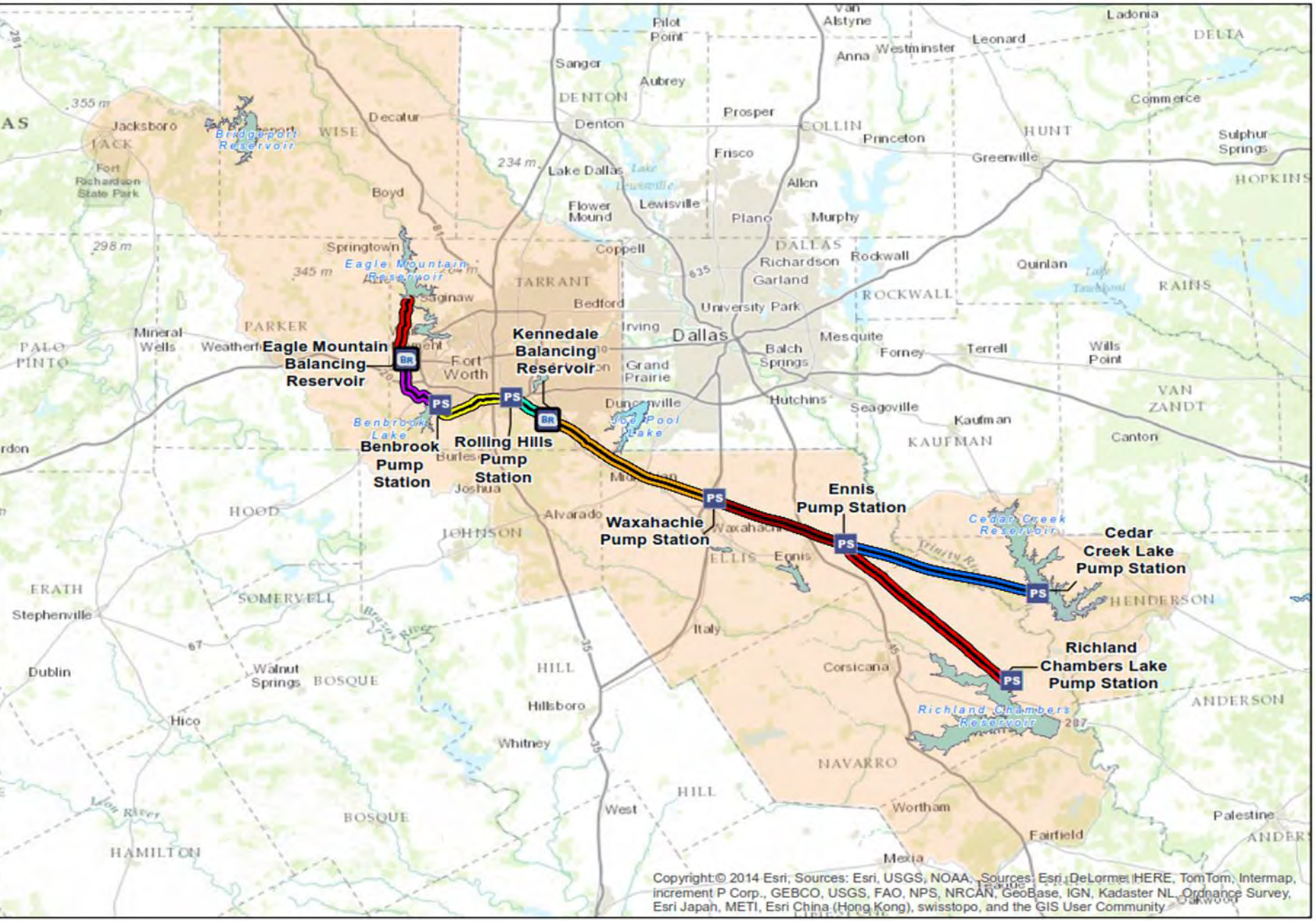
Reservoir Levels on the West Fork Trinity

David Marshall

Tarrant Regional Water District



trwd Tarrant Regional Water District

West Fork Water Supply Operations

- By contract we must run the system in the most efficient manner
- We evaluate pumping costs and reliability for operational decisions
- The reservoir levels fluctuate due to use, evaporation, rainfall and pumping from east Texas reservoirs
- The TRWD reservoir system is designed to deliver all the water we will need during the worst drought, so we will not run out of water
- The reservoir levels will be very low at the end of a severe drought
- The Eagle Mountain Connection supplies additional water to the West Fork to permit Fort Worth to use more water and improve reliability for the West Fork System
- During the drought we experienced, the Eagle Mountain Connection provided almost all the water Fort Worth used.

trwd Tarrant Regional Water District

Water Supply and Reservoir Levels

- Water Supply - Bridgeport
  - Bridgeport serves six municipal customers and seven irrigation/industrial customers whom withdraw water from the reservoir, with a contractual total of 25,500 acre feet
  - Our water right requires 15,000 acre feet of use be set aside for local customers and up to 78,000 acre feet be used or released to Eagle Mountain
  - The most sustainable use from Bridgeport is about 60,000 acre feet
  - On wet years we use up to the limit, on dry years much less.
  - In 2014, an exceptionally dry year, we used 19,110 acre feet from the reservoir, and no water was released to Eagle Mountain

trwd Tarrant Regional Water District

Water Supply and Reservoir Levels

- Water Supply – Eagle Mountain
  - Eagle Mountain serves four municipal customers and three irrigation/industrial users with a contractual total of 105,000 acre feet
  - Fort Worth is restricted by contract to use no more than 100,000 acre feet of "native" water during normal years and 46,000 acre feet during droughts
  - Our water right allows us to use or release up to 159,600 acre feet
  - Sustainable use is about 102,000 acre feet annually.
  - Eagle Mountain is also supplied by pumping from East Texas. On dry years we add water to the reservoir so use may go above the sustainable level
  - In 2014 we added 58,380 acre feet of water to the reservoir, about 1/3rd of Eagle Mountain's total volume
  - In 2014 total use was 67,975 from Eagle Mountain and Lake Worth, 86% supplied by the Eagle Mountain Connection

