



Interagency Flood Risk Management (InFRM)

Watershed Hydrology Assessment for the Trinity River Basin
Appendix B – Rainfall-Runoff Modeling in HEC-HMS

July 2021

Table of Contents

1	Rainfall-Runoff Modeling in HEC-HMS	3
1.1	HEC-HMS Model from the Trinity CWMS Implementation.....	3
1.2	Updates to the HEC-HMS Model.....	5
1.3	HEC-HMS Model Initial Parameters.....	5
1.4	HEC-HMS Model Calibration	38
1.4.1	Calibration Methodology	59
1.4.2	Calibrated Parameters	62
1.4.3	Calibration Results	155
1.5	Final Model Parameters	282
1.6	Point Rainfall Depths for the Frequency Storms	310
1.7	Frequency Storm Results – Uniform Rainfall Method.....	321
2	References and Resources	335
2.1	References	335
2.2	Software	335
2.3	Data Sources, Guidance & Procedures.....	336
3	Terms of Reference.....	338

1 Rainfall-Runoff Modeling in HEC-HMS

Watershed rainfall-runoff modeling is often used to estimate the rare frequency events whose return periods exceed the gaged period of record as well as to account for non-stationary watershed conditions such as urban development, reservoir storage and regulation, and climate variability. Rainfall-runoff modeling also provides a means of estimating flood frequency flows at other locations throughout the watershed that do not coincide with a stream flow gage. Rainfall-runoff watershed modeling is used to simulate the physical processes that occur during storm events that move water across the land surface and through the streams and rivers.

In this phase of the multi-layered hydrologic analysis, a watershed model was built for the Trinity River Basin with input parameters that represented the physical characteristics of the watershed. The rainfall-runoff model for the basin was completed using the basin-wide Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS) model developed for the 2015 Trinity Basin Corps Water Management System (CWMS) implementation as a starting point. This model was further refined by adding additional detailed data, updating the land use, and calibrating the model to multiple recent flood events. Through calibration, the updated HEC-HMS model was verified to accurately reproduce the response of the watershed to multiple, recently observed storm events, including those similar in magnitude to a 1% annual chance (100-yr) storm. Finally, frequency storms were built using the depth area analysis in HEC-HMS and the latest published frequency rainfall depths from National Oceanic and Atmospheric Administration (NOAA) Atlas 14 (NOAA, 2018). These frequency storms were run through the verified model, yielding consistent estimates of the 1% annual chance (100-yr) and other frequency peak flows at various locations throughout the basin.

1.1 HEC-HMS MODEL FROM THE TRINITY CWMS IMPLEMENTATION

The HEC-HMS model from the Trinity CWMS Implementation was used as the starting point for the current study. The CWMS model contained 289 subbasins in the Trinity River Basin and totaled approximately 17,889 square miles. The model extended from the headwaters to Trinity Bay. The subbasins were delineated using the HEC-GeoHMS program and utilized 30-meter National Elevation Dataset (NED) terrain data. The Trinity CWMS HEC-HMS model used the following methods.

- **Losses** – Initial and Constant
- **Transform** – Snyder Unit Hydrograph
- **Baseflow** – Recession
- **Routing** – Lag, Modified Puls, Muskingum, and Straddle Stagger
- **Computation Interval** – 60 minutes

A map of the Trinity CWMS subbasins are shown in Figure 1. More information on the CWMS model development is given in the final CWMS report for the Trinity River Basin (USACE, 2015).

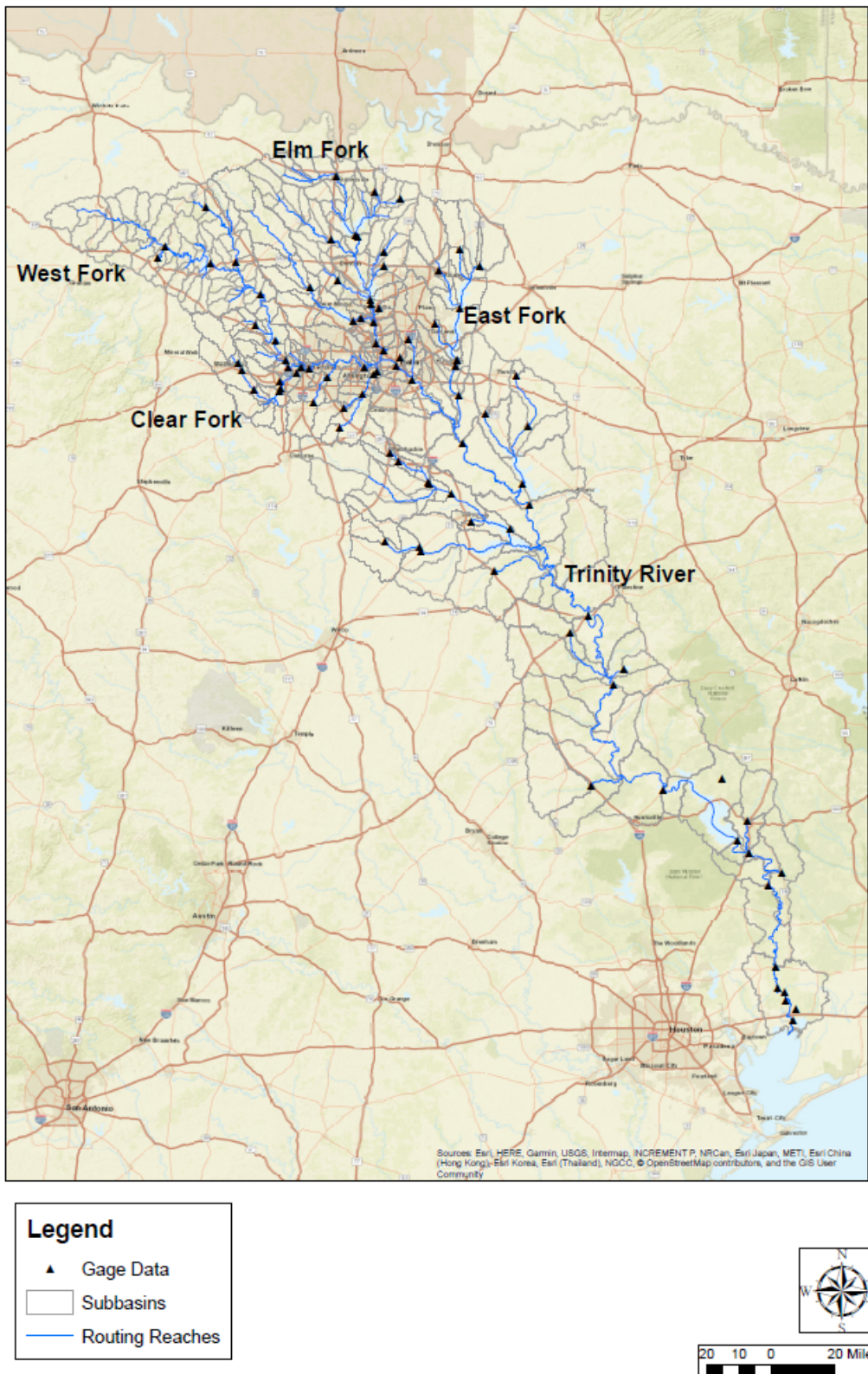


Figure 1: CWMS subbasins for the Trinity River Basin

1.2 UPDATES TO THE HEC-HMS MODEL

The subbasin layout was reviewed and determined sufficient for the study. One of the important components of this study is to utilize information at U.S. Geological Survey (USGS) gages for model calibration and results comparison. Inclusion of the gage locations in the model was a priority during the CWMS modeling and so additional subdivision was not required.

