



Effects of El Nino on the West Fork Trinity

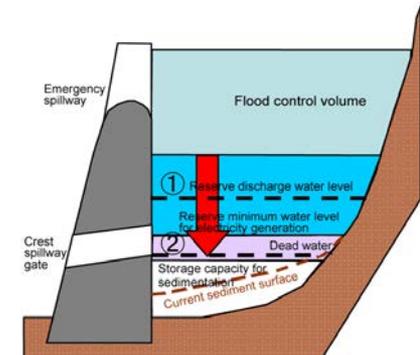
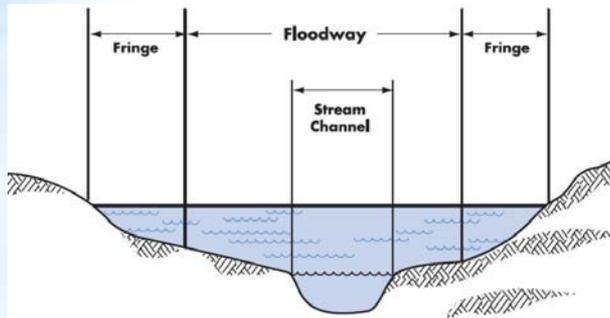
David Marshall, P.E.

Operations and Engineering
Coordination

Tarrant Regional Water District

Anatomy of a flood

- Rainfall driven
 - Storm total volume
 - Peak flow
- Reservoirs rise and store water
- River rises and stores water (valley storage)
- The floodway system stores water in the sumps
- Stored water from the sumps and reservoirs is released after the peak



The 1922 flood in Fort Worth



LARGEST CIRCULATION IN TEXAS **FORT WORTH STAR-TELEGRAM** **HOME EDITION**
 DOUBLE DAILY ASSOCIATED PRESS REPORT BY LEASED WIRE
 VOLUME XLII, NUMBER 86, EIGHTEEN PAGES, FORT WORTH, TEXAS, THURSDAY, APRIL 27, 1922. PRICE 5 CENTS

38 PERSONS YET MISSING

REFUGEES RETURNING TO THEIR HOMES THURSDAY IN THE FLOODED DISTRICT WEST OF THE CITY. Left, this truck bears all the family possessions rescued from the waters. Center, drying out the clothes which spent several days under water. Right, refugees along the Camp Bowie Boulevard looking over the place where "home" used to be.

FLOOD CREST PASSES DALLAS, 1,500 HOMELESS NEAR CITY
SITUATION OVER NORTH TEXAS IMPROVES
Boy Is Fatally Burned When Torch Explodes
'CATS' DONATE ROOM FOR Y. M. C. A.
Vacogoches Gets Seven-Inch Rain; Rivers Overflow
Weather or Not It Will Rain
GERMANY TO OFFER SOVEREIGNTY TO RUSSIA
THINK IT OVER

Young Wife Sobs for Mother as She Huddles Her Own Baby Saved From Raging Torrent
3 ENTIRE FAMILIES BELIEVED DROWNED; KNOWN DEAD SEVEN
SEED CRUSHER SCORES BILL ON TARIFF
Klan Issue Is Injected in Trial of Liqueur Case
TEXAS & PACIFIC TRAIN STILL STRANDED
REVISIED LIST OF DEAD AND MISSING IN FLOOD
Water Now in City Main Has Been Filtered
MURDER VERDICT IN KANSAS IS UPHELD

Y. M. C. A. Campaign for \$375,000 Building Fund Extended Two Days

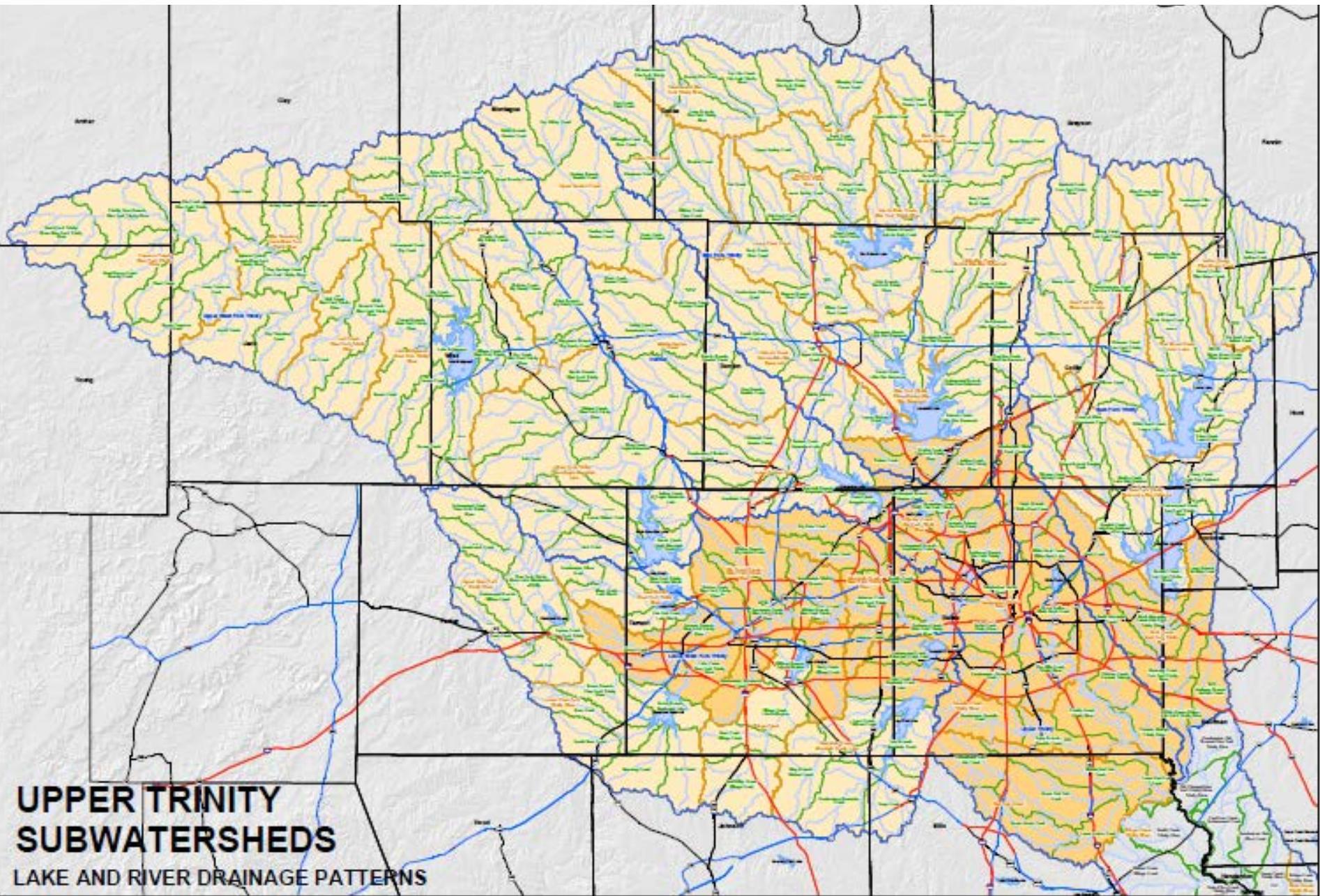
LARGEST CIRCULATION IN TEXAS **FORT WORTH STAR-TELEGRAM** **HOME EDITION**
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CITY LAYING PLANS TO AVOID FUTURE FLOODS

On April 26 Mayor Cockrell said a special committee would consider a bond issue to rebuild damaged streets, parks, and bridges. He said a levee would be built to protect the Holly Street waterworks, situated next to the river.