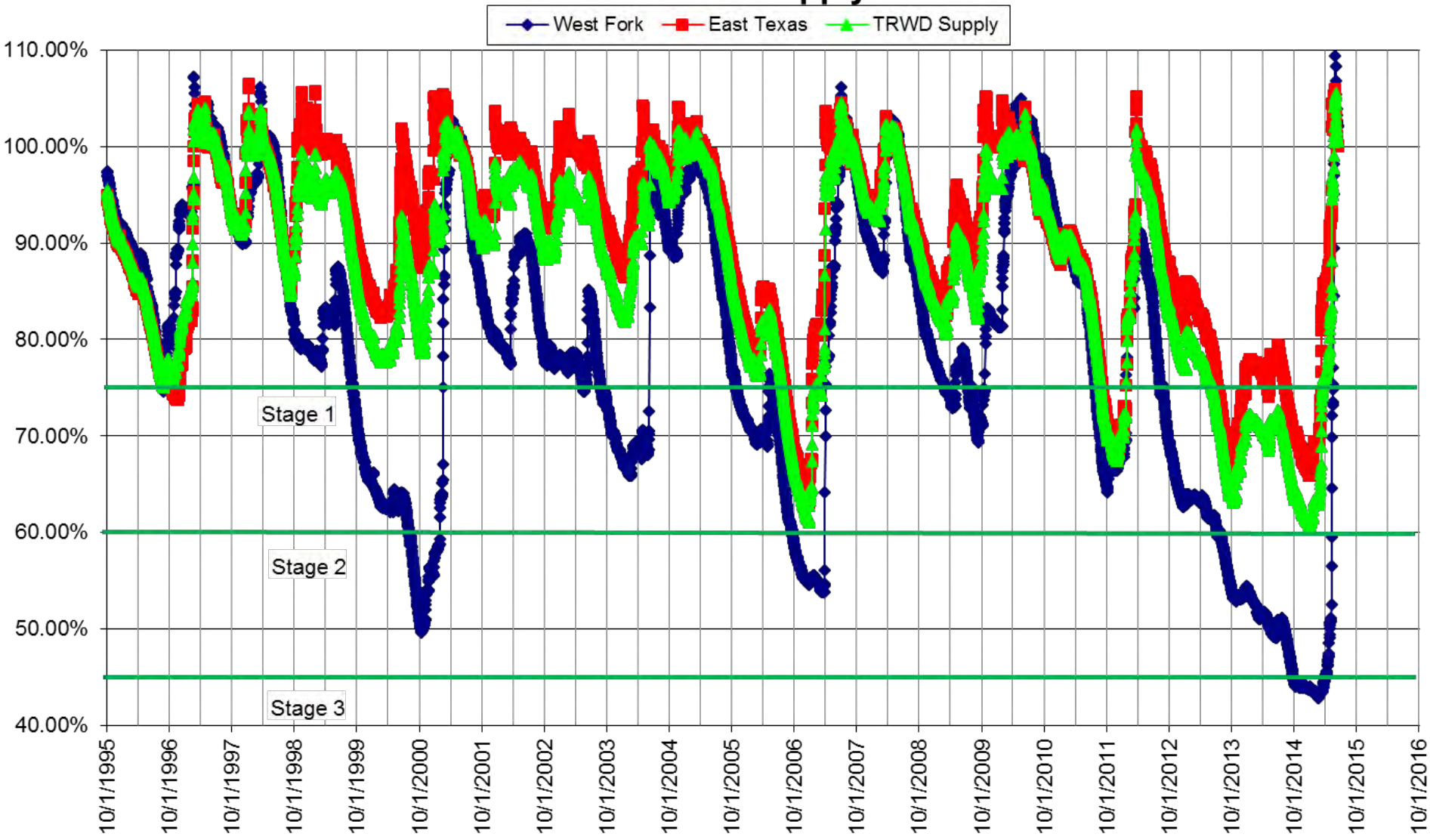
trwd Tarrant Regional Water District

Water Supply and Reservoir Levels

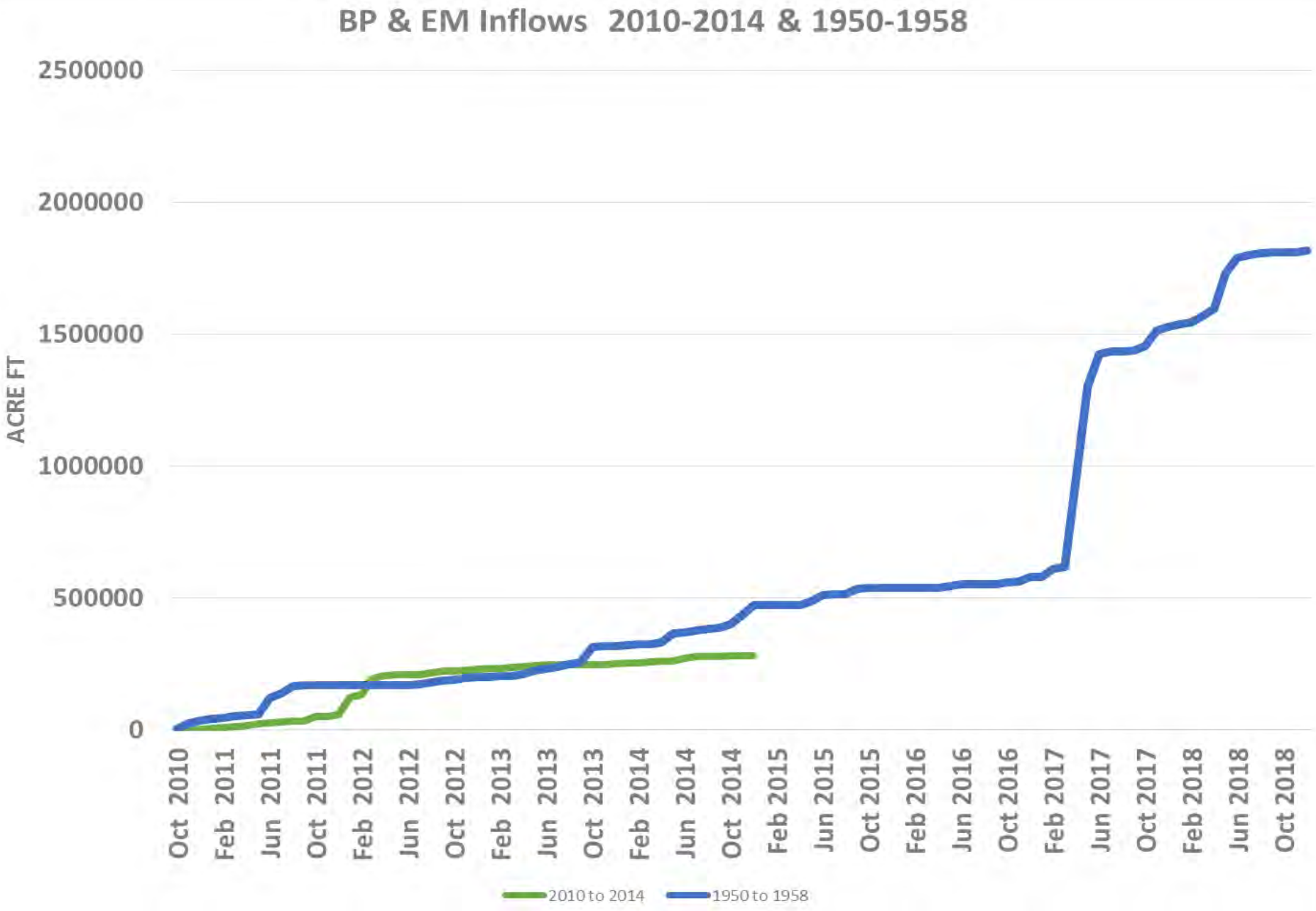
- Water Supply – Lake Worth
  - Provides water to Fort Worth's Holly Water Treatment Plant, River Oaks and Lockheed Martin
  - To provide water to the water plant and Lockheed, the lake must be no lower than 4 feet below conservation
  - Fort Worth has the right to take 12,143 acre feet from a water rights permit
  - The sustainable use is very low, a few thousand acre feet at most.
  - During drought, TRWD limits evaporation by lowering the water surface through controlled discharges from Eagle Mountain