During the study, Federal Emergency Management Agency (FEMA) Base Level Engineering (BLE) hydraulic HEC-RAS models became available and were utilized to improve the hydraulic routing data within the Richland-Chambers watershed where detailed hydraulic modeling was available. These models were built off of detailed topographic data as opposed to the 10m NED digital elevation model (DEM) data used in the 2015 CWMS model used to develop routing data below Bardwell and Navarro Mills dams. This hydraulic routing data includes storage-discharge tables which are extracted from the hydraulic models and are used for the Modified-Puls routing method which calculates the change in flow through the reach based on the volume of floodplain storage through that reach.

Finally, after updating the above data within the Richland-Chambers watershed, the computation interval of the model was also increased from 60 to 15 minutes.

1.3 HEC-HMS MODEL INITIAL PARAMETERS

The Trinity River HEC-HMS model contains 289 subbasins totaling about 17,889 square miles. The subbasins were delineated using the HEC-GeoHMS program and utilized 30-meter NED terrain data. The InFRM Trinity River HEC-HMS model methods includes initial and constant losses, Snyder unit hydrograph transform parameters, recession baseflows, and Modified Puls, Muskingum, Straddle Stagger, and Lag routing. The sources of the initial estimates for these parameters are described below. All of the model parameters, excluding the percent impervious values, were adjusted during model calibration.

- **Initial Loss and Constant Loss Rate** – Initial estimates of losses were made using NRCS soil data and recommended values from the HEC-HMS Technical Reference Manual. The recommended values (inches per hour) were 0.3-0.45 for Group A, 0.15-0.30 for Group B, 0.05-0.15 for Group C, and 0.00-0.05 for Group D. The constant loss rate estimates in the model ranged from 0.03 to 0.26 depending on soil type. These losses were adjusted during calibration and varied significantly between events. The initial estimates for the constant loss rates for the calibration runs were based on National Resources Conservation Service (NRCS) soil type. These differ slightly from the Fort Worth District Loss Rates in that the Fort Worth District Loss Rates vary by frequency. The constant losses were very different for each calibration event based on the soil moisture condition. The initial loss rate estimates as well as the final frequency loss rates fell within the range of the events observed during calibration.
- **Percent Impervious** – The percent impervious values were developed based on the 2011 National Landcover Database (NLCD) percent developed impervious dataset. The 2011 data was available upon study initiation but was superseded with 2016 data before study completion.
- **Snyder Transform Parameters** – Initial estimates of transform parameters utilized existing models as much as possible. The methods used to develop parameter estimates as well as the level of calibration applied to each model varied. A table of the existing models utilized to develop initial parameter estimates is shown below.

Table 1: Existing Models Utilized to Develop Initial Parameter Estimates

Location	Initial Method/Model Type	Agency	Year	Calibrated
West Fork upstream of Lake Worth Dam	Regional Ct/Forecast Model (HEC-1)	TRWD	2013	Yes
Clear Fork upstream of Benbrook Dam	Urban Curves/Upper Trinity Feasibility Model(HEC-1)	USACE	1995	Yes
Area between Lake Worth Dam, Benbrook Dam, and Lewisville Dam downstream to Trinity at Five Mile Creek	Urban Curves/CDC Model (Model parameters recomputed using existing condition (2005) land use)	USACE	2013	No
Elm Fork Trinity upstream of Lewisville Dam	Urban Curves/Lewisville Dam Safety Mod. Study	USACE	2010	Yes
East Fork Trinity upstream of Crandall Gage	Regional Ct/Forecast Model (HEC-1)	USACE	1996	Yes
Area between Trinity nr Rosser Gage downstream to confluence with Chambers Creek.	Regional Ct/Lower Trinity Reconnaissance Study (HEC-1)	USACE	1991	No

Where existing models were not available, engineering judgement was utilized in assigning initial parameter estimates.

Of the existing models, the majority of the models utilized the U.S. Army Corps of Engineers (USACE) Fort Worth District urban curves to develop initial parameter estimates. These curves recommend time to peak and peaking coefficients and are based on length and slope watershed characteristics extracted from HEC-GeoHMS, percent urban values taken from land cover data, and percent sand values estimated from the NRCS soil data. From this data, the following regional equation, which was developed as part of the Fort Worth District urban studies (Nelson, 1979) (Rodman, 1977) (USACE, 1989), was used to calculate lag time:

$$\log(tp) = .383\log(L * Lca / (Sst \wedge .5)) + (Sand * (\log 1.81 - \log .92) + \log .92) - (BW * Urban. / 100)$$

where: tp = Snyder's lag time (hours)

L = longest flow path within the subbasin (miles)

Lca = distance along the stream from the subbasin centroid to outlet (miles)

Sst = stream slope over reach between 10% and 85% of L (feet per mile)

Sand = percentage of sand factor as related to the permeability of the soils

(0% Sand = low permeability, 100% Sand = high permeability)

BW = log(tp) bandwidth between 0% and 100% urbanization = 0.266 (log hours)

Urban. = percentage urbanization factor

The remaining models utilized regional Ct and peaking coefficient values which were developed regionally.

- **Baseflow Parameters** – Initial baseflow parameters were taken from the existing USACE Trinity CWMS HEC-HMS model, which utilized values from existing models. The existing models that were used are identified in Table 1 above.
- **Routing Parameters** (Modified Puls, Muskingum, Straddle Stagger, and Lag) – Routing parameters were taken from the existing USACE Trinity CWMS HEC-HMS model, which utilized values from existing models that are listed in Table 1 above.

The initial subbasin and routing parameters that were entered into the HEC-HMS model are shown in Tables 2 through 8. Some of these parameters were adjusted during calibration.

Table 2: Subbasin Area, Percent Impervious and Initial Estimate of Loss Rates

Subbasin Name	Drainage Area (sq mi)	Initial Loss (in)	Constant Loss (in/hr)	Percent Impervious (%)
West_Fork_S020	66.786	0	0.08	0
West_Fork_S010	61.994	0	0.08	0
West_Fork_S030	62.292	0	0.06	0
West_Fork_S040	40.404	0	0.07	0
West_Fork_S050	31.856	0	0.08	0
West_Fork_S060	69.086	0	0.07	0
West_Fork_S070	50.349	0	0.09	0
West_Fork_S080	20.329	0	0.07	0
West_Fork_S090	36.124	0	0.09	0
West_Fork_S100	38.843	0	0.08	0
West_Fork_S120	49.759	0	0.08	1
West_Fork_S110	21.591	0	0.10	0
Big_Cleveland_S010	52.559	0	0.09	0
Big_Cleveland_S020	46.104	0	0.10	1
West_Fork_S130	20.65	0	0.07	0
Lost_Ck_S010	28.818	0	0.06	3
Lost_Ck_S020	13.637	0	0.10	0
West_Fork_S140	39.6	0	0.08	1
West_Fork_S150	41.295	0	0.07	0
West_Fork_S160	35.598	0	0.08	2
Beans_Ck_S010	36.233	0	0.09	1
Beans_Ck_S020	10.718	0	0.07	1
Big_Ck_S010	50.689	0	0.10	0