The 1949 flood

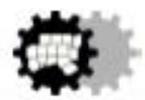




UPPER TRINITY SUBWATERSHEDS

LAKE AND RIVER DRAINAGE PATTERNS

- Legend**
- Upper Trinity Basin
 - Upper to Lower Trinity Subwatershed
 - Upper to Trinity River
 - Subwatershed
 - Subwatershed
 - Primary Highway
 - Secondary Highway
 - Access Road
 - Major Road
 - Trinity River
 - Lakes
 - Streams
 - Counties



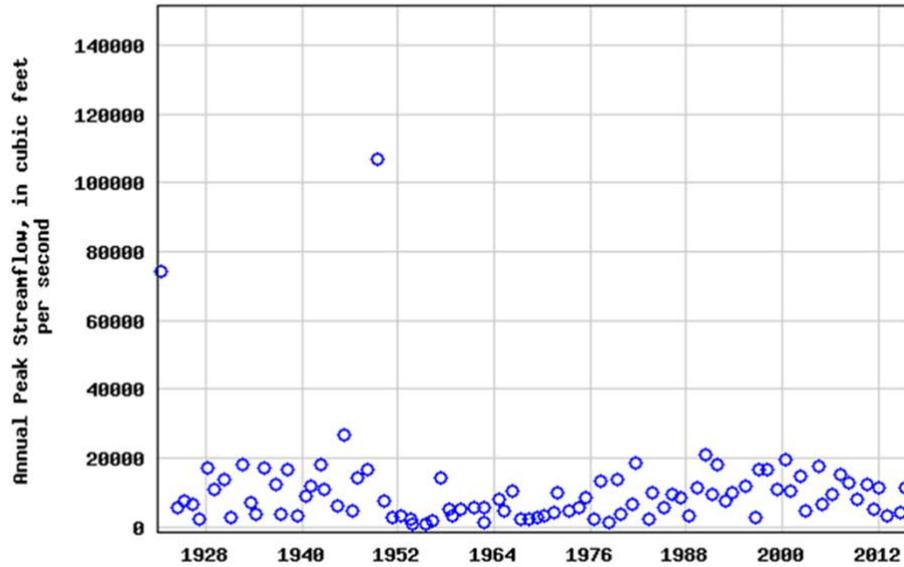
North Central Texas
Council of Governments
Environment & Development



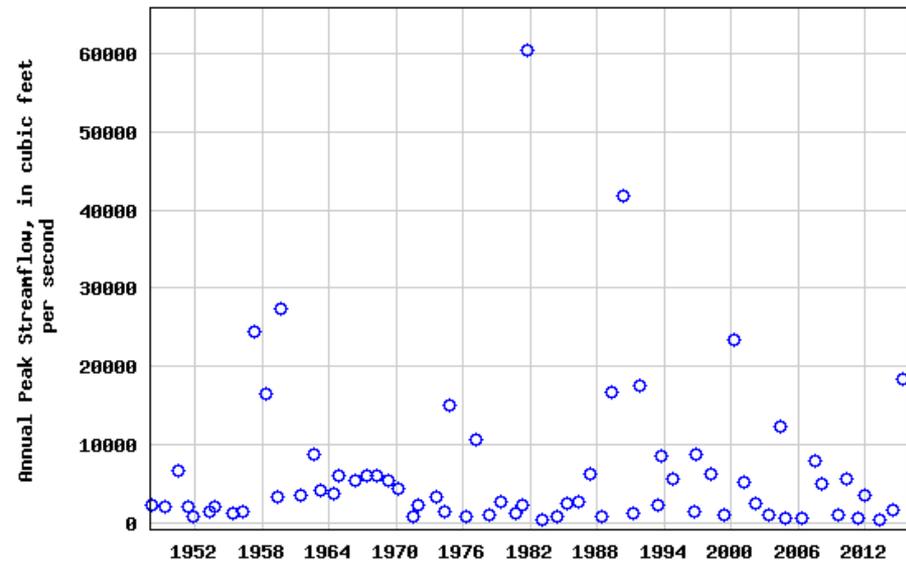
Data Source: Watershed Boundary Dataset (WBD) by
USDA - National Resources Conservation Service

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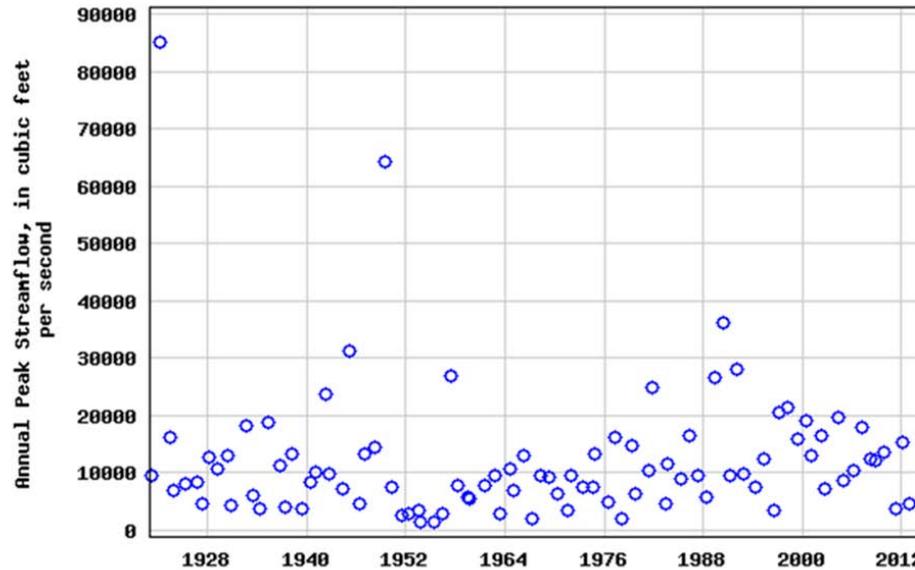
USGS 08047500 Clear Fk Trinity Rv at Ft Worth, TX