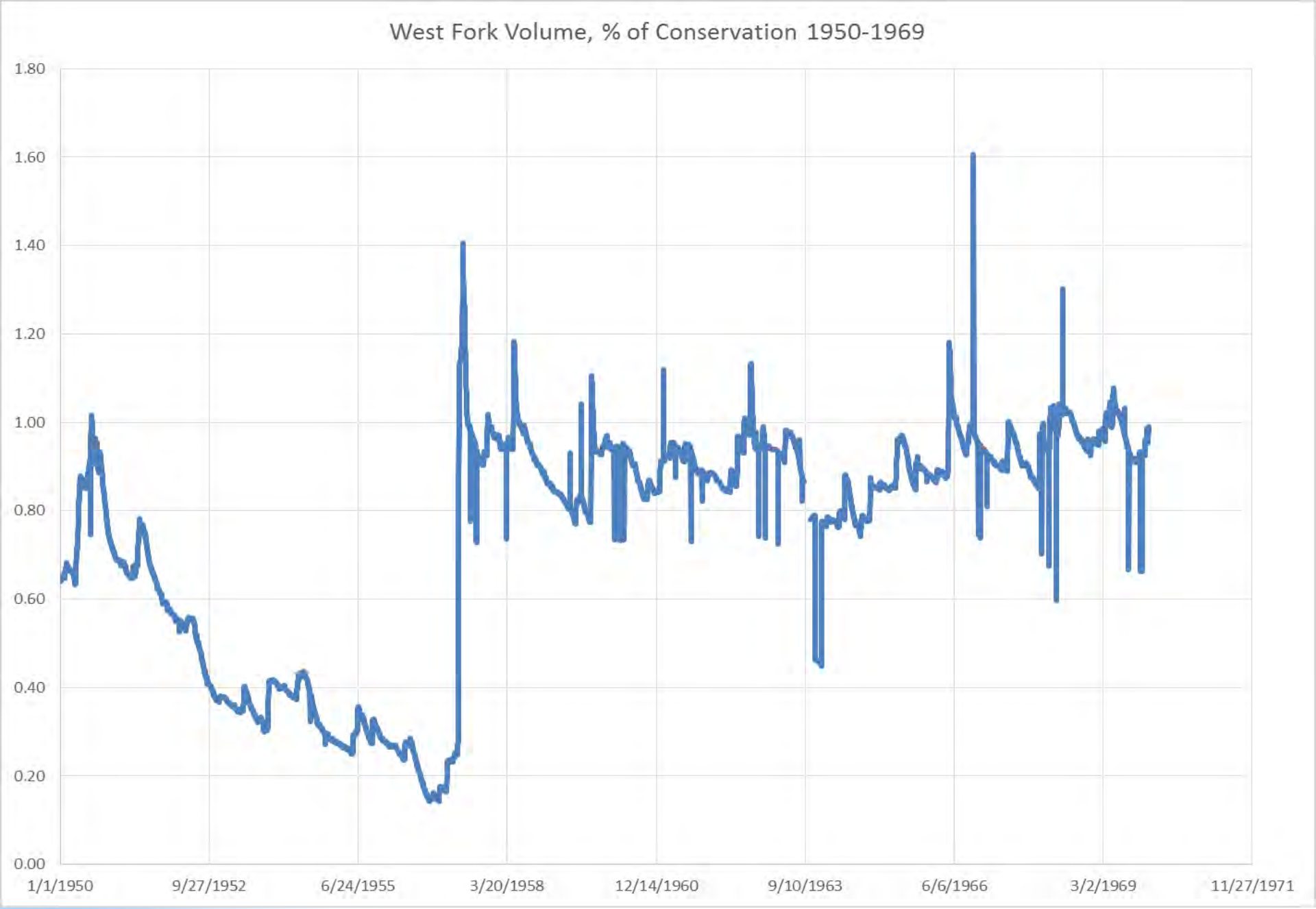
trwd Tarrant Regional Water District

TRWD reservoir Supply Status



trwd Tarrant Regional Water District


BP & EM Inflows 2010-2014 & 1950-1958
ACRE FT
2500000
2000000
1500000
1000000
500000
0
Oct 2010
Feb 2011
Jun 2011
Oct 2011
Feb 2012
Jun 2012
Oct 2012
Feb 2013
Jun 2013
Oct 2013
Feb 2014
Jun 2014
Oct 2014
Feb 2015
Jun 2015
Oct 2015
Feb 2016
Jun 2016
Oct 2016
Feb 2017
Jun 2017
Oct 2017
Feb 2018
Jun 2018
Oct 2018
2010 to 2014
1950 to 1958



trwd Tarrant Regional Water District

West Fork Reservoirs as flood control

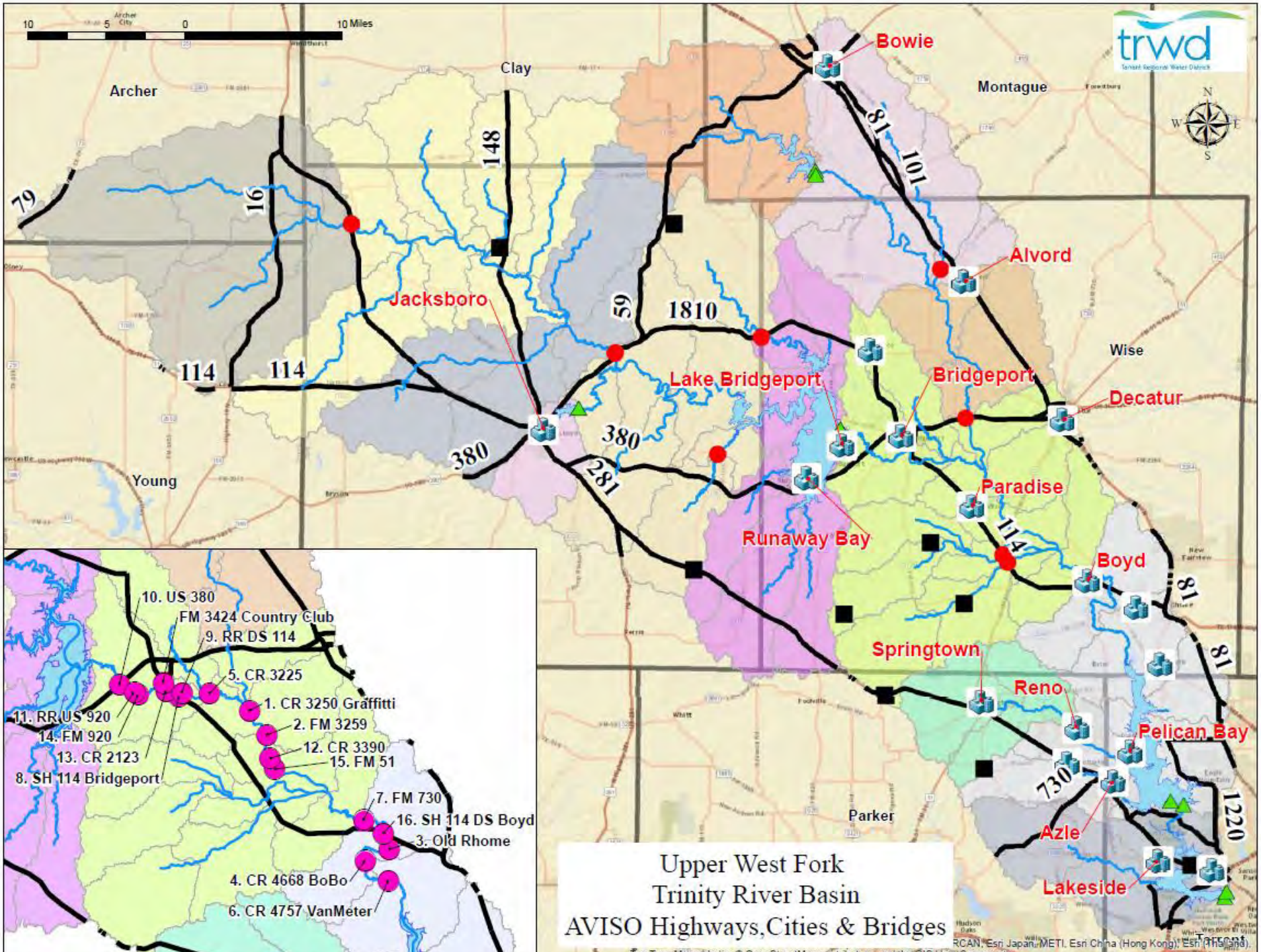
- Bridgeport and Eagle Mountain were designed in the 1920's as flood control reservoirs and used to protect downstream
- Bridgeport has a flood easement up to 851 feet msl, 15 feet above the 836 feet msl conservation level
- Bridgeport has about 325,000 acre feet of flood storage
- Eagle Mountain has a flood easement up to 668 feet msl, 17 feet above the conservation level of 649.1
- Eagle Mountain as about 156,000 acre feet of flood storage
- Lake Worth has a flood easement of 6 feet, elevation 600 feet msl, a storage of about 24,000 acre feet

