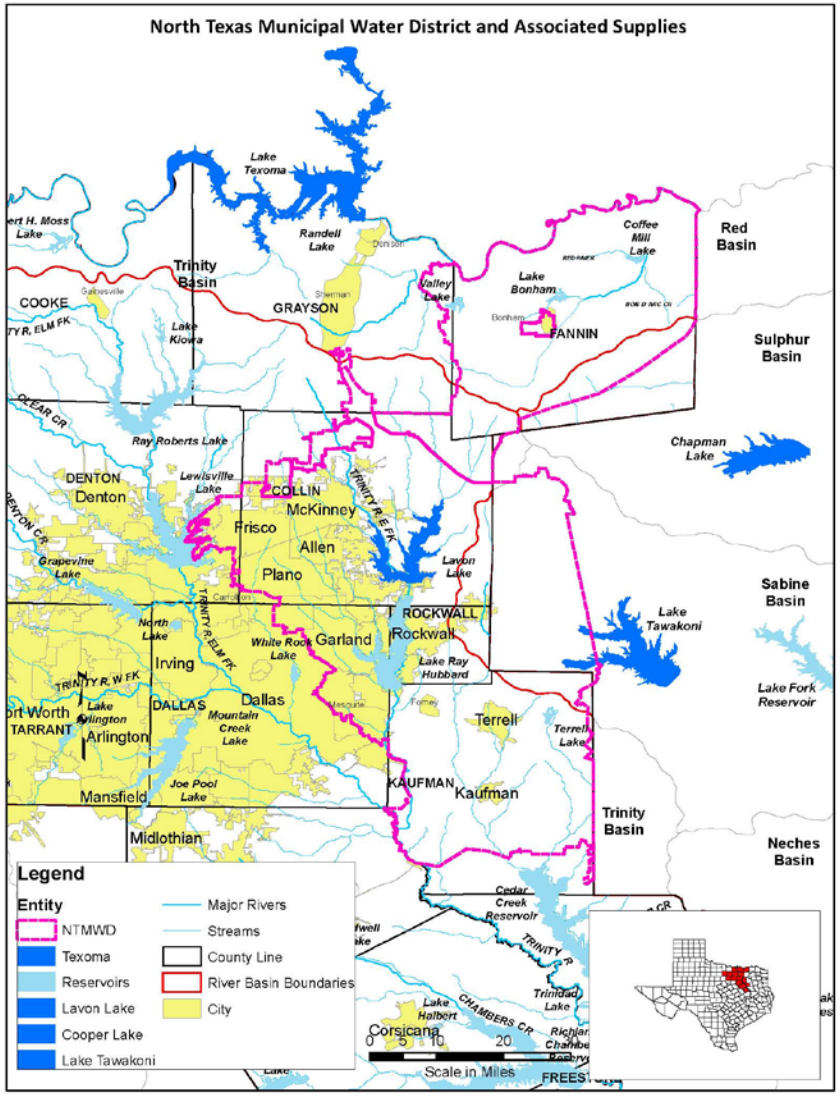
http://drought.unl.edu/dm

USDA National Drought Mitigation Center

Released Thursday, September 15, 2011
Mark Svoboda, NDMC

North Texas Municipal Water District (NTMWD)

- Service Area
  - Approximately 1.6 Million People
  - Northern Dallas Suburbs (Plano, Frisco, Richardson)
- Current Supplies
  - Lake Lavon
  - Lake Texoma
  - Jim Chapman Lake
  - Lake Tawakoni
  - Indirect Reuse
  - East Fork Wetlands
- Zebra Mussels



Summary of Current Situation

- Lake Texoma water not available – loss of 82.8 mgd
- Lake Tawakoni supply limited
- Temporary diversion permit from Lake Lavon
  - Makes extra diversions legal but does not provide water in drought
  - Good until 2014