USGS 08044500 W Fk Trinity Rv nr Boyd, TX



USGS 08048000 W Fk Trinity Rv at Ft Worth, TX



West Fork Trinity– 2,052 square mile drainage



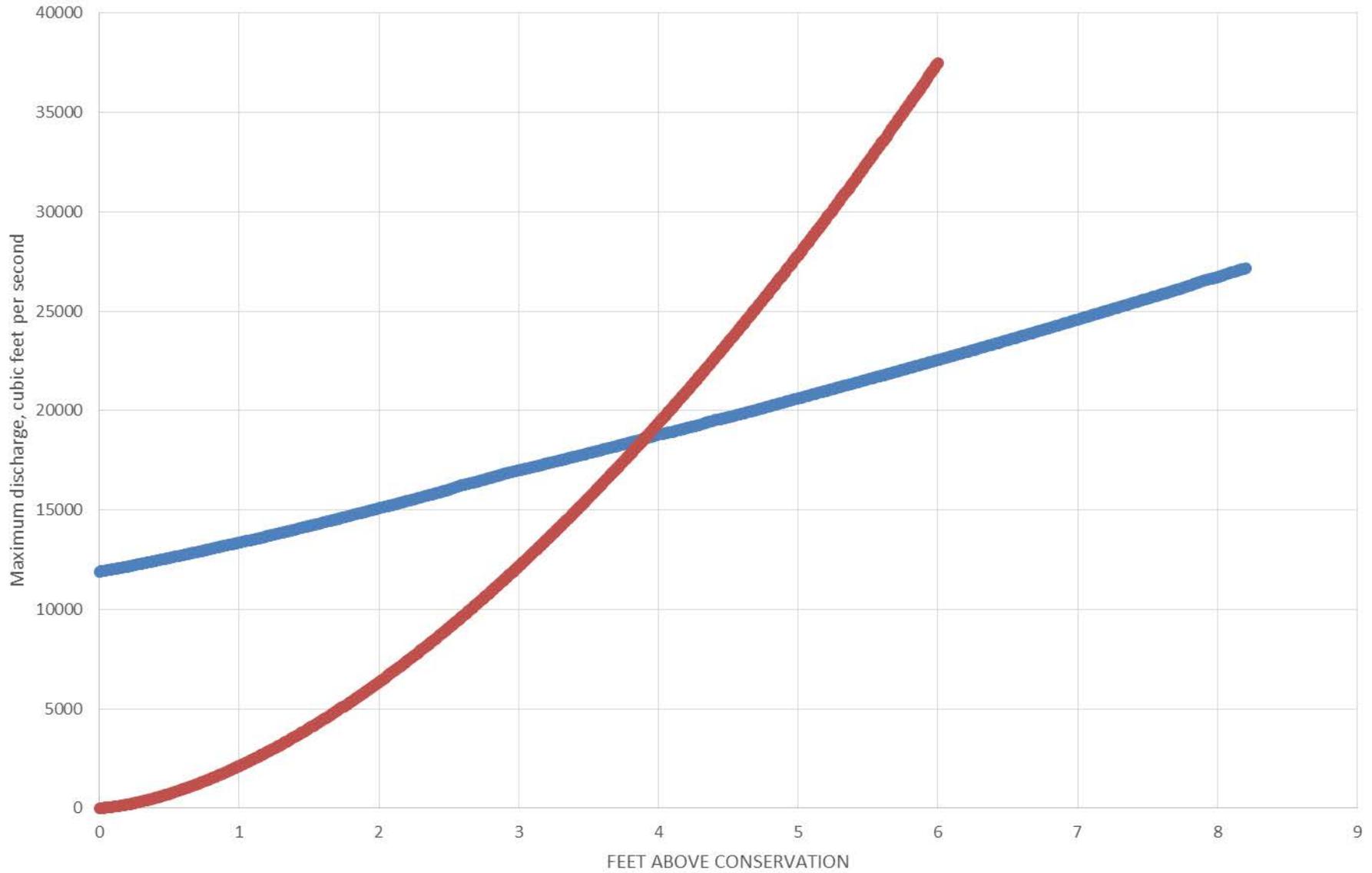
Bridgeport and Eagle Mountain reservoirs spillways act like a bucket with a hole; the higher the water the more is released. Volume is temporarily stored and the peaks reduced through valley storage.



Lake Worth's spillway acts like a bucket with a spout, storing very little floodwaters. As the level in the lake increases, the release increases.

SPILLWAY CAPACITY

—●— Eagle Mountain —●— Lake Worth



West Fork Reservoirs

- Bridgeport – conservation level 836 ft msl, flood easement level 851, flood storage about 198,000 acre feet. Peak flood elevation recorded – 844.36 (8.36')
- Eagle Mountain conservation level 649.1, flood easement 668, flood storage volume about 240,000 acre feet of flood storage. Peak flood elevation recorded – 659.9 (10.1')
- Lake Worth Conservation level 594, flood easement to 600, flood storage 23,946 acre feet. Peak flood elevation - 598.70 (4.7')

LOWEST HOME ELEVATIONS

(above conservation)



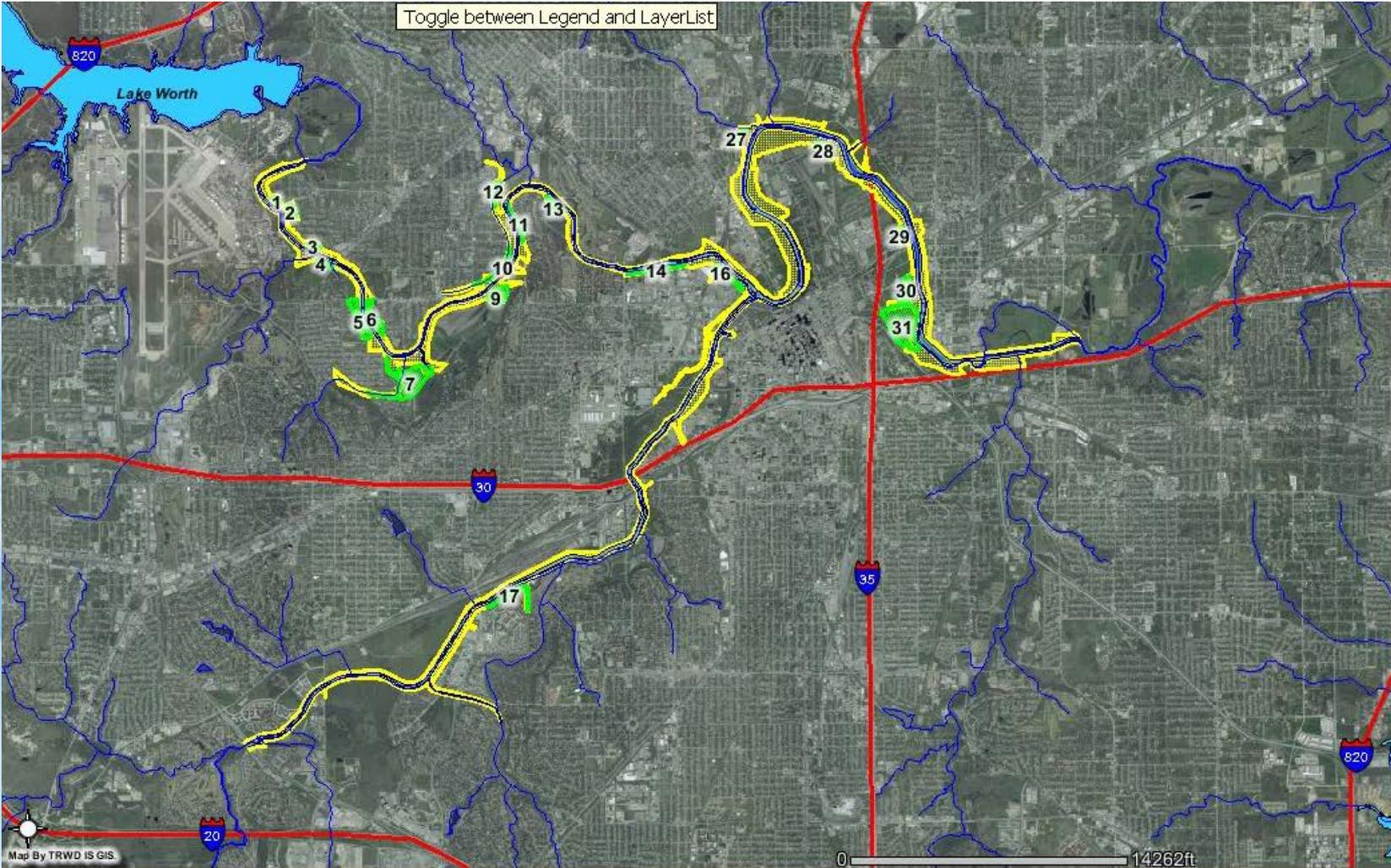
Lake Bridgeport
(TRWD)