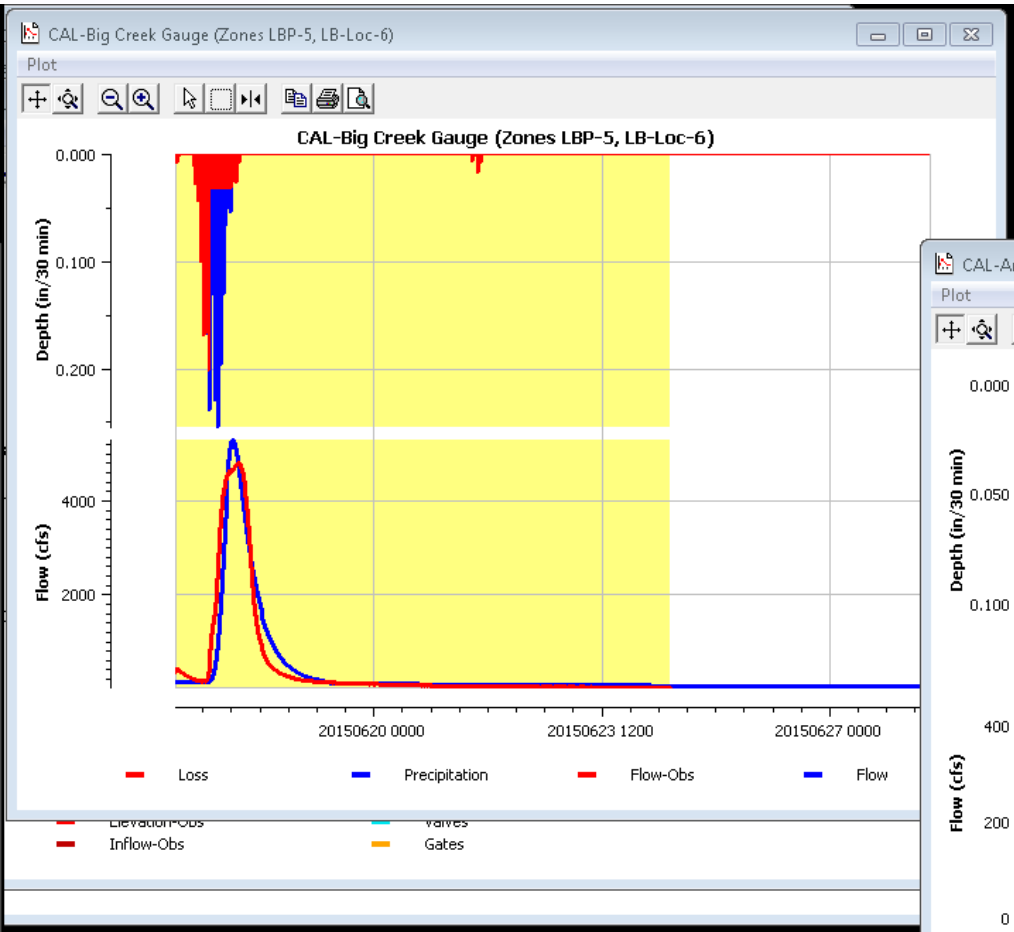
trwd Tarrant Regional Water District

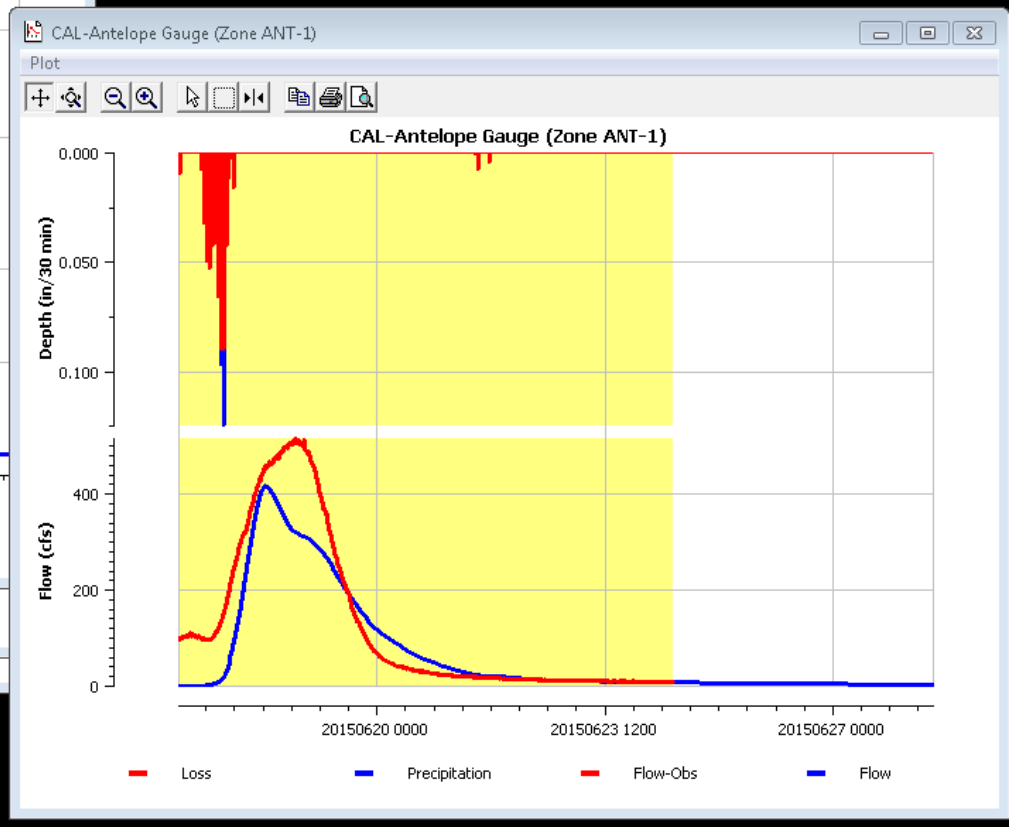
West Fork Flooding

- Flood releases from the reservoirs are made considering:
  - Dam integrity
  - Public safety
  - Property damage
- The Eagle Mountain discharge works are designed to limit releases to protect the Fort Worth Floodway
- TRWD's flood easements did not give us the right to control building – there are hundreds of homes within the flood pool boundaries

trwd Tarrant Regional Water District


10 5 0 10 Miles
trwd
Archer
Clay
Montague
Wise
Young
Parker
Bowie
Alvord
Jacksboro
Lake Bridgeport
Bridgeport
Decatur
Paradise
Runaway Bay
Boyd
Springtown
Reno
Pelican Bay
Azle
Lakeside
79
16
148
114
114
59
1810
380
380
281
81
101
81
81
114
730
1220
10. US 380
FM 3424 Country Club
9. RR DS 114
5. CR 3225
1. CR 3250 Graffitti
2. FM 3259
12. CR 3390
15. FM 51
11. RR US 920
14. FM 920
13. CR 2123