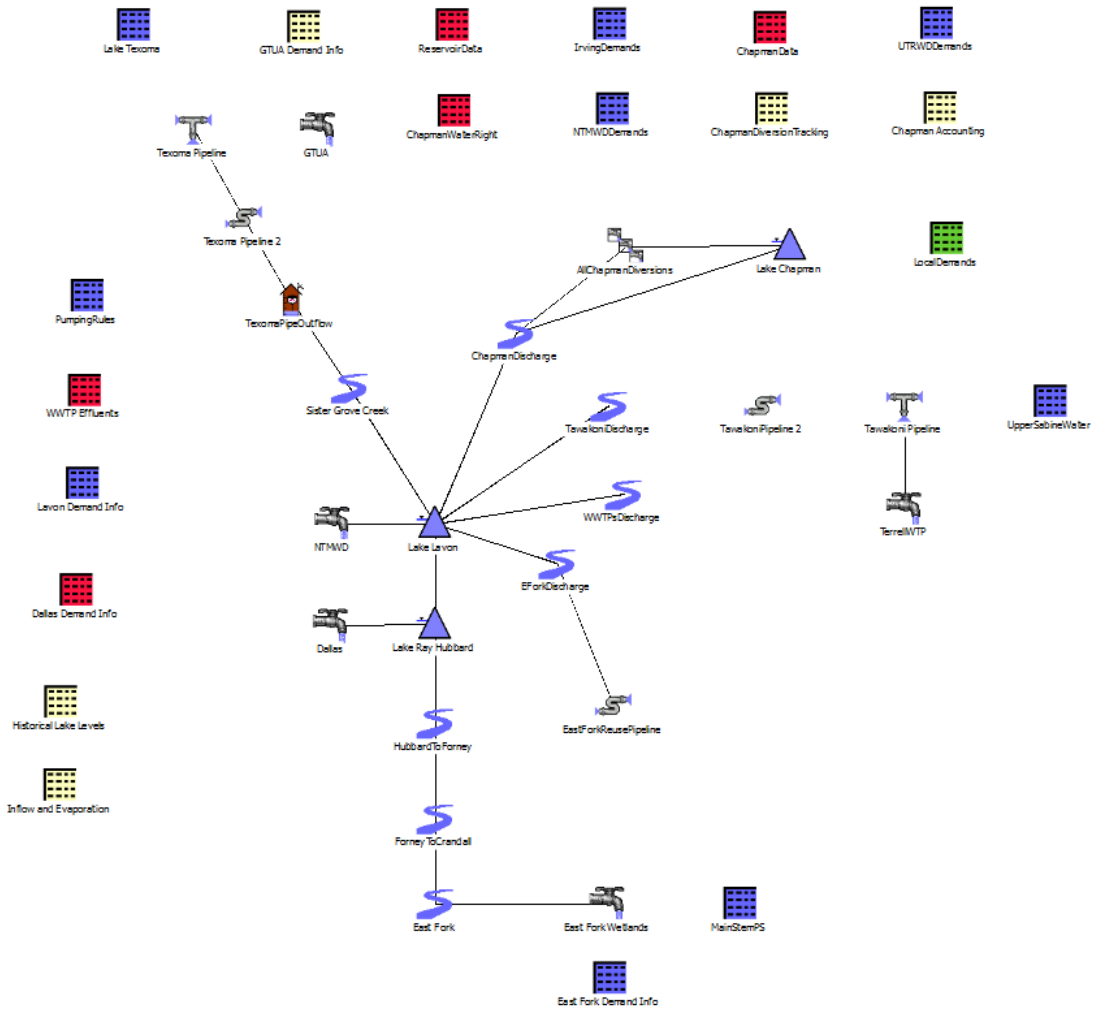
Modeling of Potential Short-Term Impacts

Assumptions

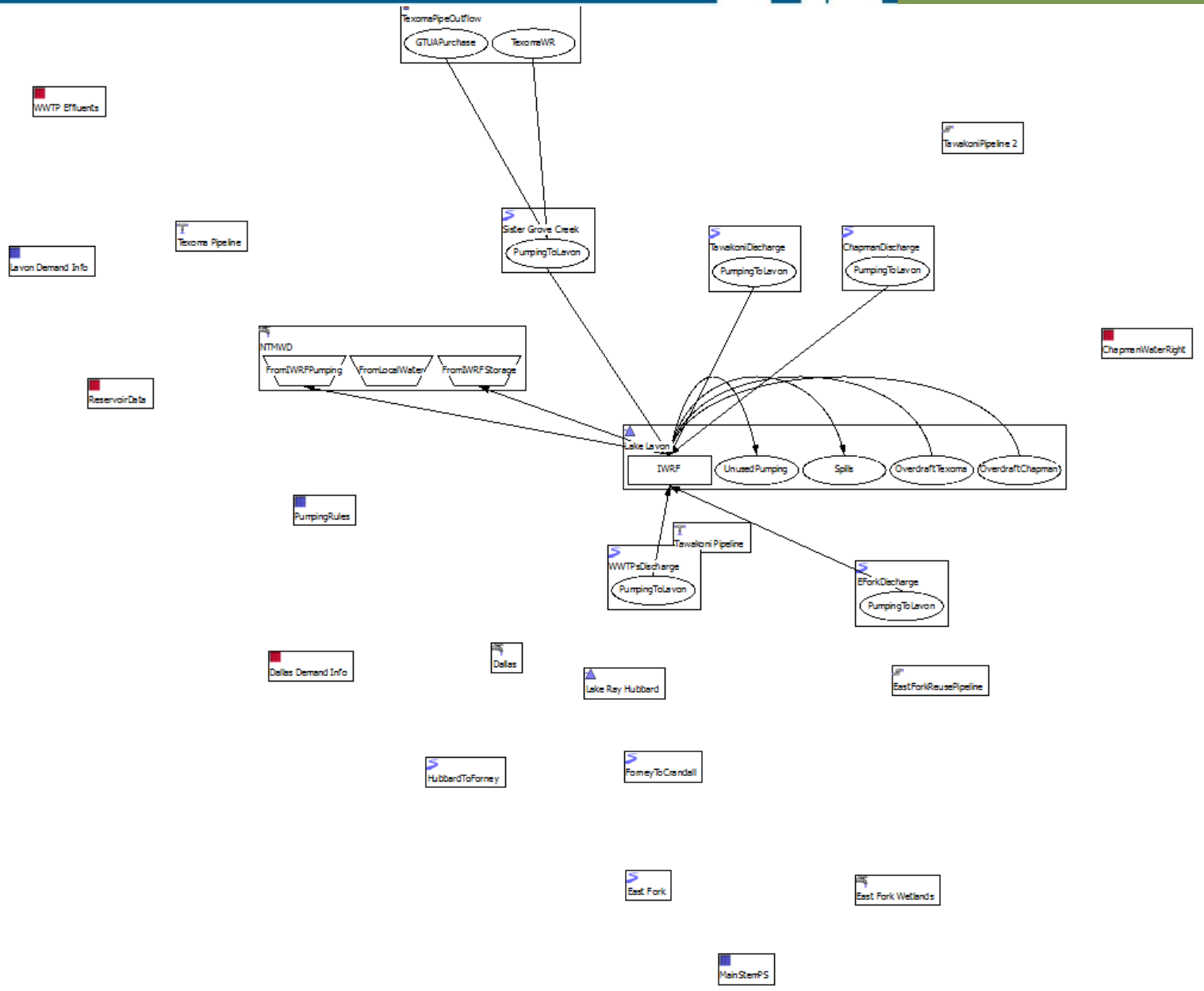
- Worst-case historical flows (1/2012-3/2013 based on 1/1956-3/1957. 4/2013-12/2016 based on 4/1953-12/1956.)
- Dry-Year demands modified by drought measures
  - Stage 3 – 10% reduction
  - Stage 4 – no outdoor use, about 33% reduction
  - Goal Demands – NTMWD goals for each city
- Chapman - 54.0 mgd (Limited by storage account)
- Texoma – winter pumping - 27 mgd annual average
- Tawakoni – 26.8 mgd
- Dallas - 60 mgd for up to 3 years (Additional Tawakoni)
  - Starts in April 2012