Lake Worth
(City of Fort Worth)

Eagle Mountain
(TRWD)

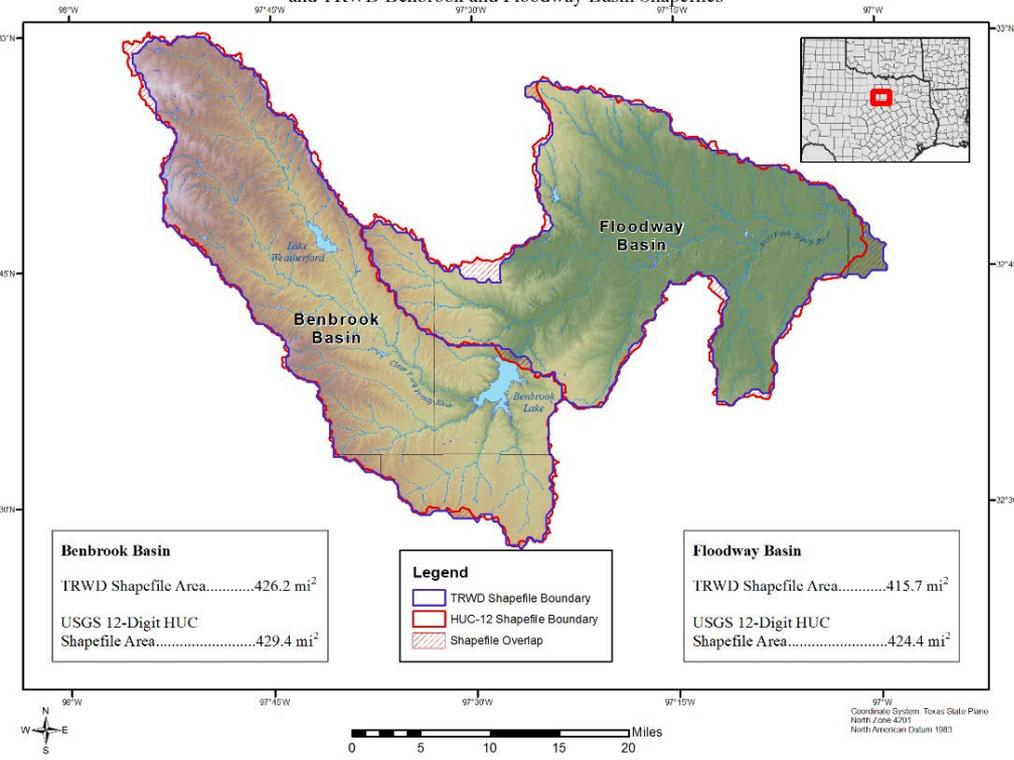
CONSERVATION ELEVATIONS

Fort Worth Floodway



Lake Benbrook – 429 square mile drainage

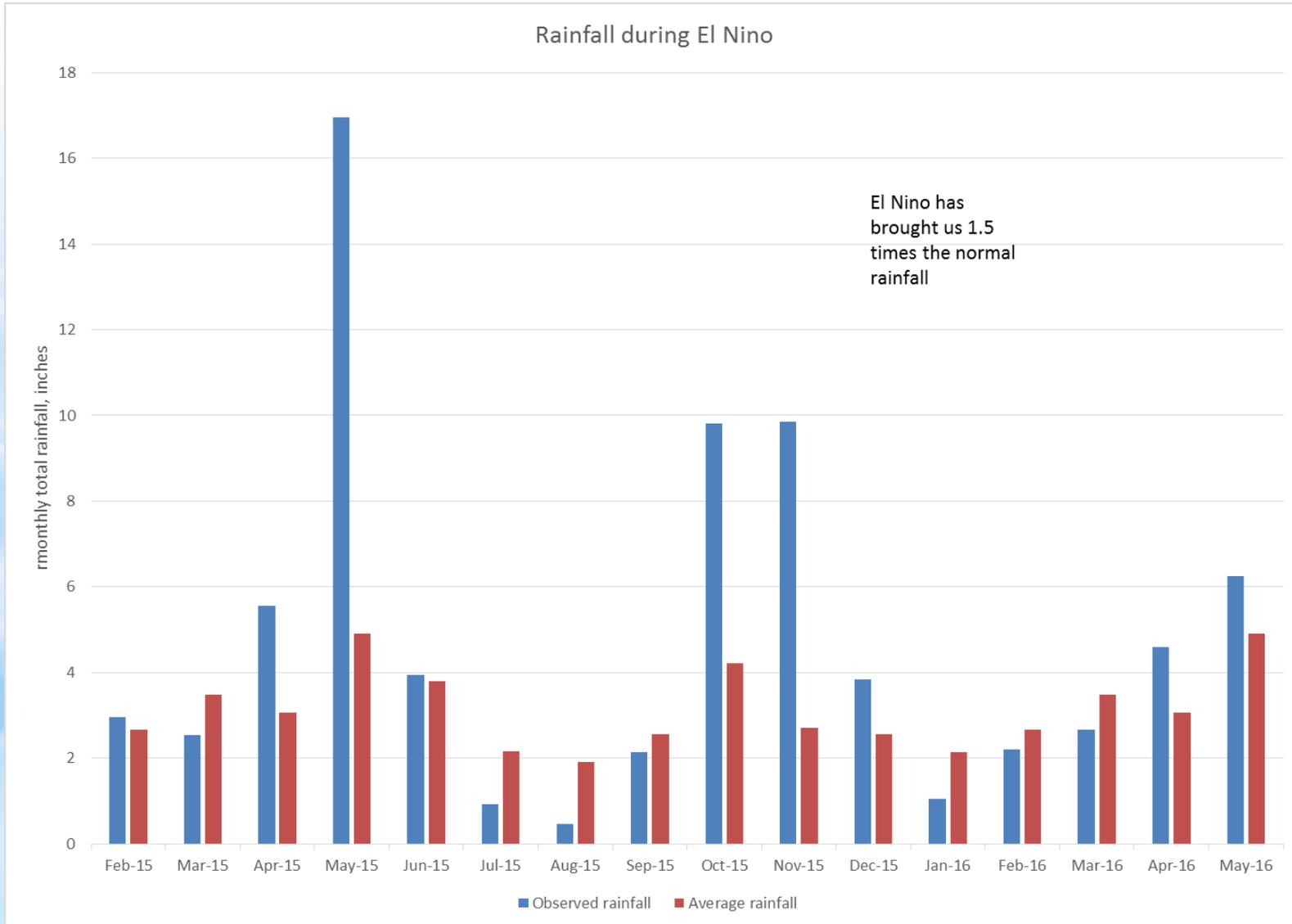
Comparison between USGS 12-Digit Hydrologic Unit Boundaries (HUC-12) and TRWD Benbrook and Floodway Basin Shapefiles