8. SH 114 Bridgeport
7. FM 730
16. SH 114 DS Boyd
3. Old Rhome
4. CR 4668 BoBo
6. CR 4757 VanMeter
Upper West Fork
Trinity River Basin
AVISO Highways,Cities & Bridges


CAL-Big Creek Gauge (Zones LBP-5, LB-Loc-6)
Plot
CAL-Big Creek Gauge (Zones LBP-5, LB-Loc-6)
Depth (in/30 min)
0.000
0.100
0.200
Flow (cfs)
4000
2000
20150620 0000
20150623 1200
20150627 0000
Loss
Precipitation
Flow-Obs
Flow
Inflow-Obs
Gates

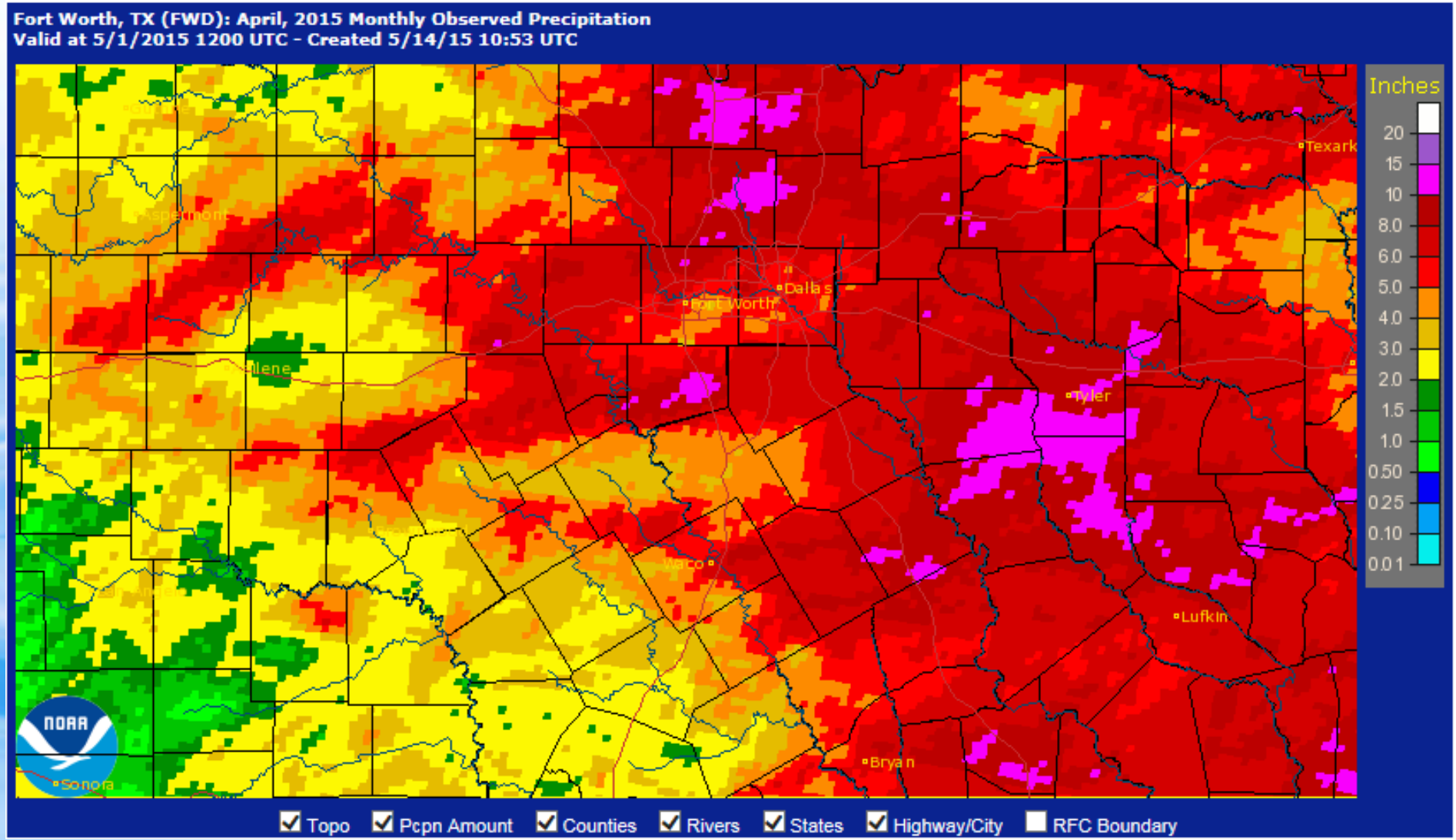

CAL-Antelope Gauge (Zone ANT-1)
Plot
CAL-Antelope Gauge (Zone ANT-1)
Depth (in/30 min)
0.000
0.050
0.100
Flow (cfs)
400
200
0
20150620 0000
20150623 1200
20150627 0000
Loss
Precipitation
Flow-Obs
Flow

The 2015 flooding

- Two distinct events
  - May rains
  - Tropical Storm Bill
- May was the wettest on record, recording 16.96 inches of rainfall
- This broke the record of 1982 by 3.3 inches
- Tropical storm Bill recorded 5 to 9 inches of rain in Wise and Jack Counties