RiverWare Model - Objects

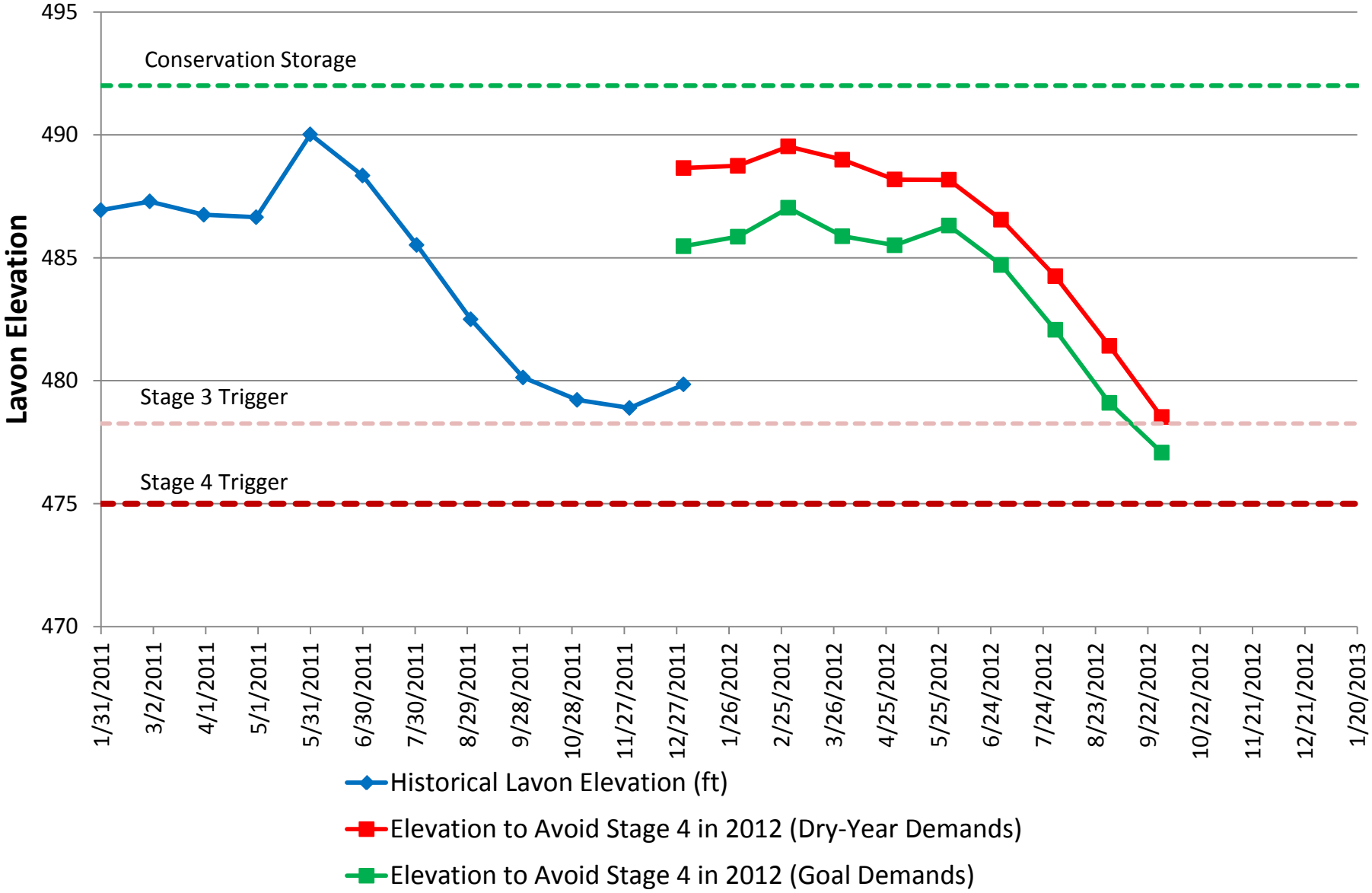
- Three reservoirs objects
  - Lake Lavon
  - Lake Ray Hubbard
  - Jim Chapman Lake
- Five water users objects
- Eight reaches
- Five pipe objects