© Can Stock Photo - csp0014755

Benbrook acts like a bucket with a spout, it fills until it spills. Volume is stored and high flows mitigated through valley storage

El Nino - Rainfall

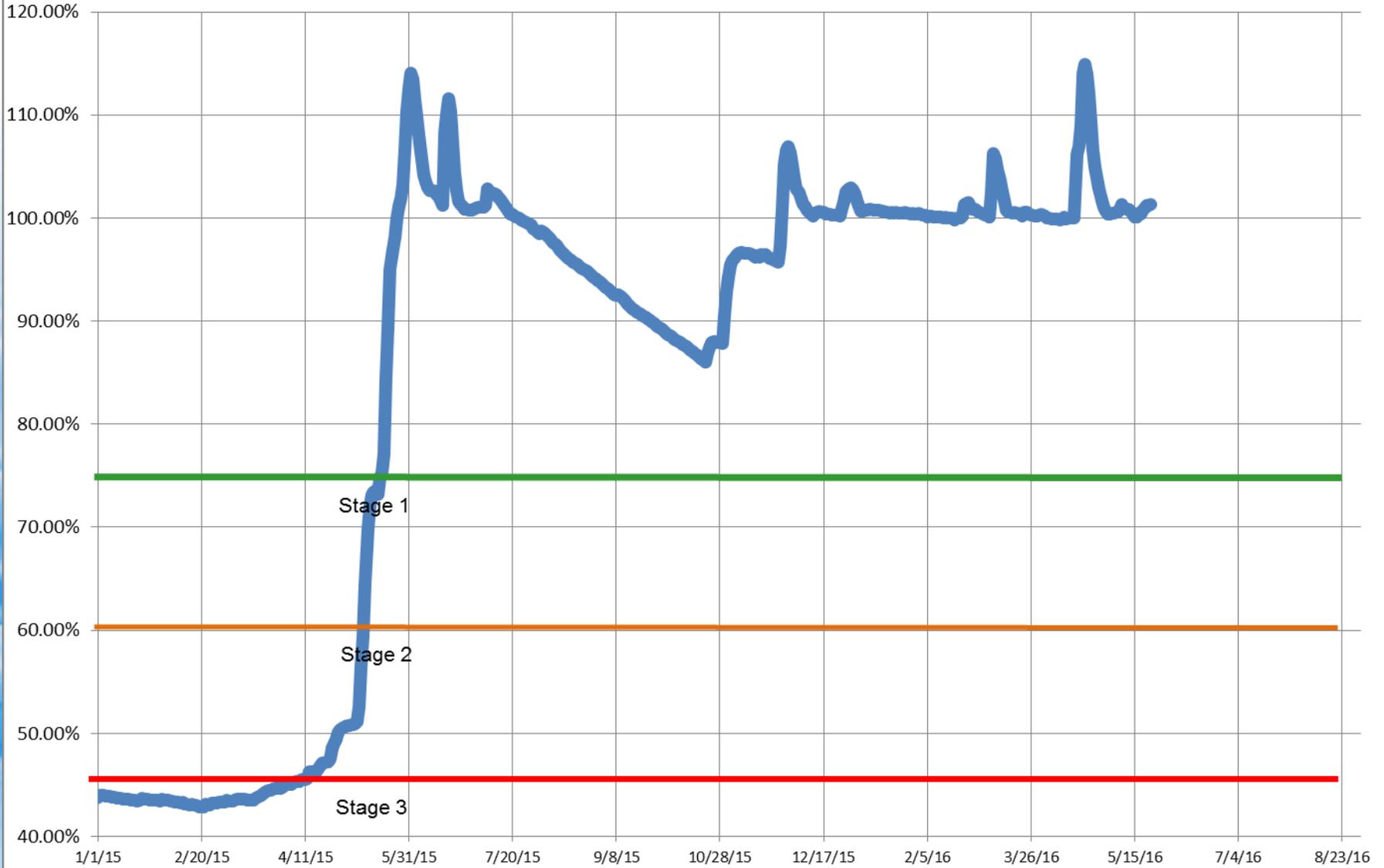


Flood Discharges

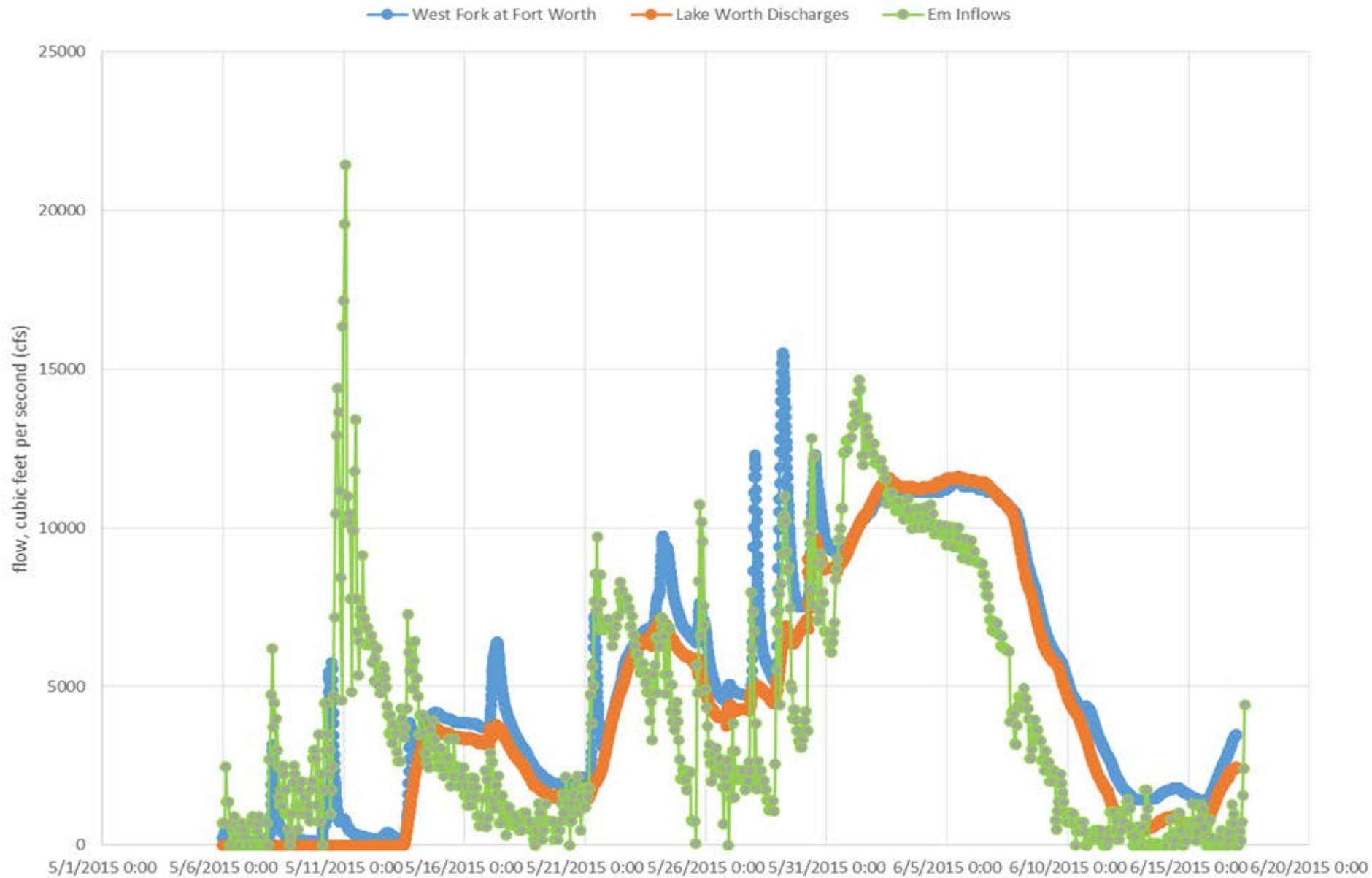
	Bridgeport	Eagle Mountain	Lake Worth
	flood releases	flood releases	flood releases
	acre feet	acre feet	acre feet
2015	374,370	780,587	788,583
2016 through 5/30	286,490	450,430	512,021
total	660,860	1,231,017	1,300,604
% Lake Volume	183%	684%	3883%