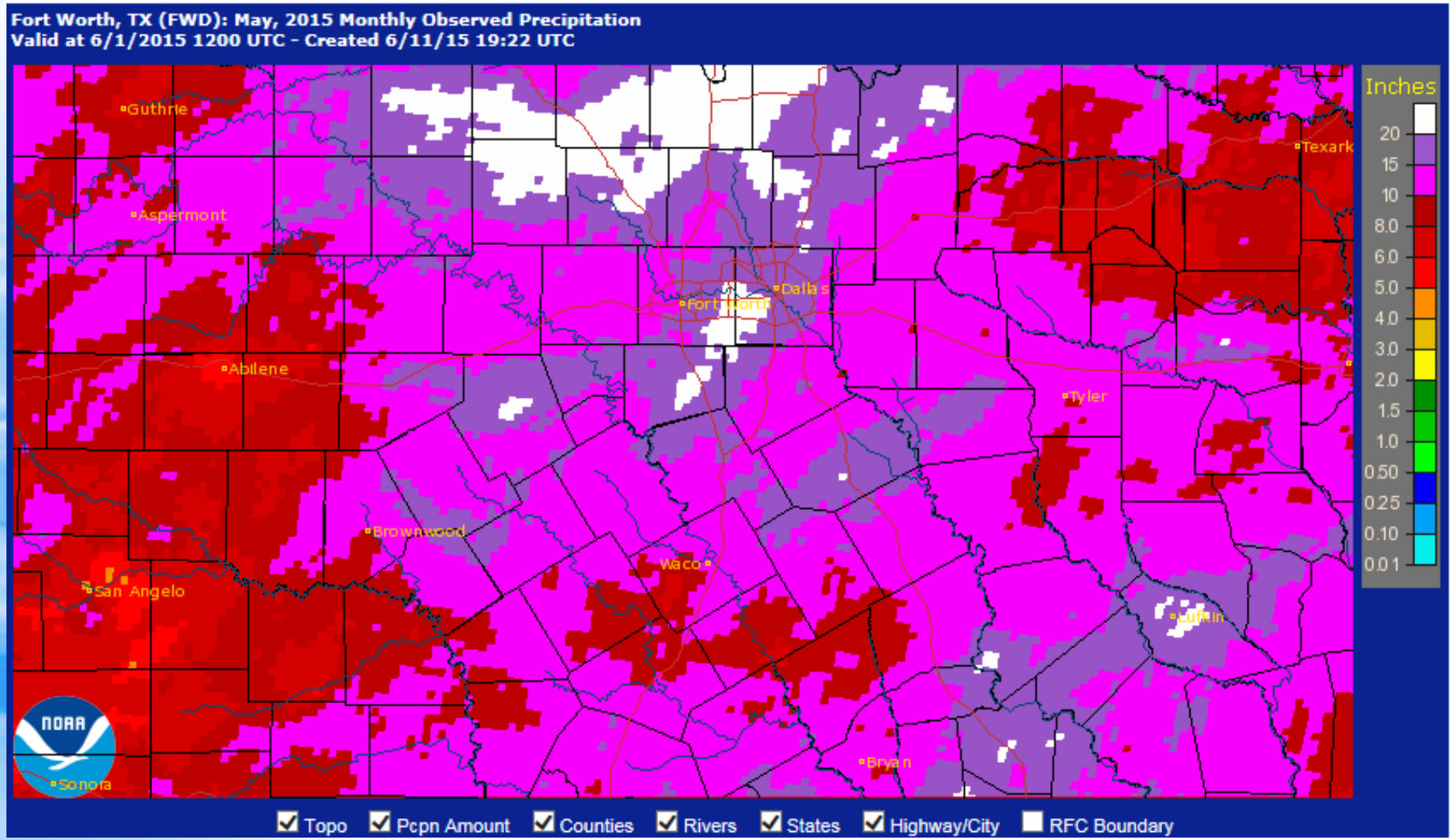
trwd Tarrant Regional Water District

Rainfall- April

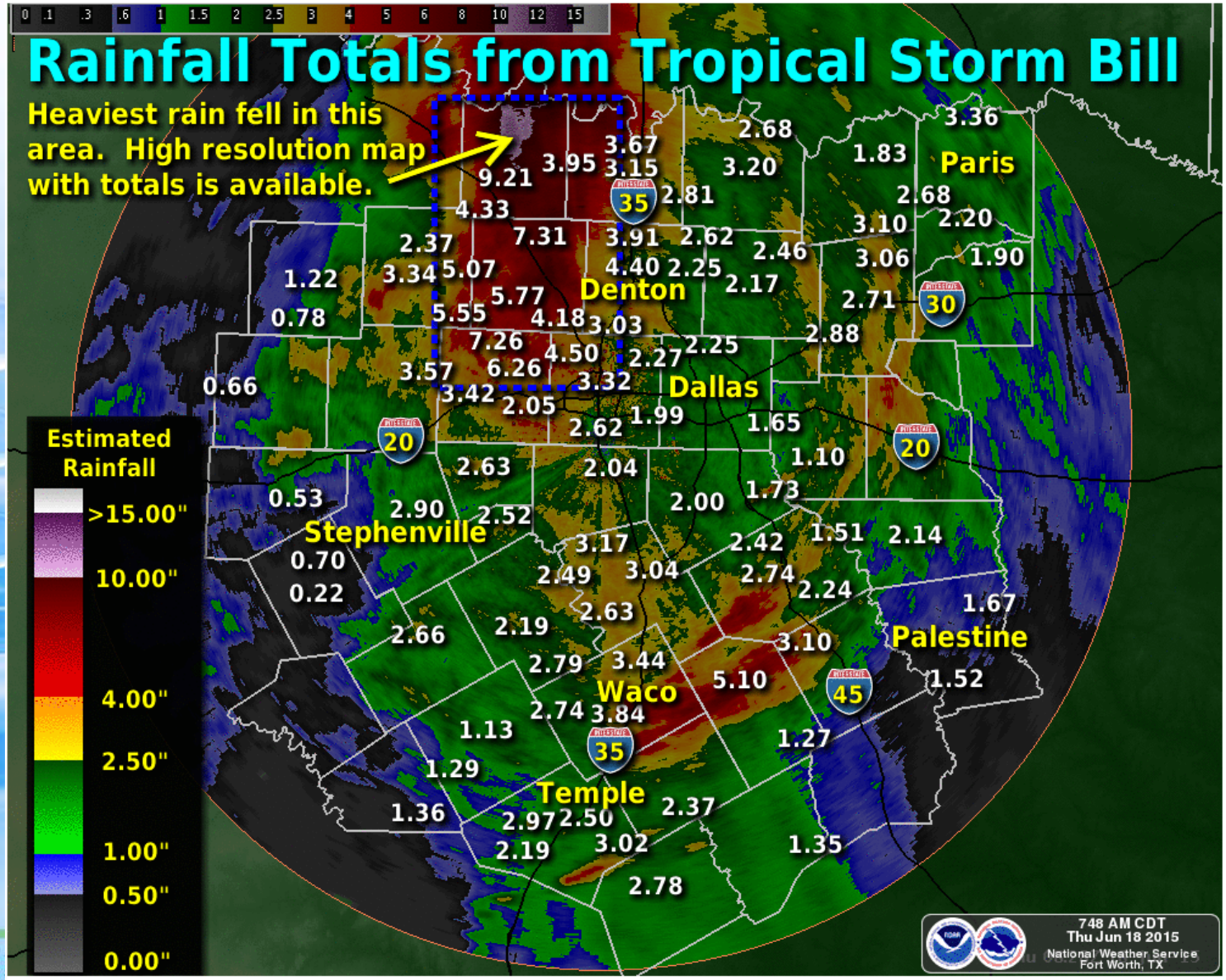


trwd Tarrant Regional Water District

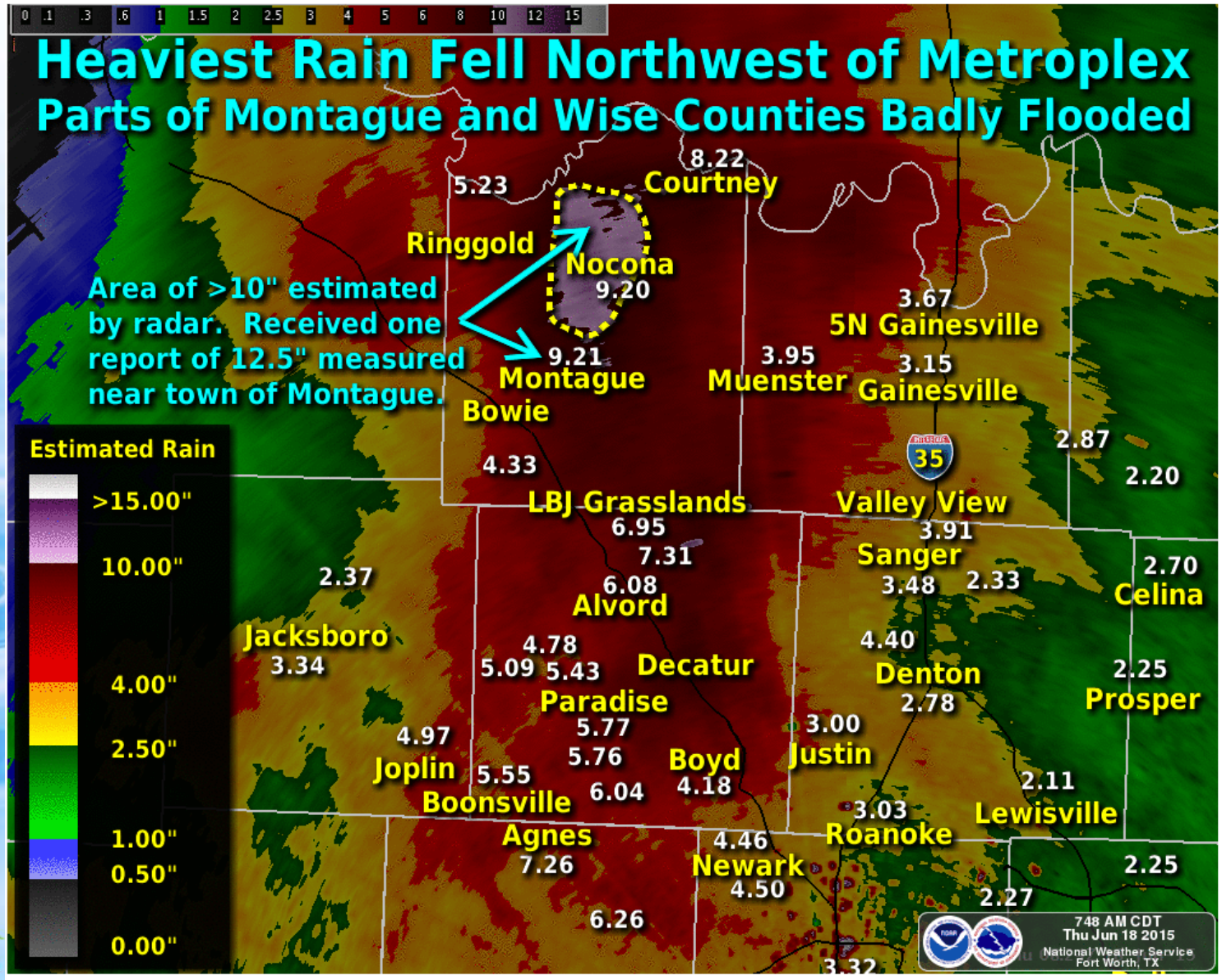
May Rains


Fort Worth, TX (FWD): May, 2015 Monthly Observed Precipitation
Valid at 6/1/2015 1200 UTC - Created 6/11/15 19:22 UTC
Inches
20
15
10
8.0
6.0
5.0
4.0
3.0
2.0
1.5
1.0
0.50
0.25
0.10
0.01
Guthrie
Aspermont
Abilene
Brownwood
San Angelo
Sonora
Waco
Dallas
Fort Worth
Tyler
Texark
Bryan
Topo
Pcpn Amount
Counties
Rivers
States
Highway/City
RFC Boundary

June 17-18 Tropical Storm Bill



June 17-18 Tropical Storm Bill



The May flood (through 6/13) - Bridgeport

- Bridgeport had 405,000 acre feet of flow into the reservoir, about 110% of its conservation volume
- Bridgeport stored 223,000 acre feet to reach conservation
- Maximum inflow was 38,500 cfs and outflow 10,900 cfs.
- Bridgeport rose 4.4 feet above conservation, after starting 24 feet below conservation
- Two homes was flooded and one business.
- Several businesses were flooded downstream and 5 roads closed (pending new information)

trwd Tarrant Regional Water District

The May Flood – Eagle Mountain & Lake Worth

- 393,000 acre feet flowed into Eagle Mountain, 124% of the conservation volume
- Eagle Mountain stored 51,300 acre feet to reach conservation
- Eagle Mountain rose 2.4 feet above conservation