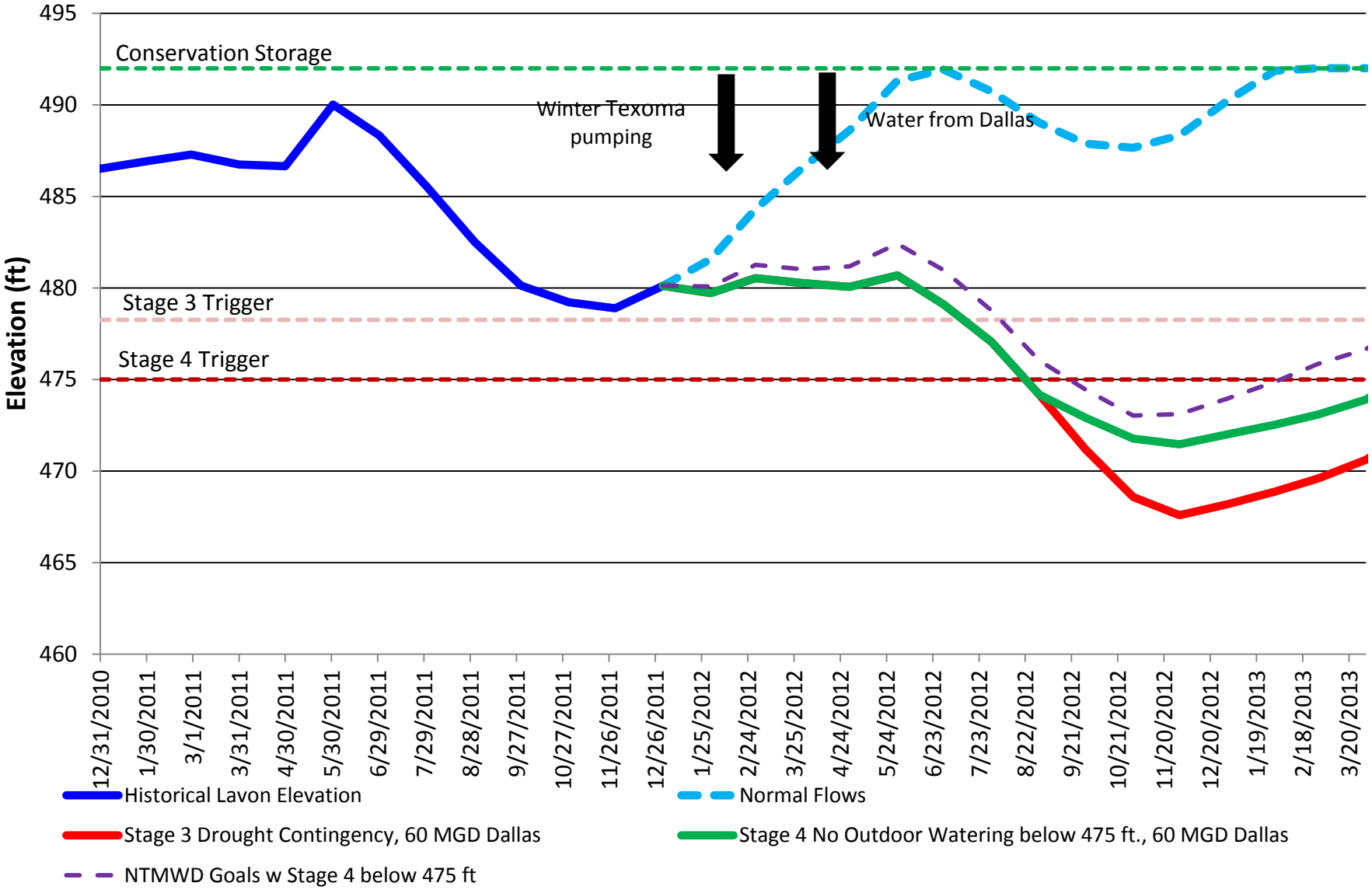
RiverWare Model – Lake Lavon Accounting



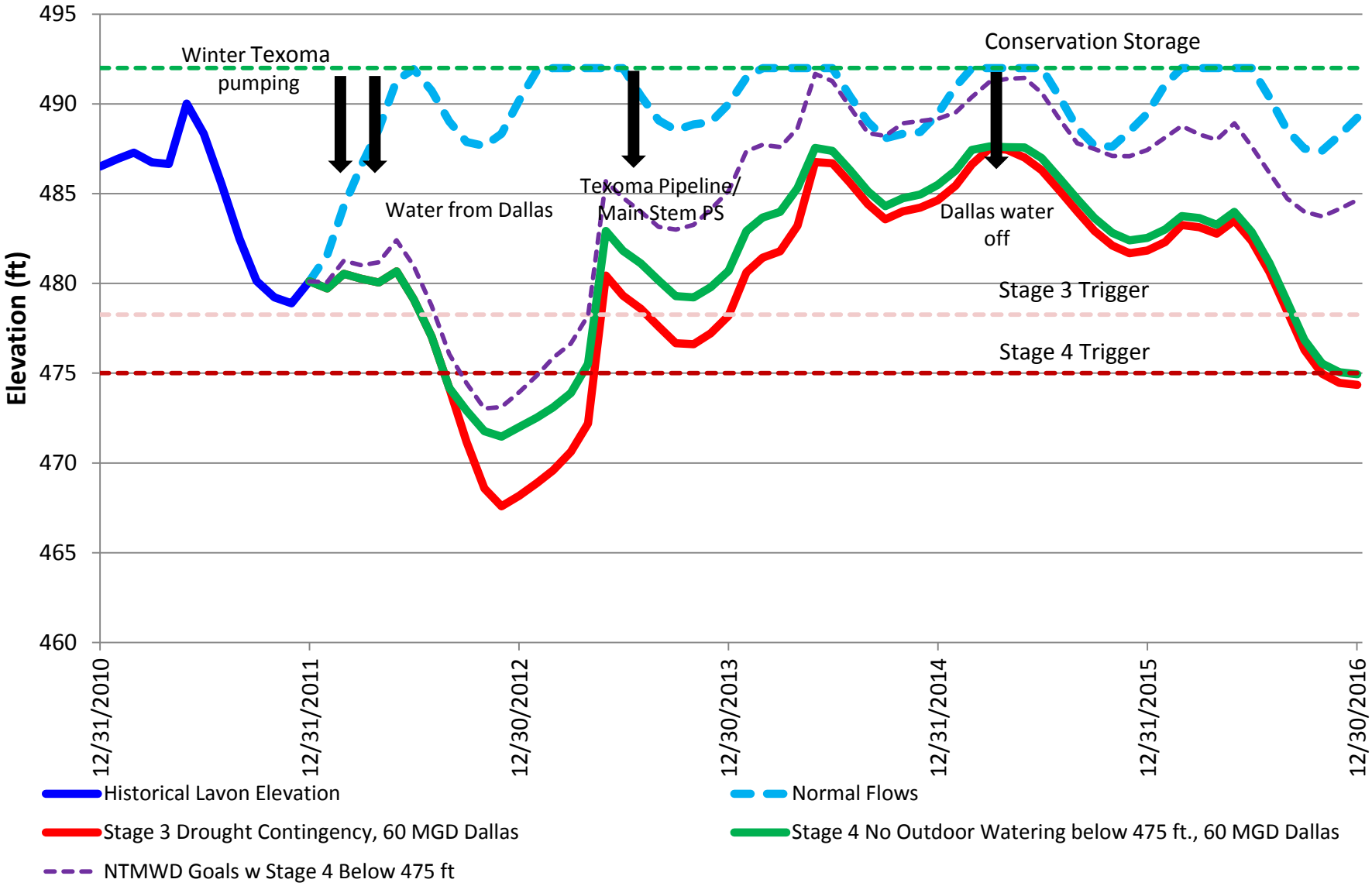
Elevation Needed to Avoid Stage 4 (Elevation 475) Even If Inflow Is Low for the Rest of the Year