Subbasin Name	Drainage Area (sq mi)	Initial Loss (in)	Constant Loss (in/hr)	Percent Impervious (%)
Big_Ck_S030	19.583	0	0.11	2
Big_Ck_S020	13.252	0	0.09	2
Bridgeport_S030	43.633	0	0.16	1
Bridgeport_S010	35.711	0	0.05	42
Bridgeport_S040	33.433	0	0.15	3
Bridgeport_S020	24.808	0	0.13	1
West_Fork_S170	40.426	0	0.12	5
Dry_Ck_S010	26.744	0	0.12	4
West_Fork_S180	6.6336	0	0.19	1
Amon_G_Carter_S030	40.302	0	0.11	8
Amon_G_Carter_S010	38.589	0	0.10	1
Amon_G_Carter_S020	30.616	0	0.10	0
Big_Sandy_Ck_S010	41.989	0	0.14	3
Big_Sandy_Ck_S020	40.704	0	0.14	1
Brushy_Ck_S010	30.876	0	0.13	3
Brushy_Ck_S020	27.856	0	0.17	1
Brushy_Ck_S030	11.859	0	0.19	1
Big_Sandy_Ck_S030	24.915	0	0.16	2
Big_Sandy_Ck_S040	46.602	0	0.20	1
Big_Sandy_Ck_S050	19.631	0	0.19	4
West_Fork_S190	28.287	0	0.19	4
West_Fork_S200	21.943	0	0.20	1
Garrett_Ck_S020	23.217	0	0.16	1
Garrett_Ck_S010	22.758	0	0.16	1
Garrett_Ck_S030	7.7349	0	0.18	1
Salt_Ck_S010	28.167	0	0.18	1
Salt_Ck_S020	24.8	0	0.20	1
West_Fork_S210	30.4	0	0.18	1
West_Fork_S220	41.104	0	0.16	2
Eagle_Mountain_S010	36.129	0	0.14	9
Eagle_Mountain_S020	18.265	0	0.06	6
Walnut_Ck_S020	31.434	0	0.17	1
Walnut_Ck_S010	31.306	0	0.16	3
Walnut_Ck_S030	18.624	0	0.15	6
Eagle_Mountain_S040	42.467	0	0.07	30
Eagle_Mountain_S030	26.439	0	0.11	4

Subbasin Name	Drainage Area (sq mi)	Initial Loss (in)	Constant Loss (in/hr)	Percent Impervious (%)
Silver_Ck_S020	34.745	0	0.09	8
Silver_Ck_S010	27.84	0	0.11	2
Lake_Worth_S010	24.097	0	0.12	19
Lake_Worth_S020	7.5243	0	0.05	43
West_Fork_S230	27.927	0	0.07	35
Lk_Weatherford_S010	95.903	0	0.15	1
Lk_Weatherford_S020	12.819	0	0.09	17
Clear_Fork_S010	136.33	0	0.11	6
Clear_Fork_S020	18.791	0	0.09	4
Bear_Ck_S010	58.923	0	0.08	1
Bear_Ck_S020	5.488	0	0.07	4
Benbrook_S010	34.538	0	0.05	1
Benbrook_S020	34.232	0	0.07	2
Benbrook_S030	32.149	0	0.04	22
Clear_Fork_S030	9.432	0	0.08	26
Marys_Ck_S010	54.161	0	0.06	8
Clear_Fork_S040	25.372	0	0.05	39
Clear_Fork_S050	4.8892	0	0.05	57
West_Fork_S240	1.1676	0	0.11	39
Marine_Ck_S020	12.613	0	0.04	38
Marine_Ck_S010	9.1106	0	0.03	28
West_Fork_S250	9.1582	0	0.07	50
West_Fork_S260	39.237	0	0.05	36
West_Fork_S270	12.962	0	0.10	27
Big_Fossil_Ck_S010	56.863	0	0.05	30
LittleFossil_Ck_S010	19.724	0	0.06	39
West_Fork_S280	28.915	0	0.12	34
Village_Ck_S010	90.4	0	0.11	10
Village_Ck_S020	34.614	0	0.10	19
Lake_Arlington_S010	18.132	0	0.09	42
Village_Ck_S030	48.52	0	0.13	28
West_Fork_S290	43.905	0	0.14	34
West_Fork_S300	20.735	0	0.09	52
West_Fork_S310	4.7638	0	0.11	29
West_Fork_S320	2.1579	0	0.18	19
Big_Bear_Ck_S010	82.535	0	0.11	31

Subbasin Name	Drainage Area (sq mi)	Initial Loss (in)	Constant Loss (in/hr)	Percent Impervious (%)
Big_Bear_Ck_S020	10.78	0	0.18	34
West_Fork_S330	8.5845	0	0.17	33
Joe_Pool_S020	111.69	0	0.03	14
Joe_Pool_S030	62.877	0	0.10	8
Joe_Pool_S040	4.3638	0	0.12	30
Joe_Pool_S010	25.953	0	0.03	3
Joe_Pool_S050	19.287	0	0.05	43
Mountain_Ck_S010	41.498	0	0.05	32
Mountain_Ck_S020	29.121	0	0.05	44
Mountain_Ck_S030	9.5825	0	0.05	31
West_Fork_S340	13.268	0	0.08	37
Elm_Fork_S020	33.952	0	0.04	1
Elm_Fork_S010	33.399	0	0.06	2
Brushy_Elm_Ck_S010	13.953	0	0.03	1
Brushy_Elm_Ck_S020	11.585	0	0.03	5
Elm_Fork_S030	44.131	0	0.04	1
Elm_Fork_S040	40.168	0	0.04	3
Elm_Fork_S050	39.582	0	0.10	6
Elm_Fork_S070	28.099	0	0.08	2
Elm_Fork_S060	20.13	0	0.03	1
Spring_Ck_S010	40.625	0	0.04	0
Spring_Ck_S020	22.069	0	0.05	6
Ray_Roberts_S010	26.116	0	0.07	19
Timber_Ck_S010	39.041	0	0.16	1
Timber_Ck_S030	21.944	0	0.09	2
Timber_Ck_S020	3.1688	0	0.16	0
Ray_Roberts_S030	56.628	0	0.12	30
Range_Ck_S010	29.306	0	0.04	0
Range_Ck_S020	21.245	0	0.03	1
Lake_Kiowa_S020	22.138	0	0.15	11
Lake_Kiowa_S010	16.824	0	0.18	7
Ray_Roberts_S020	37.459	0	0.04	32
Range_Ck_S030	31.128	0	0.05	3
Buck_Ck_S010	23.091	0	0.03	0
Ray_Roberts_S050	15.763	0	0.04	12
Ray_Roberts_S040	11.221	0	0.07	31

Subbasin Name	Drainage Area (sq mi)	Initial Loss (in)	Constant Loss (in/hr)	Percent Impervious (%)
Ray_Roberts_S060	7.2967	0	0.08	34
Timber_Ck_S040	2.5225	0	0.08	7
Elm_Fork_S080	36.867	0	0.11	2
Clear_Ck_S010	50.564	0	0.13	0
Clear_Ck_S020	33.309	0	0.15	1
Clear_Ck_S030	16.059	0	0.12	1
Clear_Ck_S040	51.636	0	0.08	1
Clear_Ck_S050	35.613	0	0.05	0
Clear_Ck_S070	24.721	0	0.05	1
Clear_Ck_S060	2.561	0	0.10	0
Clear_Ck_S080	45.063	0	0.08	1
Clear_Ck_S090	35.1	0	0.05	2
Clear_Ck_S110	15.304	0	0.06	6
Clear_Ck_S100	12.82	0	0.06	2
Clear_Ck_S120	28.433	0	0.08	2
Little_Elm_Ck_S010	42.284	0	0.03	2
Little_Elm_Ck_S020	30.566	0	0.04	2
Little_Elm_Ck_S030	22.952	0	0.03	1
Pecan_Ck_S010	43.069	0	0.11	2
Doe_Branch_S010	38.401	0	0.04	4
Doe_Branch_S020	32.613	0	0.04	14
Lewisville_S030	21.388	0	0.11	10
Hickory_Ck_S020	41.143	0	0.05	1
Hickory_Ck_S010	39.534	0	0.05	1
Hickory_Ck_S030	18.092	0	0.07	11
Hickory_Ck_S040	30.172	0	0.08	6
Hickory_Ck_S050	19.984	0	0.14	11
Lewisville_S010	89.013	0	0.11	18
Lewisville_S040	43.47	0	0.04	27
Lewisville_S050	34.958	0	0.04	28
Lewisville_S020	32.483	0	0.09	26
Elm_Fork_S090	21.401	0	0.08	28
Elm_Fork_S110	16.052	0	0.04	34
Elm_Fork_S100	24.07	0	0.12	36
Elm_Fork_S120	18.411	0	0.06	50
Denton_Ck_S010	116.04	0	0.15	1