- Eagle Mountain had a maximum inflow of 15,700 cfs and a release of 11,700 cfs
- One home, possibly two were flooded
- Lake Worth had 342,000 acre feet inflow and stored 11,500 acre feet
- Lake Worth had a maximum inflow of 13,120 cfs and release of 11,582
- Lake Worth rose 2.9 feet above conservation

trwd Tarrant Regional Water District

TS Bill Flood

- Bridgeport received 100,200 acre feet of inflow. Peak inflow was 41,360 cfs and release 8,806 cfs
- Bridgeport rose 3 feet, and one home was flooded
- Eagle Mountain received 191,500 acre feet of inflow. Peak inflow was 24,800 cfs and release 15,900 cfs
- Eagle Mountain rose 3.4 feet and 5 homes were flooded
- Lake Worth received 204,500 acre feet of inflow. Peak inflow was 23,600 cfs and released 15,300 cfs
- Lake Worth rose 3.5 feet and two homes were flooded

trwd Tarrant Regional Water District

Flood Frequency – May storm

- Flows above Bridgeport, Trinity at Jacksboro, peaked at 14,600 cfs, a flow that would happen once about every 8 years
- Flow above Eagle Mountain on Big Sandy, peaked at 19,800 cfs, a frequency of once in about 20 years
- Flow above Eagle Mountain, Trinity River at Boyd, peaked at 11,200 cfs, a frequency of one in 6 years
- To fill from 64% to 100% in May had a chance of less than 1 in 100 years.
- The peak flows from the flood were not high, but the total volume of the storm was rare