Lake Lavon Elevations - Worst 15-Month Inflows (1/56 - 3/57)
60 MGD from Dallas

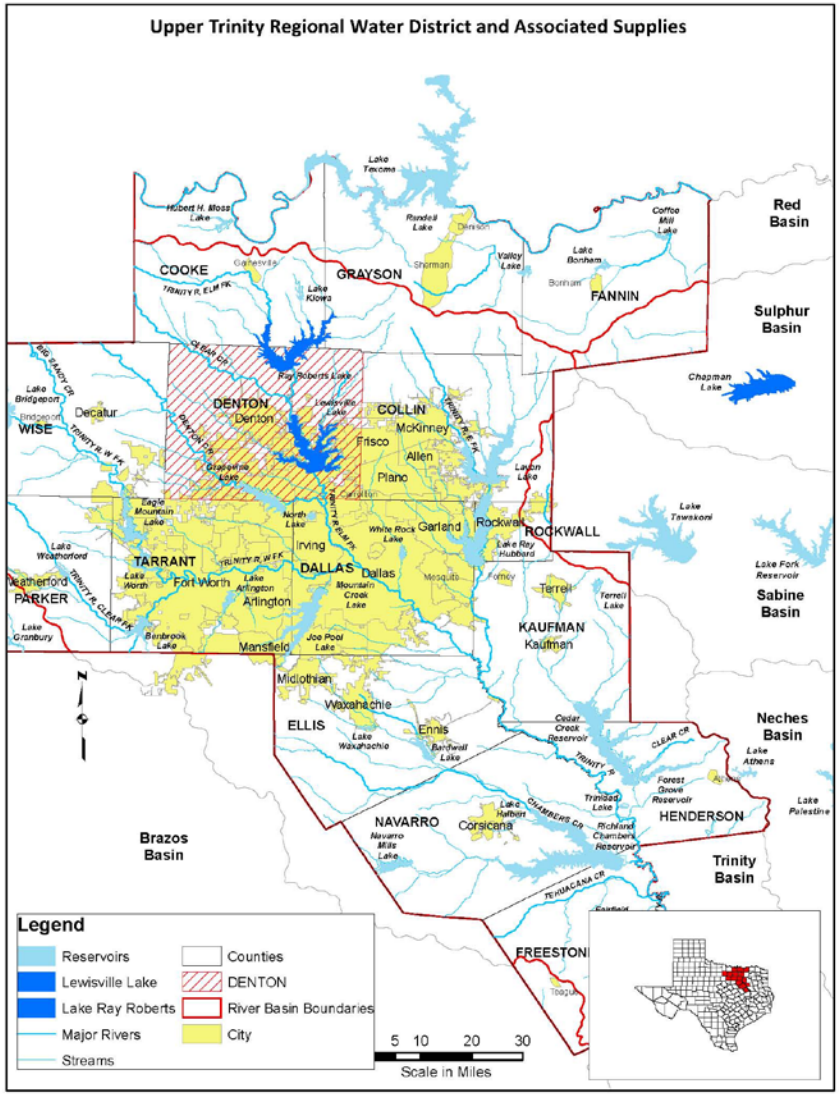


Lake Lavon Elevations - Five More Years of Drought
60 MGD from Dallas



Upper Trinity Regional Water District (UTRWD)