Subbasin Name	Drainage Area (sq mi)	Initial Loss (in)	Constant Loss (in/hr)	Percent Impervious (%)
Denton_Ck_S020	169.01	0	0.15	1
Denton_Ck_S030	61.584	0	0.12	2
Denton_Ck_S040	53.408	0	0.07	1
Denton_Ck_S050	75.302	0	0.06	2
Denton_Ck_S060	30.783	0	0.07	5
Denton_Ck_S070	93.553	0	0.05	8
Grapevine_S010	94.746	0	0.11	21
Denton_Ck_S080	24.302	0	0.11	33
Elm_Fork_S130	39.176	0	0.06	50
Hackberry_Ck_S010	14.676	0	0.03	42
Hackberry_Ck_S020	4.6175	0	0.03	43
Hackberry_Ck_S030	1.5901	0	0.04	45
Elm_Fork_S140	16.129	0	0.08	47
Elm_Fork_S150	22.195	0	0.09	47
Bachman_Branch_S010	12.676	0	0.05	33
Bachman_Branch_S020	1.4028	0	0.08	44
Elm_Fork_S160	6.0919	0	0.09	45
Trinity_River_S010	12.471	0	0.05	38
Trinity_River_S020	42.888	0	0.06	54
White_Rock_Ck_S010	66.661	0	0.06	49
White_Rock_Ck_S020	17.611	0	0.08	49
White_Rock_Ck_S030	10.77	0	0.07	48
White_Rock_Ck_S040	39.838	0	0.08	30
Trinity_River_S030	22.538	0	0.09	30
Fivemile_Ck_S010	43.493	0	0.07	29
Trinity_River_S040	28.855	0	0.09	17
Trinity_River_S050	38.875	0	0.10	18
Tenmile_Ck_S010	74.205	0	0.06	21
Tenmile_Ck_S020	27.911	0	0.08	6
Trinity_River_S060	59.61	0	0.13	8
Indian_Ck_S010	104.6	0	0.04	2
Indian_Ck_S030	85.214	0	0.06	1
Indian_Ck_S020	15.956	0	0.03	1
Indian_Ck_S040	30.154	0	0.05	6
Sister_Grove_S010	83.154	0	0.07	2
Sister_Grove_S020	38.04	0	0.06	6

Subbasin Name	Drainage Area (sq mi)	Initial Loss (in)	Constant Loss (in/hr)	Percent Impervious (%)
East_Fork_S020	118.24	0	0.06	2
East_Fork_S010	49.637	0	0.06	3
East_Fork_S030	22.229	0	0.07	9
East_Fork_S040	24.674	0	0.06	10
Wilson_Ck_S010	77.486	0	0.07	19
Lavon_S010	85.736	0	0.04	26
Lavon_S020	33.092	0	0.05	32
Rowlett_Ck_S010	119.88	0	0.06	38
Ray_Hubbard_S010	137.97	0	0.05	32
Ray_Hubbard_S020	43.943	0	0.05	48
East_Fork_S050	48.092	0	0.05	36
East_Fork_S070	9.6301	0	0.04	11
East_Fork_S060	34.344	0	0.04	13
East_Fork_S080	23.001	0	0.04	21
East_Fork_S090	29.546	0	0.04	34
East_Fork_S110	19.138	0	0.05	6
East_Fork_S100	19.268	0	0.04	15
Trinity_River_S070	231.25	0	0.05	4
East_Fork_S120	104.18	0	0.05	3
Kings_Ck_S020	133.14	0	0.03	3
Kings_Ck_S010	89.439	0	0.04	5
Kings_Ck_S030	120.56	0	0.04	6
Cedar_Ck_S040	285.73	0	0.10	17
Cedar_Ck_S010	176.13	0	0.06	2
New_Terrell_City_Lake_S010	14.019	0	0.03	9
Cedar_Ck_S020	93.332	0	0.05	5
Cedar_Ck_S030	98.44	0	0.09	4
Trinity_River_S080	398.9	0	0.05	1
Trinity_River_S090	283.46	0	0.08	2
Chambers_Ck_S010	161.82	0	0.06	1
Chambers_Ck_S020	146.57	0	0.06	1
Chambers_Ck_S040	105.96	0	0.05	1
Chambers_Ck_S030	97.554	0	0.06	1
Waxahachie_Ck_S010	60.388	0	0.06	7
Waxahachie_Ck_S020	30.598	0	0.06	1.7
Waxahachie_Ck_S030	30.048	0	0.06	4

Subbasin Name	Drainage Area (sq mi)	Initial Loss (in)	Constant Loss (in/hr)	Percent Impervious (%)
Mustang_Ck_S010	29.914	0	0.03	7
Bardwell_S010	23.442	0	0.04	29
Chambers_Ck_S050	75.82	0	0.04	0
Chambers_Ck_S060	33.261	0	0.06	0
Chambers_Ck_S070	29.085	0	0.04	1
Chambers_Ck_S080	145.13	0	0.05	34
Post_Oak_Ck_S010	29.49	0	0.04	13
Lake_Halbert_S010	11.534	0	0.03	5
Navarro_Mills_S020	143.52	0	0.04	1
Navarro_Mills_S030	74.878	0	0.05	1
Navarro_Mills_S010	65.75	0	0.06	1
Navarro_Mills_S040	35.712	0	0.04	23
Richland_Ck_S010	220.05	0	0.05	1
Richland_Ck_S020	174.9	0	0.04	0
Richland-Chambers_S010	141.82	0	0.04	23
Richland-Chambers_S020	92.537	0	0.04	47
Tehuacana_Ck_S020	245.04	0	0.11	2
Tehuacana_Ck_S010	141.34	0	0.07	1
Trinity_River_S100	70.586	0	0.10	2
Fairfield_Lake_S010	36.167	0	0.11	12
Trinity_River_S110	305.13	0	0.23	3
Big_Brown_Ck_S010	46.426	0	0.19	1
Trinity_River_S120	240	0	0.16	3
Trinity_River_S130	256.66	0	0.15	2
Upper_Keechi_Ck_S030	272.69	0	0.19	3
Upper_Keechi_Ck_S010	150.34	0	0.13	4
Upper_Keechi_Ck_S020	36.468	0	0.20	1
Upper_Keechi_Ck_S040	49.746	0	0.14	1
Trinity_River_S140	0.60116	0	0.04	1
Little_Elkhart_S010	95.014	0	0.22	1
Houston_County_Lake_S010	47.982	0	0.26	6
Trinity_River_S150	112.48	0	0.10	2
Trinity_River_S160	176.66	0	0.13	1
Trinity_River_S170	187.6	0	0.20	1
Trinity_River_S180	395.03	0	0.12	2
Bedias_Ck_S010	330.55	0	0.09	1

Subbasin Name	Drainage Area (sq mi)	Initial Loss (in)	Constant Loss (in/hr)	Percent Impervious (%)
Bedias_Ck_S020	273.7	0	0.10	1
Trinity_River_S190	328.14	0	0.11	4
Livingston_S010	509.39	0	0.07	3
Livingston_S030	414.8	0	0.09	27
Livingston_S020	70.271	0	0.09	17
Trinity_River_S200	39.412	0	0.14	3
Long_King_Ck_S010	141.11	0	0.12	1
Long_King_Ck_S020	85.25	0	0.15	4
Trinity_River_S210	61.113	0	0.18	4
Menard_Ck_S010	148.14	0	0.17	1
Trinity_River_S220	97.556	0	0.15	2
Trinity_River_S230	72.024	0	0.07	4
Trinity_River_S240	230.77	0	0.07	2
Trinity_River_S250	441.84	0	0.05	8