trwd Tarrant Regional Water District

Flood Frequency – TS Bill

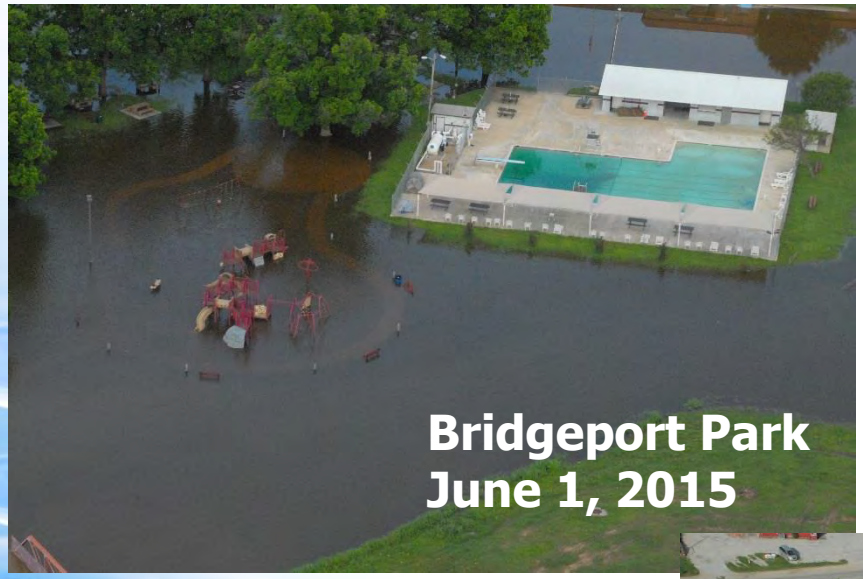
- Trinity River at Jacksboro peak for was 4,100 cfs, a flow to be expected once every three years
- Big Sandy peaked at 17,000 cfs, a flow seen about once in 15 years
- Trinity River at Boyd's peak flow was 18,500 cfs, a 1 in 18 year event
- Trinity River at Fork Worth's peak flow was 15,000 cfs, a flow that happens about every other year
- Flow through Dallas on the Trinity actually peaked on 5/29 at 47,200 cfs, a flow to be expected once in about 7 years.

trwd Tarrant Regional Water District

Lake Bridgeport

trwd Tarrant Regional Water District

Impacts at Bridgeport



trwd Tarrant Regional Water District

Gazebo at Lake Bridgeport

trwd Tarrant Regional Water District

Runaway Bay

trwd Tarrant Regional Water District

Road Impacts

June 1, 2[illegible]
Bobo Bridge [illegible]

FM 730 in Boyd

trwd Tarrant Regional Water District

Eagle Mountain

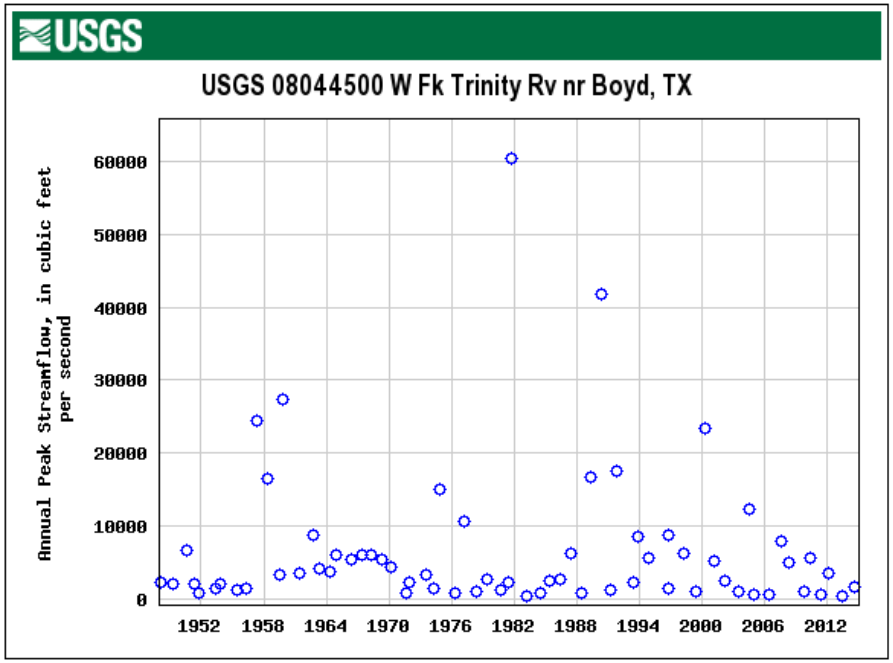
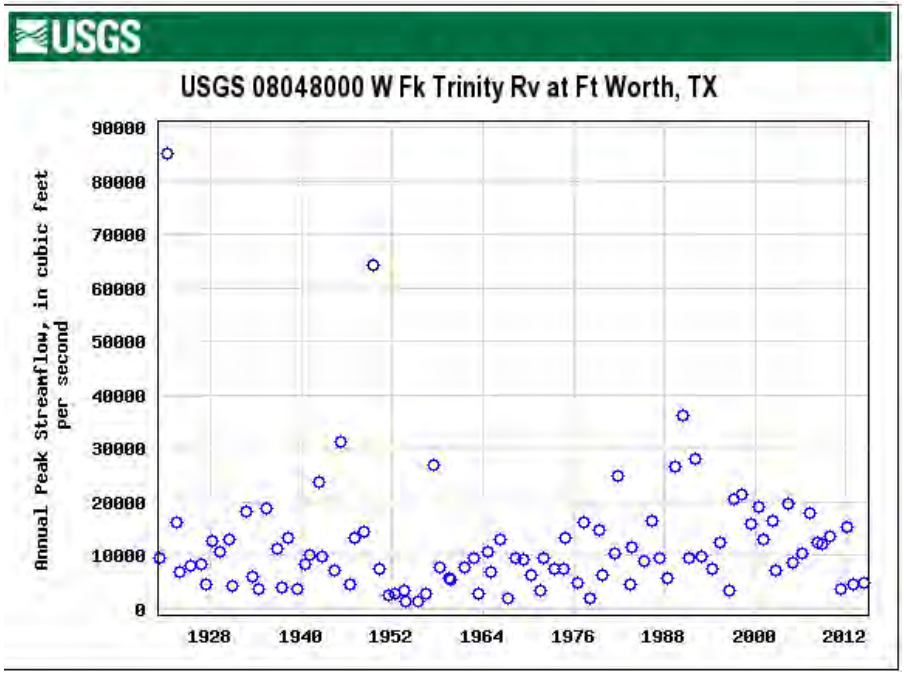
trwd Tarrant Regional Water District

Fort Worth Nature Center & Refuge

trwd Tarrant Regional Water District

Floodway

trwd Tarrant Regional Water District

The flood

- We have been in a very dry period and the flood seems intense
- This flood was not unusually severe
- Historic events show we need to be prepared for much larger events