West Fork Water Supply Reservoirs Capacity

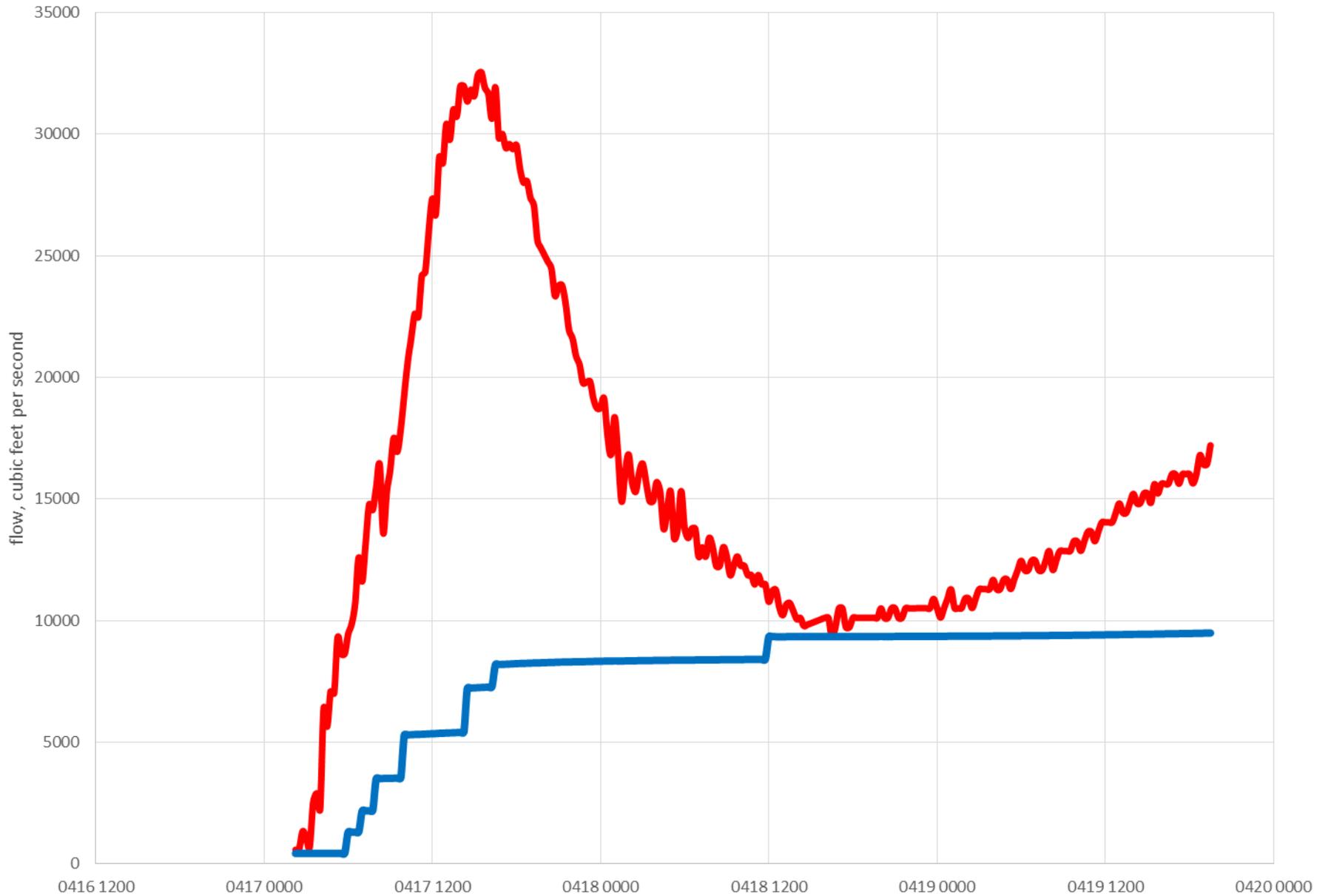
West Fork



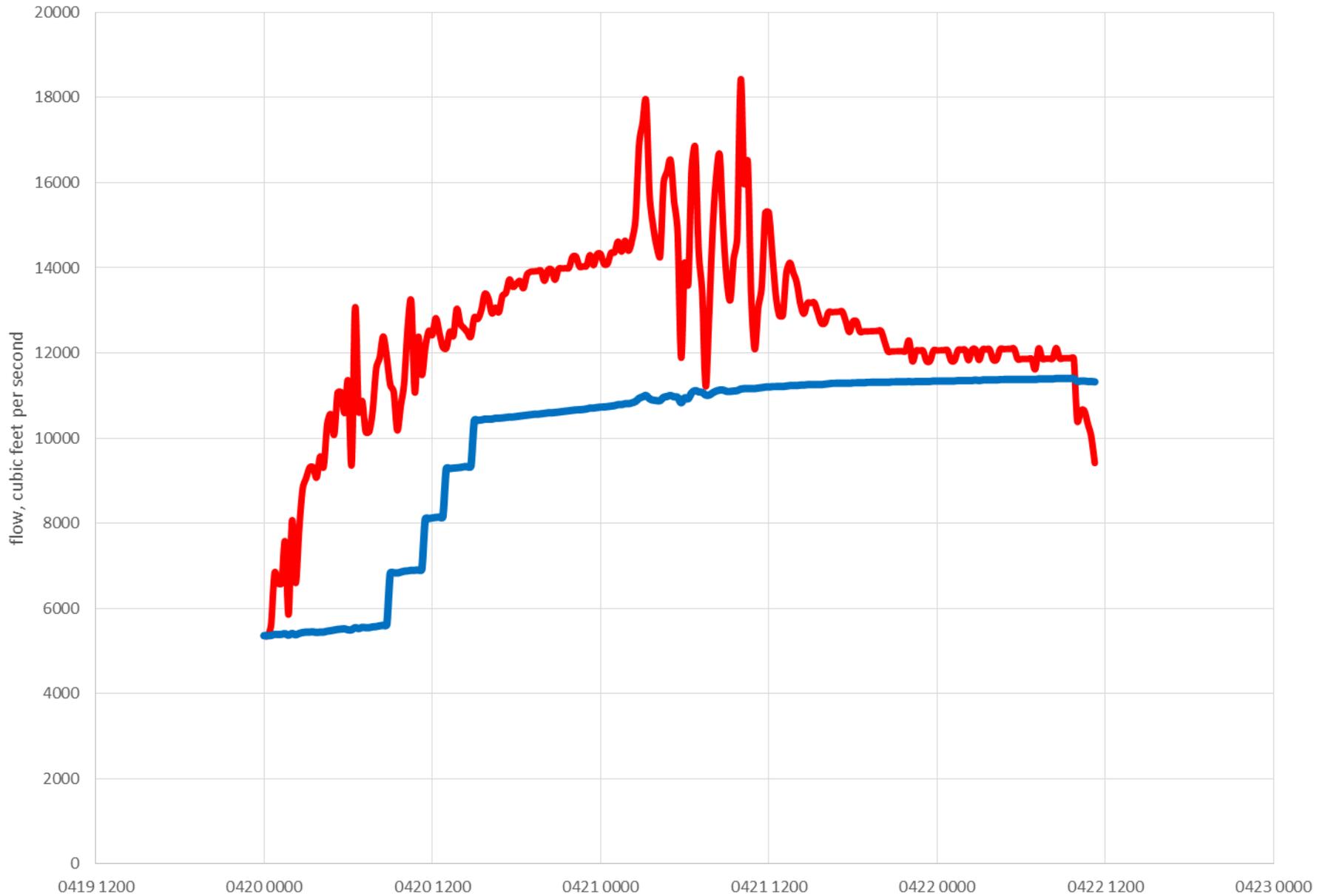