Table 3: Initial Estimates of Snyder's Transform Parameters

Subbasin Name	Lag Time (hr)	Peaking Coefficient
West_Fork_S020	8.43	0.36
West_Fork_S010	7	0.36
West_Fork_S030	9.49	0.36
West_Fork_S040	8.51	0.36
West_Fork_S050	6.22	0.43
West_Fork_S060	8.68	0.43
West_Fork_S070	6.95	0.43
West_Fork_S080	5.07	0.43
West_Fork_S090	7.08	0.43
West_Fork_S100	7.18	0.43
West_Fork_S120	8.57	0.43
West_Fork_S110	6.44	0.43
Big_Cleveland_S010	9.18	0.43
Big_Cleveland_S020	6.41	0.43
West_Fork_S130	4.88	0.43
Lost_Ck_S010	4	0.5
Lost_Ck_S020	4.4	0.53

Subbasin Name	Lag Time (hr)	Peaking Coefficient
West_Fork_S140	5.38	0.53
West_Fork_S150	6.06	0.53
West_Fork_S160	5.13	0.53
Beans_Ck_S010	4.98	0.53
Beans_Ck_S020	3.12	0.53
Big_Ck_S010	5.64	0.53
Big_Ck_S030	4.23	0.53
Big_Ck_S020	4.1	0.53
Bridgeport_S030	6.22	0.53
Bridgeport_S010	5.31	0.53
Bridgeport_S040	5.51	0.53
Bridgeport_S020	4.96	0.53
West_Fork_S170	6.74	0.77
Dry_Ck_S010	6.52	0.77
West_Fork_S180	2	0.64
Amon_G_Carter_S030	5.19	0.7
Amon_G_Carter_S010	5.61	0.7
Amon_G_Carter_S020	5.3	0.7
Big_Sandy_Ck_S010	6.52	0.42
Big_Sandy_Ck_S020	7.68	0.42
Brushy_Ck_S010	7.93	0.42
Brushy_Ck_S020	6.86	0.42
Brushy_Ck_S030	5.74	0.42
Big_Sandy_Ck_S030	4.52	0.64
Big_Sandy_Ck_S040	7.12	0.64
Big_Sandy_Ck_S050	5.44	0.77
West_Fork_S190	2.44	0.77
West_Fork_S200	4.42	0.77
Garrett_Ck_S020	6.01	0.77
Garrett_Ck_S010	6.79	0.77
Garrett_Ck_S030	3.74	0.77
Salt_Ck_S010	5.73	0.77
Salt_Ck_S020	4.91	0.77
West_Fork_S210	4.64	0.77
West_Fork_S220	6.46	0.43
Eagle_Mountain_S010	5.29	0.43

Subbasin Name	Lag Time (hr)	Peaking Coefficient
Eagle_Mountain_S020	5.11	0.43
Walnut_Ck_S020	3.63	0.76
Walnut_Ck_S010	3.44	0.76
Walnut_Ck_S030	5.47	0.43
Eagle_Mountain_S040	5.91	0.43
Eagle_Mountain_S030	7.3	0.43
Silver_Ck_S020	4.99	0.59
Silver_Ck_S010	4.91	0.59
Lake_Worth_S010	4.5	0.59
Lake_Worth_S020	3.6	0.59
West_Fork_S230	3.55	0.7
Lk_Weatherford_S010	8	0.66
Lk_Weatherford_S020	2	0.68
Clear_Fork_S010	11	0.65
Clear_Fork_S020	2.9	0.63
Bear_Ck_S010	6	0.68
Bear_Ck_S020	1.7	0.62
Benbrook_S010	5	0.62
Benbrook_S020	2.4	0.62
Benbrook_S030	1.8	0.63
Clear_Fork_S030	1.44	0.7
Marys_Ck_S010	3.19	0.7
Clear_Fork_S040	1.7	0.7
Clear_Fork_S050	0.94	0.7
West_Fork_S240	0.87	0.7
Marine_Ck_S020	1.24	0.7
Marine_Ck_S010	1.02	0.7
West_Fork_S250	1.85	0.7
West_Fork_S260	2.53	0.53
West_Fork_S270	1.86	0.7
Big_Fossil_Ck_S010	3.62	0.7
LittleFossil_Ck_S010	2.26	0.7
West_Fork_S280	3.05	0.7
Village_Ck_S010	5.87	0.7
Village_Ck_S020	1.64	0.7
Lake_Arlington_S010	1.36	0.7

Subbasin Name	Lag Time (hr)	Peaking Coefficient
Village_Ck_S030	5.36	0.7
West_Fork_S290	1.42	0.7
West_Fork_S300	3.47	0.7
West_Fork_S310	0.78	0.7
West_Fork_S320	1.4	0.7
Big_Bear_Ck_S010	8.56	0.7
Big_Bear_Ck_S020	3.18	0.7
West_Fork_S330	2.26	0.7
Joe_Pool_S020	2.59	0.7
Joe_Pool_S030	5.62	0.7
Joe_Pool_S040	1.44	0.7
Joe_Pool_S010	2.92	0.7
Joe_Pool_S050	3	0.68
Mountain_Ck_S010	2.3	0.7
Mountain_Ck_S020	1.33	0.7
Mountain_Ck_S030	1.27	0.7
West_Fork_S340	2.38	0.7
Elm_Fork_S020	4.41	0.7
Elm_Fork_S010	3.63	0.7
Brushy_Elm_Ck_S010	2.71	0.7
Brushy_Elm_Ck_S020	2.99	0.7
Elm_Fork_S030	3.87	0.7
Elm_Fork_S040	3.69	0.7
Elm_Fork_S050	4.4	0.7
Elm_Fork_S070	5.06	0.7
Elm_Fork_S060	3.67	0.7
Spring_Ck_S010	3.57	0.7
Spring_Ck_S020	2.47	0.7
Ray_Roberts_S010	1.47	0.7
Timber_Ck_S010	6.26	0.7
Timber_Ck_S030	4.1	0.7
Timber_Ck_S020	1.85	0.7
Ray_Roberts_S030	1.53	0.7
Range_Ck_S010	2.79	0.7
Range_Ck_S020	4.9	0.7
Lake_Kiowa_S020	2.41	0.7

Subbasin Name	Lag Time (hr)	Peaking Coefficient
Lake_Kiowa_S010	3.1	0.7
Ray_Roberts_S020	1	0.7
Range_Ck_S030	3.8	0.7
Buck_Ck_S010	4.46	0.7
Ray_Roberts_S050	1	0.7
Ray_Roberts_S040	1.65	0.7
Ray_Roberts_S060	1	0.7
Timber_Ck_S040	2	0.62
Elm_Fork_S080	3.86	0.62
Clear_Ck_S010	5.13	0.62
Clear_Ck_S020	4.43	0.62
Clear_Ck_S030	2.03	0.62
Clear_Ck_S040	3.87	0.62
Clear_Ck_S050	6.2	0.62
Clear_Ck_S070	3.7	0.62
Clear_Ck_S060	1.1	0.62
Clear_Ck_S080	6.83	0.62
Clear_Ck_S090	4.99	0.62
Clear_Ck_S110	2.89	0.62
Clear_Ck_S100	3.2	0.62
Clear_Ck_S120	4.31	0.62
Little_Elm_Ck_S010	4.02	0.62
Little_Elm_Ck_S020	4.66	0.62
Little_Elm_Ck_S030	6.09	0.62
Pecan_Ck_S010	6.35	0.62
Doe_Branch_S010	4.44	0.62
Doe_Branch_S020	3.58	0.62
Lewisville_S030	2.3	0.62
Hickory_Ck_S020	5.36	0.62
Hickory_Ck_S010	3.95	0.62
Hickory_Ck_S030	3.48	0.62
Hickory_Ck_S040	3.14	0.62
Hickory_Ck_S050	2.08	0.62
Lewisville_S010	3.54	0.62
Lewisville_S040	2.33	0.62
Lewisville_S050	2.19	0.62