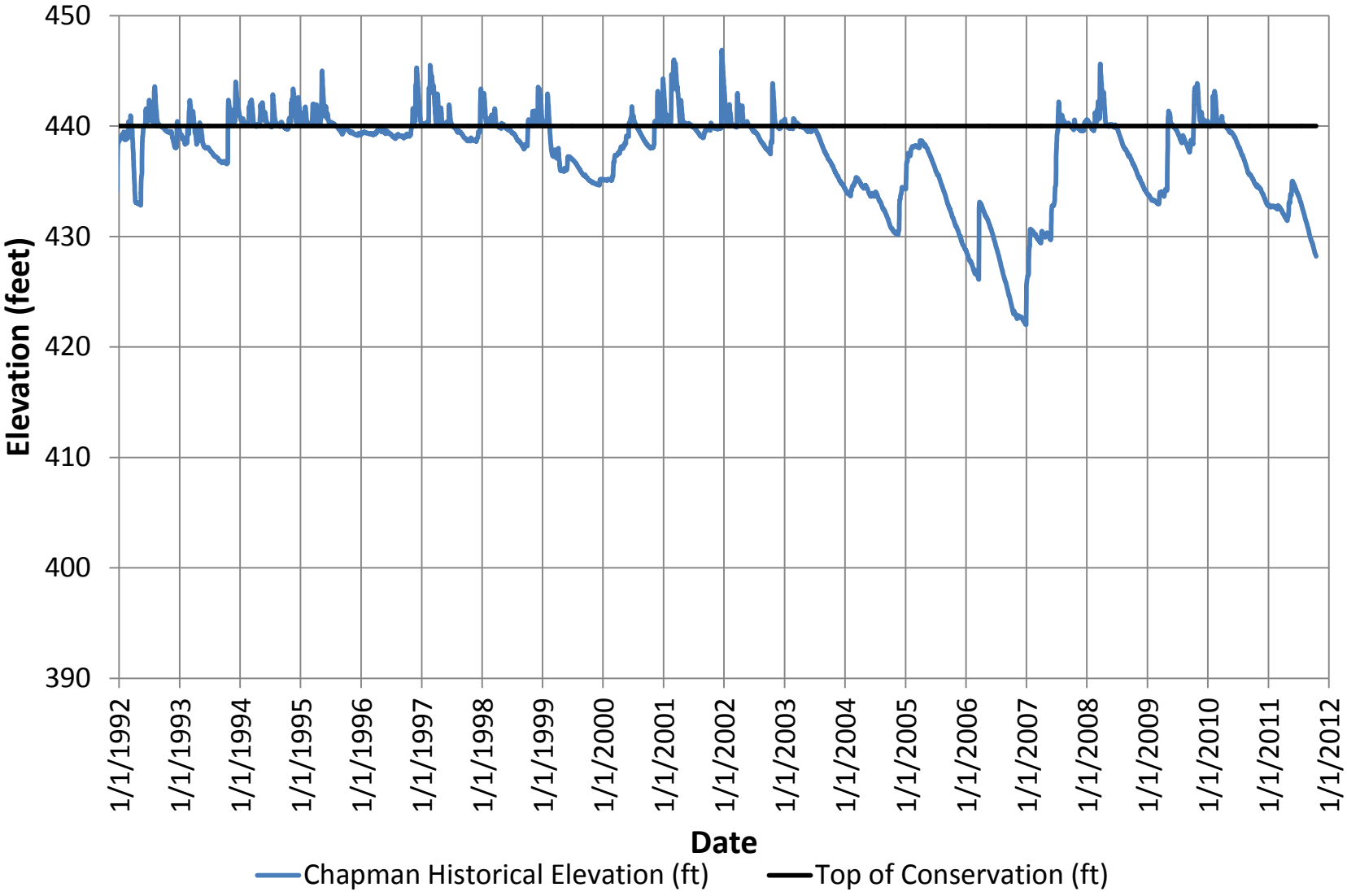
- Joint Study
  - UTRWD
  - NTMWD
  - Irving
- Service Area
  - Denton County
- Current Supplies
  - Jim Chapman Lake
  - Lake Lewisville (DWU)
  - Ray Roberts Lake (DWU)



Jim Chapman Lake Summary of Authorizations

Owner	Authorized Storage	Authorized Diversion	Share of Firm Yield	
	(acre-feet)	(acre-feet per year)	(acre-feet per year)	(MGD)
City of Irving	100,628	54,000	43,281	38.6
NTMWD	106,606	57,214	45,857	40.9
UTRWD	**30,003**	**16,106**	**12,909**	**11.5**
City of Cooper	1,993	1,072	859	0.8
City of Sulphur Springs	33,770	18,128	14,529	13.0
Total	273,000	146,520	117,435	104.8