May 2015 Flooding



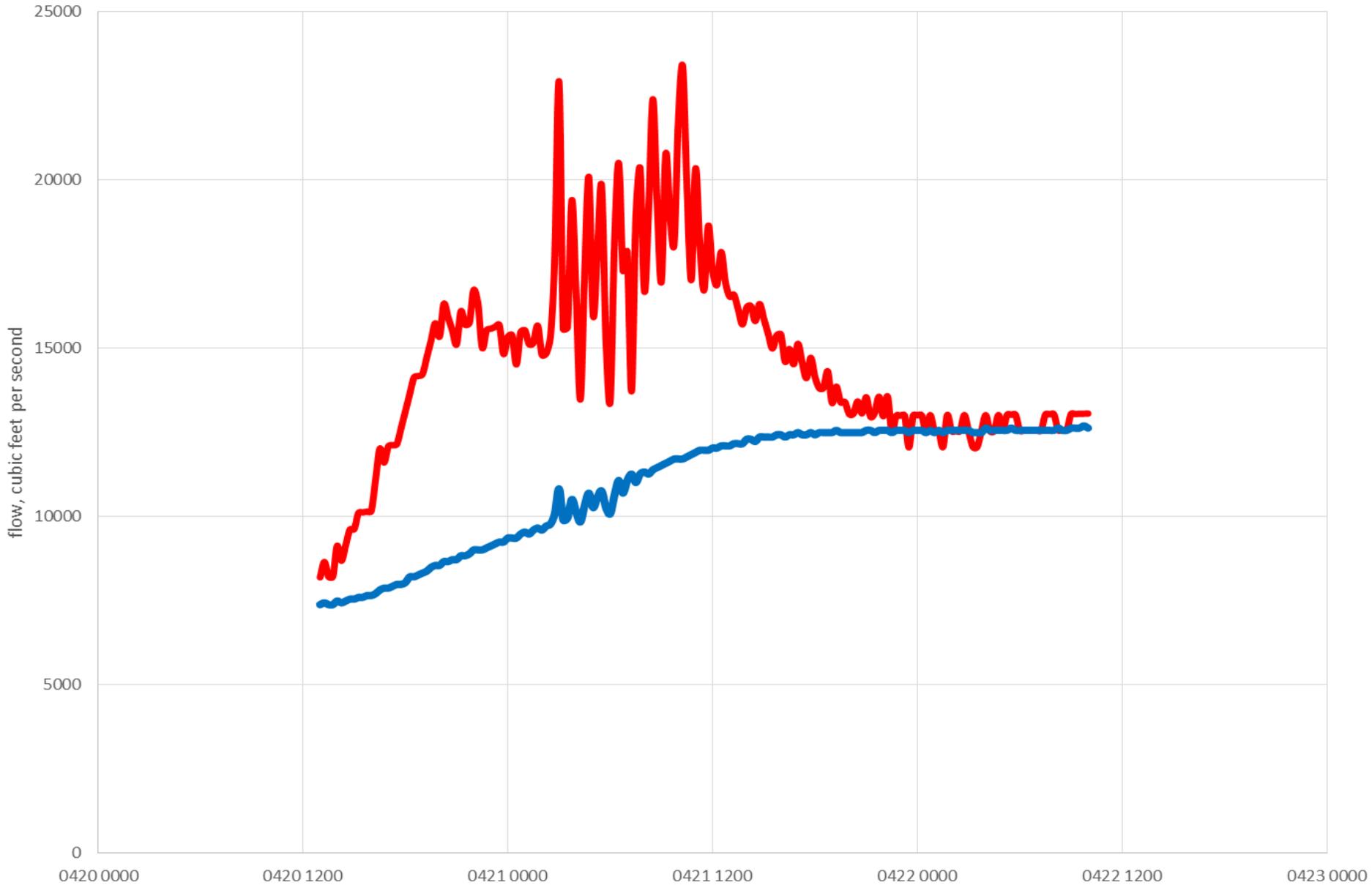
Bridgeport inflows and releases - April 17 flood