Subbasin Name	Lag Time (hr)	Peaking Coefficient
Lewisville_S020	1.63	0.62
Elm_Fork_S090	3.11	0.7
Elm_Fork_S110	2.23	0.7
Elm_Fork_S100	4.28	0.7
Elm_Fork_S120	4.6	0.62
Denton_Ck_S010	7	0.7
Denton_Ck_S020	7	0.7
Denton_Ck_S030	3.96	0.7
Denton_Ck_S040	3.91	0.7
Denton_Ck_S050	4.84	0.7
Denton_Ck_S060	4.9	0.7
Denton_Ck_S070	6.73	0.7
Grapevine_S010	2.75	0.7
Denton_Ck_S080	3.56	0.7
Elm_Fork_S130	1.28	0.7
Hackberry_Ck_S010	1.76	0.7
Hackberry_Ck_S020	1.14	0.7
Hackberry_Ck_S030	0.88	0.7
Elm_Fork_S140	1.18	0.7
Elm_Fork_S150	1.09	0.7
Bachman_Branch_S010	1.01	0.7
Bachman_Branch_S020	1.01	0.7
Elm_Fork_S160	0.74	0.7
Trinity_River_S010	1.5	0.7
Trinity_River_S020	1.98	0.7
White_Rock_Ck_S010	3.1	0.7
White_Rock_Ck_S020	1.1	0.7
White_Rock_Ck_S030	1.3	0.7
White_Rock_Ck_S040	1.9	0.7
Trinity_River_S030	1.62	0.7
Fivemile_Ck_S010	2.4	0.7
Trinity_River_S040	5.6	0.72
Trinity_River_S050	11.1	0.72
Tenmile_Ck_S010	10.8	0.72
Tenmile_Ck_S020	7.4	0.72
Trinity_River_S060	11	0.72

Subbasin Name	Lag Time (hr)	Peaking Coefficient
Indian_Ck_S010	9	0.7
Indian_Ck_S030	10	0.7
Indian_Ck_S020	9	0.7
Indian_Ck_S040	5	0.7
Sister_Grove_S010	9	0.7
Sister_Grove_S020	6	0.7
East_Fork_S020	13	0.7
East_Fork_S010	10	0.7
East_Fork_S030	8	0.7
East_Fork_S040	5	0.7
Wilson_Ck_S010	10	0.7
Lavon_S010	5	0.7
Lavon_S020	4	0.7
Rowlett_Ck_S010	10	0.7
Ray_Hubbard_S010	4	0.7
Ray_Hubbard_S020	4	0.7
East_Fork_S050	6	0.7
East_Fork_S070	4	0.7
East_Fork_S060	9	0.7
East_Fork_S080	7	0.7
East_Fork_S090	6	0.7
East_Fork_S110	5	0.7
East_Fork_S100	9	0.7
Trinity_River_S070	21.6	0.72
East_Fork_S120	13	0.7
Kings_Ck_S020	19.6	0.72
Kings_Ck_S010	16.2	0.72
Kings_Ck_S030	19.4	0.72
Cedar_Ck_S040	20.6	0.72
Cedar_Ck_S010	16.4	0.72
New_Terrell_City_Lake_S010	7.5	0.72
Cedar_Ck_S020	17.2	0.72
Cedar_Ck_S030	18.3	0.72
Trinity_River_S080	27	0.72
Trinity_River_S090	17	0.72
Chambers_Ck_S010	9	0.72

Subbasin Name	Lag Time (hr)	Peaking Coefficient
Chambers_Ck_S020	6.4	0.72
Chambers_Ck_S040	6.3	0.72
Chambers_Ck_S030	6.9	0.72
Waxahachie_Ck_S010	4.3	0.7
Waxahachie_Ck_S020	4	0.7
Waxahachie_Ck_S030	3.7	0.7
Mustang_Ck_S010	3.6	0.7
Bardwell_S010	2.3	0.7
Chambers_Ck_S050	5.1	0.72
Chambers_Ck_S060	3	0.72
Chambers_Ck_S070	3	0.72
Chambers_Ck_S080	7.4	0.72
Post_Oak_Ck_S010	3.9	0.72
Lake_Halbert_S010	1.9	0.72
Navarro_Mills_S020	4.8	0.72
Navarro_Mills_S030	6.9	0.72
Navarro_Mills_S010	4.4	0.72
Navarro_Mills_S040	3.8	0.72
Richland_Ck_S010	9	0.72
Richland_Ck_S020	8.1	0.72
Richland-Chambers_S010	9.2	0.72
Richland-Chambers_S020	8.1	0.72
Tehuacana_Ck_S020	24.9	0.72
Tehuacana_Ck_S010	17.2	0.72
Trinity_River_S100	19.6	0.72
Fairfield_Lake_S010	11.3	0.72
Trinity_River_S110	24.1	0.72
Big_Brown_Ck_S010	17	0.72
Trinity_River_S120	21.6	0.72
Trinity_River_S130	7	0.35
Upper_Keechi_Ck_S030	5.4	0.35
Upper_Keechi_Ck_S010	4.3	0.35
Upper_Keechi_Ck_S020	2	0.36
Upper_Keechi_Ck_S040	2	0.36
Trinity_River_S140	1.1	0.35
Little_Elkhart_S010	2.9	0.36

Subbasin Name	Lag Time (hr)	Peaking Coefficient
Houston_County_Lake_S010	1.7	0.36
Trinity_River_S150	7	0.35
Trinity_River_S160	4.3	0.5
Trinity_River_S170	5.4	0.5
Trinity_River_S180	7.9	0.5
Bedias_Ck_S010	16.5	0.5
Bedias_Ck_S020	7.4	0.5
Trinity_River_S190	4.3	0.5
Livingston_S010	5.4	0.5
Livingston_S030	3.7	0.35
Livingston_S020	1.4	0.37
Trinity_River_S200	2.2	0.49
Long_King_Ck_S010	5.1	0.35
Long_King_Ck_S020	3.2	0.49
Trinity_River_S210	2.2	0.35
Menard_Ck_S010	6.3	0.35
Trinity_River_S220	3.7	0.5
Trinity_River_S230	4	0.49
Trinity_River_S240	2.2	0.49
Trinity_River_S250	2.8	0.5

Table 4: Initial Estimates of Baseflow Parameters

Subbasin Name	Initial Type	Initial Discharge (CFS/MI2)	Initial Discharge (CFS)	Recession Constant	Ratio to Peak
West_Fork_S020	Discharge	na	10	0.55	0.02
West_Fork_S010	Discharge	na	10	0.55	0.02
West_Fork_S030	Discharge	na	10	0.55	0.02
West_Fork_S040	Discharge	na	10	0.55	0.02
West_Fork_S050	Discharge	na	10	0.55	0.02
West_Fork_S060	Discharge	na	10	0.53	0.01
West_Fork_S070	Discharge	na	10	0.53	0.04
West_Fork_S080	Discharge	na	10	0.55	0.02
West_Fork_S090	Discharge	na	10	0.55	0.02
West_Fork_S100	Discharge	na	10	0.53	0.04
West_Fork_S120	Discharge	na	10	0.53	0.01
West_Fork_S110	Discharge	na	10	0.55	0.02
Big_Cleveland_S010	Discharge	na	10	0.53	0.04
Big_Cleveland_S020	Discharge	na	10	0.55	0.09
West_Fork_S130	Discharge	na	10	0.55	0.02
Lost_Ck_S010	Discharge	na	10	0.53	0.04
Lost_Ck_S020	Discharge	na	10	0.53	0.05
West_Fork_S140	Discharge	na	0	0.55	0.05
West_Fork_S150	Discharge	na	0	0.53	0.05
West_Fork_S160	Discharge	na	0	0.70	0.05
Beans_Ck_S010	Discharge	na	0	0.73	0.05
Beans_Ck_S020	Discharge	na	0	0.73	0.05
Big_Ck_S010	Discharge	na	0	0.89	0.05
Big_Ck_S030	Discharge	na	0	0.80	0.05
Big_Ck_S020	Discharge	na	0	0.89	0.05
Bridgeport_S030	Discharge	na	0	0.89	0.05
Bridgeport_S010	Discharge	na	0	0.70	0.05
Bridgeport_S040	Discharge	na	0	0.55	0.05
Bridgeport_S020	Discharge	na	0	0.53	0.05
West_Fork_S170	Discharge	na	0	0.70	0.02
Dry_Ck_S010	Discharge	na	0	0.70	0.01
West_Fork_S180	Discharge	na	0	0.70	0.02
Amon_G_Carter_S030	Discharge	na	0	0.53	0.05
Amon_G_Carter_S010	Discharge	na	0	0.53	0.05