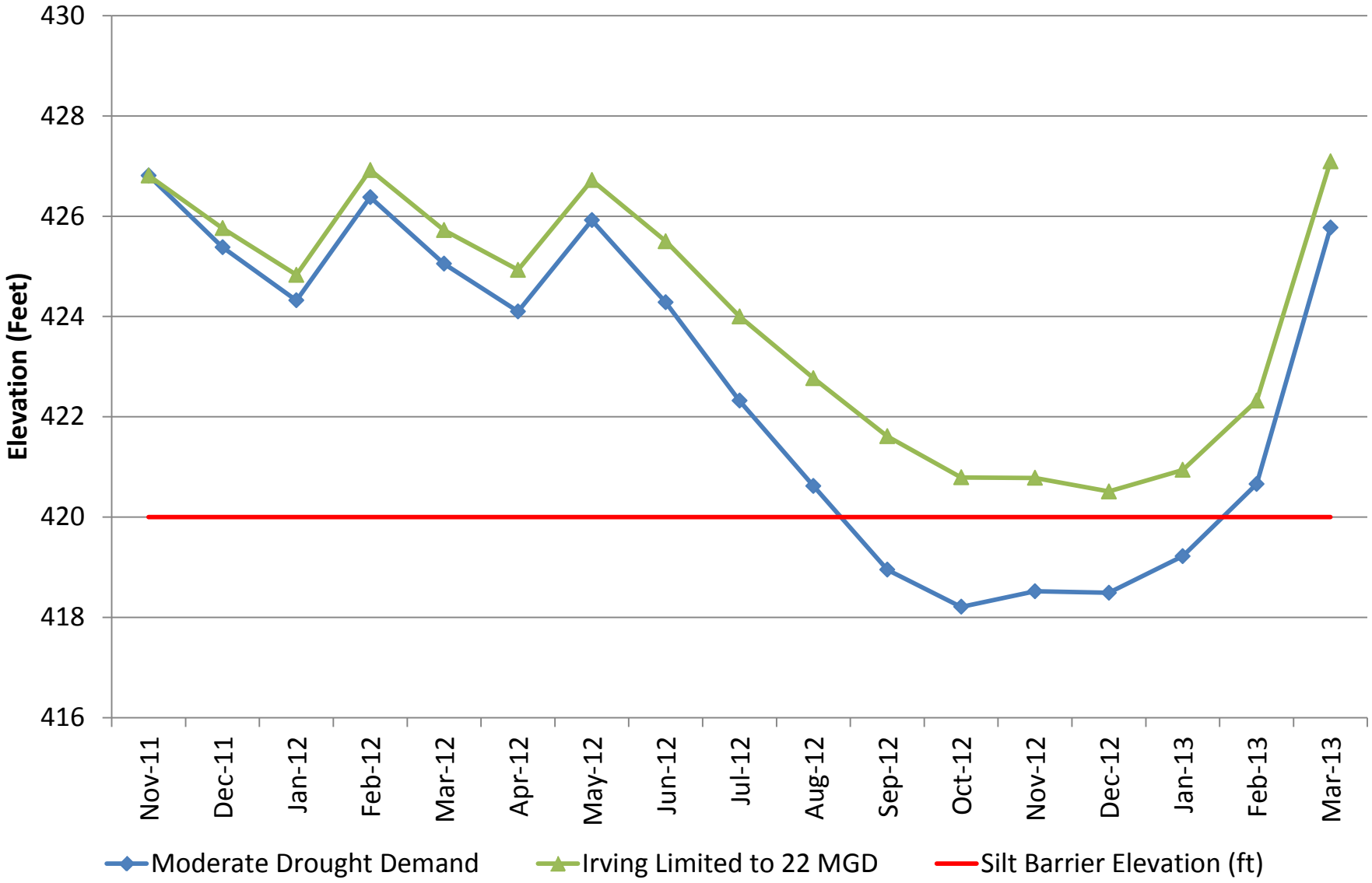
Jim Chapman Lake
Historical Elevations



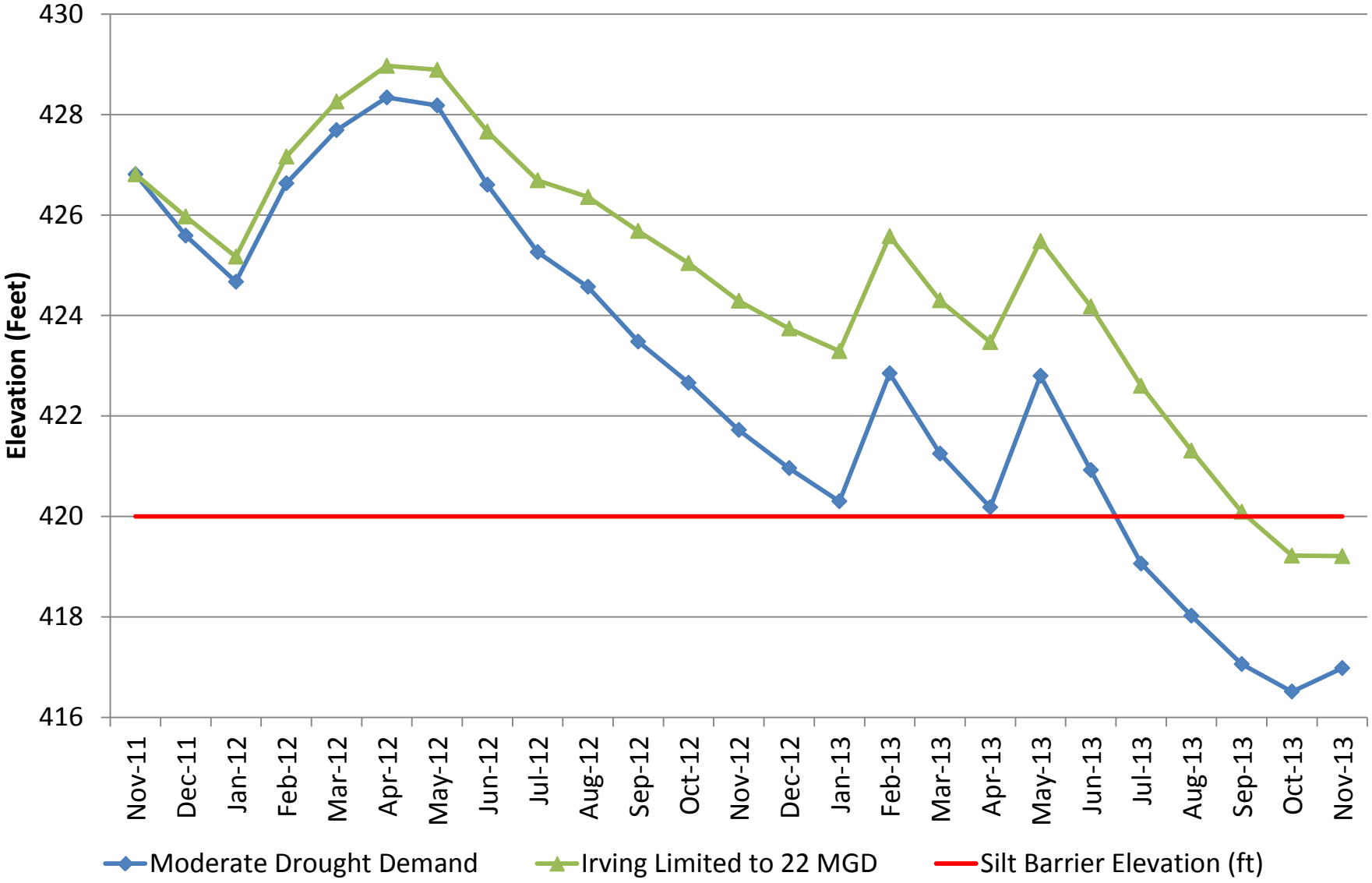
Assumptions

- Elevation 420 is below the silt barrier
- Irving and NTMWD may run out of water in their accounts
- Three different demand levels
  - Normal Conditions
  - Moderate Drought Conditions
  - Severe Drought Conditions