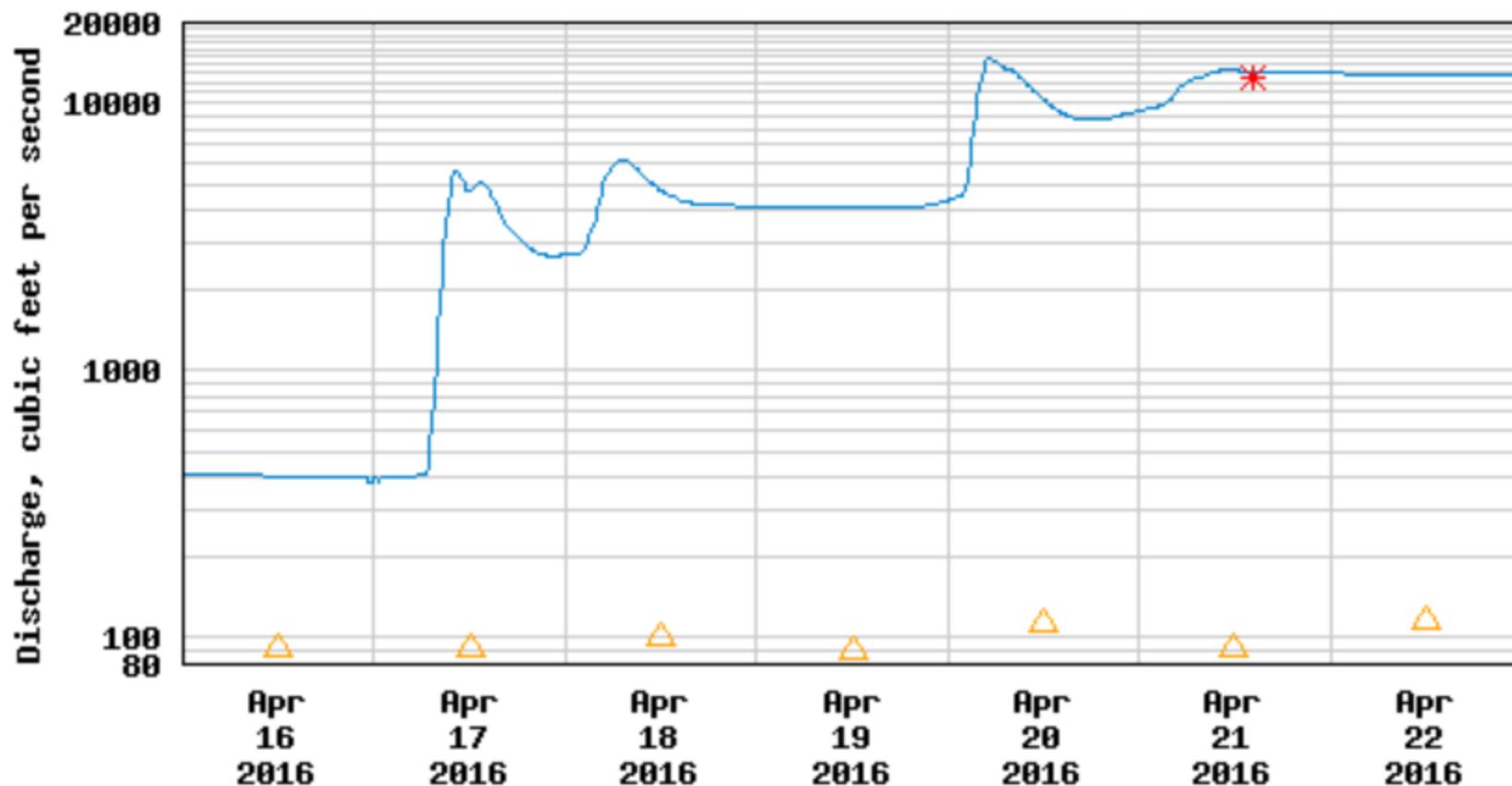
Eagle Mountain inflows and releases - April 17 flood



Lake Worth inflows and releases - April 17 flood



USGS 08048000 W Fk Trinity Rv at Ft Worth, TX

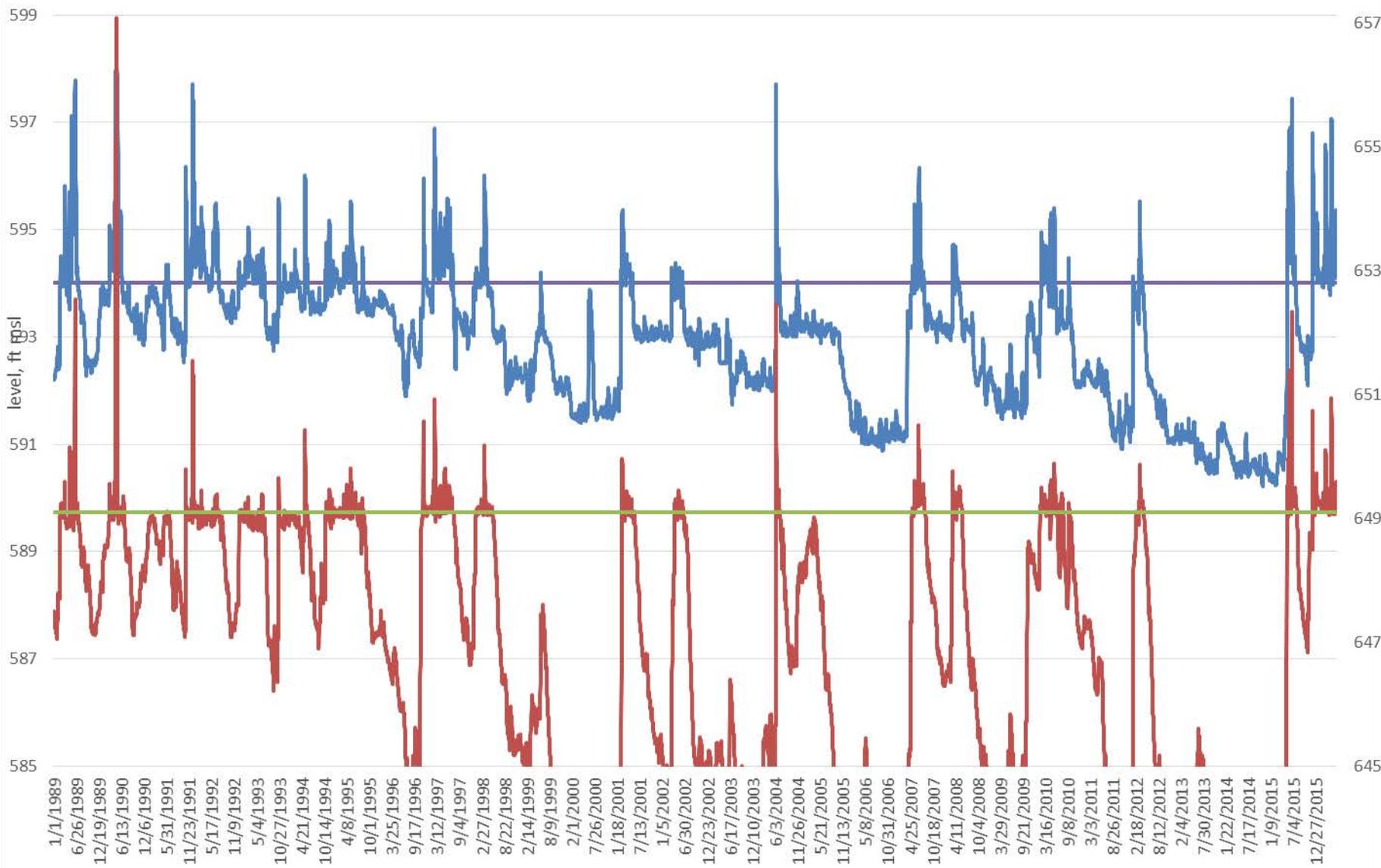


---- Provisional Data Subject to Revision ----

- Median daily statistic (95 years)
- Measured discharge
- Discharge

Lake Worth and Eagle Mountain Levels

conservation LW lake worth Eagle Mountain conservation EM



Effects of El Nino

- 50% more rainfall than average
- Very large volumes of runoff
- Reservoir levels at conservation or above constantly since November
- Floods on all reservoirs, with homes damaged on Bridgeport and Eagle Mountain
- A great water supply for the upcoming La Nina period