Subbasin Name	Initial Type	Initial Discharge (CFS/MI2)	Initial Discharge (CFS)	Recession Constant	Ratio to Peak
Amon_G_Carter_S020	Discharge	na	0	0.65	0.05
Big_Sandy_Ck_S010	Discharge	na	0	0.53	0.01
Big_Sandy_Ck_S020	Discharge	na	0	0.53	0.01
Brushy_Ck_S010	Discharge	na	0	0.53	0.02
Brushy_Ck_S020	Discharge	na	0	0.53	0.02
Brushy_Ck_S030	Discharge	na	0	0.53	0.05
Big_Sandy_Ck_S030	Discharge	na	0	0.53	0.01
Big_Sandy_Ck_S040	Discharge	na	0	0.53	0.01
Big_Sandy_Ck_S050	Discharge	na	0	0.80	0.2
West_Fork_S190	Discharge	na	0	0.70	0.02
West_Fork_S200	Discharge	na	0	0.70	0.02
Garrett_Ck_S020	Discharge	na	0	0.70	0.04
Garrett_Ck_S010	Discharge	na	0	0.70	0.01
Garrett_Ck_S030	Discharge	na	0	0.70	0.01
Salt_Ck_S010	Discharge	na	0	0.70	0.04
Salt_Ck_S020	Discharge	na	0	0.70	0.04
West_Fork_S210	Discharge	na	0	0.70	0.02
West_Fork_S220	Discharge	na	0	0.50	0.02
Eagle_Mountain_S010	Discharge	na	0	0.50	0.02
Eagle_Mountain_S020	Discharge	na	0	0.50	0.01
Walnut_Ck_S020	Discharge	na	0	0.50	0.02
Walnut_Ck_S010	Discharge	na	0	0.50	0.02
Walnut_Ck_S030	Discharge	na	0	0.50	0.02
Eagle_Mountain_S040	Discharge	na	0	0.50	0.02
Eagle_Mountain_S030	Discharge	na	0	0.50	0.02
Silver_Ck_S020	Discharge	na	0	0.50	0.02
Silver_Ck_S010	Discharge	na	0	0.50	0.02
Lake_Worth_S010	Discharge	na	0	0.50	0.02
Lake_Worth_S020	Discharge	na	0	0.50	0.02
West_Fork_S230	Discharge Per Area	0.77	na	0.70	0.05
Lk_Weatherford_S010	Discharge Per Area	0.77	na	0.70	0.05
Lk_Weatherford_S020	Discharge Per Area	0.77	na	0.70	0.05
Clear_Fork_S010	Discharge Per Area	0.77	na	0.67	0.085
Clear_Fork_S020	Discharge Per Area	0.77	na	0.67	0.085
Bear_Ck_S010	Discharge Per Area	0.77	na	0.67	0.085

Subbasin Name	Initial Type	Initial Discharge (CFS/MI2)	Initial Discharge (CFS)	Recession Constant	Ratio to Peak
Bear_Ck_S020	Discharge Per Area	0.77	na	0.67	0.085
Benbrook_S010	Discharge Per Area	0.77	na	0.67	0.085
Benbrook_S020	Discharge Per Area	0.77	na	0.67	0.085
Benbrook_S030	Discharge Per Area	0.77	na	0.67	0.085
Clear_Fork_S030	Discharge Per Area	0.77	na	0.70	0.05
Marys_Ck_S010	Discharge Per Area	0.77	na	0.71	0.05
Clear_Fork_S040	Discharge Per Area	0.77	na	0.70	0.05
Clear_Fork_S050	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S240	Discharge Per Area	0.77	na	0.70	0.05
Marine_Ck_S020	Discharge Per Area	0.77	na	0.70	0.05
Marine_Ck_S010	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S250	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S260	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S270	Discharge Per Area	0.77	na	0.70	0.05
Big_Fossil_Ck_S010	Discharge Per Area	0.77	na	0.70	0.05
LittleFossil_Ck_S010	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S280	Discharge Per Area	0.77	na	0.70	0.05
Village_Ck_S010	Discharge Per Area	0.77	na	0.40	0.05
Village_Ck_S020	Discharge Per Area	0.77	na	0.50	0.02
Lake_Arlington_S010	Discharge Per Area	0.77	na	0.53	0.02
Village_Ck_S030	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S290	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S300	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S310	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S320	Discharge Per Area	0.77	na	0.70	0.05
Big_Bear_Ck_S010	Discharge Per Area	0.77	na	0.70	0.05
Big_Bear_Ck_S020	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S330	Discharge Per Area	0.77	na	0.70	0.05
Joe_Pool_S020	Discharge Per Area	0.77	na	0.70	0.01
Joe_Pool_S030	Discharge Per Area	0.77	na	0.53	0.05
Joe_Pool_S040	Discharge Per Area	0.77	na	0.70	0.01
Joe_Pool_S010	Discharge Per Area	0.77	na	0.05	0.1
Joe_Pool_S050	Discharge Per Area	0.77	na	0.70	0.01
Mountain_Ck_S010	Discharge Per Area	0.77	na	0.70	0.05
Mountain_Ck_S020	Discharge Per Area	0.77	na	0.70	0.05

Subbasin Name	Initial Type	Initial Discharge (CFS/MI2)	Initial Discharge (CFS)	Recession Constant	Ratio to Peak
Mountain_Ck_S030	Discharge Per Area	0.77	na	0.70	0.05
West_Fork_S340	Discharge	na	150	0.80	0.05
Elm_Fork_S020	Discharge Per Area	0.3	na	0.70	0.05
Elm_Fork_S010	Discharge Per Area	0.3	na	0.70	0.05
Brushy_Elm_Ck_S010	Discharge Per Area	0.3	na	0.70	0.05
Brushy_Elm_Ck_S020	Discharge Per Area	0.3	na	0.70	0.05
Elm_Fork_S030	Discharge Per Area	0.3	na	0.70	0.05
Elm_Fork_S040	Discharge Per Area	0.2	na	0.70	0.05
Elm_Fork_S050	Discharge Per Area	0.4	na	0.70	0.05
Elm_Fork_S070	Discharge Per Area	0.4	na	0.70	0.05
Elm_Fork_S060	Discharge Per Area	0.4	na	0.70	0.05
Spring_Ck_S010	Discharge Per Area	0.75	na	0.70	0.05
Spring_Ck_S020	Discharge Per Area	0.75	na	0.70	0.05
Ray_Roberts_S010	Discharge Per Area	0.75	na	0.70	0.05
Timber_Ck_S010	Discharge Per Area	0.75	na	0.70	0.01
Timber_Ck_S030	Discharge Per Area	0.75	na	0.70	0.05
Timber_Ck_S020	Discharge Per Area	0.75	na	0.70	0.05
Ray_Roberts_S030	Discharge Per Area	0.75	na	0.70	0.05
Range_Ck_S010	Discharge Per Area	0.7	na	0.40	0.03
Range_Ck_S020	Discharge Per Area	0.75	na	0.70	0.05
Lake_Kiowa_S020	Discharge Per Area	0.75	na	0.70	0.05
Lake_Kiowa_S010	Discharge Per Area	0.75	na	0.70	0.05
Ray_Roberts_S020	Discharge Per Area	0.75	na	0.70	0.05
Range_Ck_S030	Discharge Per Area	0.75	na	0.70	0.05
Buck_Ck_S010	Discharge Per Area	0.75	na	0.70	0.05
Ray_Roberts_S050	Discharge Per Area	0.75	na	0.70	0.05
Ray_Roberts_S040	Discharge Per Area	0.75	na	0.70	0.05
Ray_Roberts_S060	Discharge Per Area	0.75	na	0.70	0.05
Timber_Ck_S040	Discharge Per Area	0.75	na	0.70	0.05
Elm_Fork_S080	Discharge Per Area	0.77	na	0.70	0.05
Clear_Ck_S010	Discharge Per Area	0.2	na	0.70	0.17
Clear_Ck_S020	Discharge Per Area	0.2	na	0.70	0.17
Clear_Ck_S030	Discharge Per Area	0.2	na	0.70	0.17
Clear_Ck_S040	Discharge Per Area	0.2	na	0.70	0.17
Clear_Ck_S050	Discharge Per Area	0.2	na	0.70	0.17