Worst 16 Months – Moderate Drought Demands



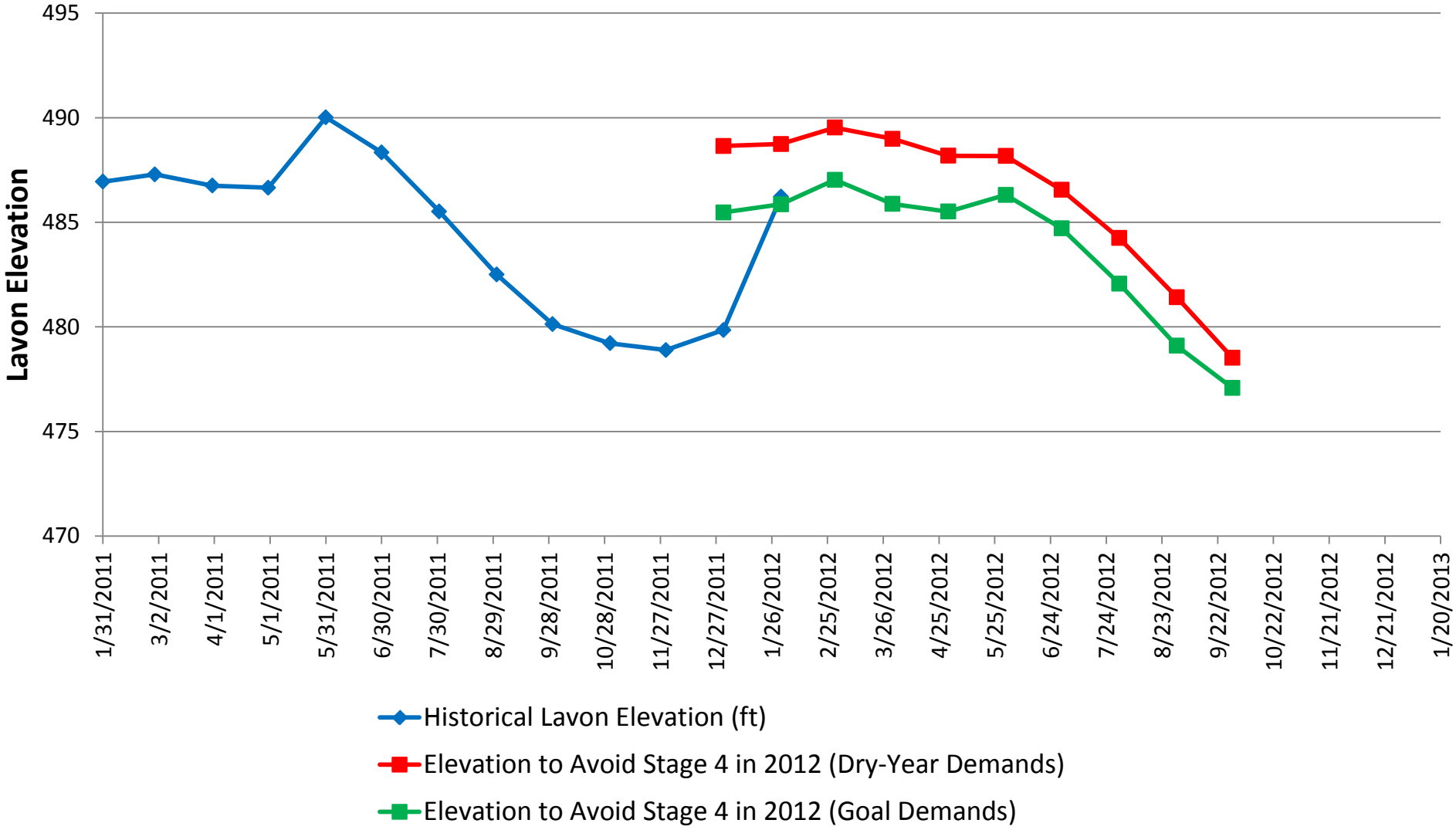
Worst 24 Months – Moderate Drought Demands



Good News

- More water in lakes than in previous worst case analysis:
  - + 5.5 feet for Lake Lavon
  - + 4.0 feet for Jim Chapman Lake
    - Results from more **inflow**, less evaporation, and/or less demand in December than worst case
- Still not out of drought

Elevation Needed to Avoid Stage 4 (Elevation 475) Even If Inflow Is Low for the Rest of the Year



Next Steps

- Update model with current lake levels
- Extend Hydrology
  - Current model through 2006, extend through 2011
- Continued monthly updates based on lake level during duration of drought

RiverWare Model Evaluation

- Advantages of RiverWare
  - Accounting
  - Alternative evaluation
  - Complex RPL rule sets
- Limitations
  - No Texas basin wide models with prior appropriation
  - Time intensive to build a model from the ground up

Acknowledgements

- North Texas Municipal Water District
- Upper Trinity Regional Water District
- City of Irving
- Jon Albright – FNI
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Questions?

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