Subbasin Name	Initial Type	Initial Discharge (CFS/MI2)	Initial Discharge (CFS)	Recession Constant	Ratio to Peak
Clear_Ck_S070	Discharge Per Area	0.2	na	0.70	0.17
Clear_Ck_S060	Discharge Per Area	0.2	na	0.70	0.17
Clear_Ck_S080	Discharge Per Area	0.2	na	0.70	0.17
Clear_Ck_S090	Discharge Per Area	0.2	na	0.70	0.17
Clear_Ck_S110	Discharge Per Area	0.77	na	0.70	0.05
Clear_Ck_S100	Discharge Per Area	0.77	na	0.70	0.05
Clear_Ck_S120	Discharge Per Area	0.77	na	0.70	0.05
Little_Elm_Ck_S010	Discharge Per Area	0.77	na	0.70	0.1
Little_Elm_Ck_S020	Discharge Per Area	0.77	na	0.70	0.1
Little_Elm_Ck_S030	Discharge Per Area	0.77	na	0.70	0.05
Pecan_Ck_S010	Discharge Per Area	0.77	na	0.70	0.05
Doe_Branch_S010	Discharge Per Area	0.77	na	0.75	0.1
Doe_Branch_S020	Discharge Per Area	0.77	na	0.70	0.05
Lewisville_S030	Discharge Per Area	0.77	na	0.70	0.05
Hickory_Ck_S020	Discharge Per Area	0.77	na	0.70	0.05
Hickory_Ck_S010	Discharge Per Area	0.77	na	0.70	0.05
Hickory_Ck_S030	Discharge Per Area	0.77	na	0.70	0.05
Hickory_Ck_S040	Discharge Per Area	0.77	na	0.70	0.05
Hickory_Ck_S050	Discharge Per Area	0.77	na	0.70	0.05
Lewisville_S010	Discharge Per Area	0.77	na	0.70	0.05
Lewisville_S040	Discharge Per Area	0.77	na	0.70	0.05
Lewisville_S050	Discharge Per Area	0.77	na	0.70	0.05
Lewisville_S020	Discharge Per Area	0.77	na	0.70	0.05
Elm_Fork_S090	Discharge Per Area	0.77	na	0.50	0.15
Elm_Fork_S110	Discharge Per Area	0.77	na	0.50	0.15
Elm_Fork_S100	Discharge Per Area	0.77	na	0.50	0.15
Elm_Fork_S120	Discharge Per Area	0.77	na	0.80	0.15
Denton_Ck_S010	Discharge Per Area	0.1	na	0.40	0.5
Denton_Ck_S020	Discharge Per Area	0.1	na	0.40	0.5
Denton_Ck_S030	Discharge Per Area	0.1	na	0.40	0.5
Denton_Ck_S040	Discharge Per Area	0.1	na	0.30	0.7
Denton_Ck_S050	Discharge Per Area	0.1	na	0.40	0.02
Denton_Ck_S060	Discharge Per Area	0.1	na	0.89	0.02
Denton_Ck_S070	Discharge Per Area	0.1	na	0.89	0.02
Grapevine_S010	Discharge Per Area	0.2	na	0.89	0.02

Subbasin Name	Initial Type	Initial Discharge (CFS/MI2)	Initial Discharge (CFS)	Recession Constant	Ratio to Peak
Denton_Ck_S080	Discharge Per Area	0.77	na	0.80	0.15
Elm_Fork_S130	Discharge Per Area	0.77	na	0.80	0.05
Hackberry_Ck_S010	Discharge Per Area	0.77	na	0.80	0.05
Hackberry_Ck_S020	Discharge Per Area	0.77	na	0.80	0.05
Hackberry_Ck_S030	Discharge Per Area	0.77	na	0.80	0.05
Elm_Fork_S140	Discharge Per Area	0.77	na	0.80	0.05
Elm_Fork_S150	Discharge	na	100	0.80	0.05
Bachman_Branch_S010	Discharge	na	100	0.80	0.05
Bachman_Branch_S020	Discharge	na	100	0.80	0.05
Elm_Fork_S160	Discharge	na	150	0.80	0.05
Trinity_River_S010	Discharge	na	150	0.80	0.05
Trinity_River_S020	Discharge	na	150	0.80	0.05
White_Rock_Ck_S010	Discharge	na	100	0.70	0.01
White_Rock_Ck_S020	Discharge	na	100	0.70	0.01
White_Rock_Ck_S030	Discharge	na	100	0.70	0.01
White_Rock_Ck_S040	Discharge	na	150	0.70	0.01
Trinity_River_S030	Discharge	na	150	1.00	0.05
Fivemile_Ck_S010	Discharge	na	150	1.00	0.05
Trinity_River_S040	Discharge Per Area	0.1	na	0.89	0.05
Trinity_River_S050	Discharge Per Area	0.1	na	0.89	0.05
Tenmile_Ck_S010	Discharge Per Area	0.1	na	0.89	0.05
Tenmile_Ck_S020	Discharge Per Area	0.1	na	0.89	0.05
Trinity_River_S060	Discharge Per Area	0.1	na	0.89	0.05
Indian_Ck_S010	Discharge Per Area	5	na	0.79	0.1
Indian_Ck_S030	Discharge Per Area	0.6	na	0.70	0.2
Indian_Ck_S020	Discharge Per Area	0.6	na	0.70	0.2
Indian_Ck_S040	Discharge Per Area	0.6	na	0.70	0.2
Sister_Grove_S010	Discharge Per Area	4	na	0.85	0.08
Sister_Grove_S020	Discharge Per Area	0.6	na	0.90	0.1
East_Fork_S020	Discharge Per Area	1.8	na	0.70	0.2
East_Fork_S010	Discharge Per Area	1.8	na	0.70	0.2
East_Fork_S030	Discharge Per Area	0.6	na	0.90	0.1
East_Fork_S040	Discharge Per Area	0.6	na	0.90	0.1
Wilson_Ck_S010	Discharge Per Area	0.6	na	0.90	0.1
Lavon_S010	Discharge Per Area	0.6	na	0.79	0.1

Subbasin Name	Initial Type	Initial Discharge (CFS/MI2)	Initial Discharge (CFS)	Recession Constant	Ratio to Peak
Lavon_S020	Discharge Per Area	0.6	na	0.79	0.1
Rowlett_Ck_S010	Discharge Per Area	2	na	0.79	0.05
Ray_Hubbard_S010	Discharge Per Area	0.2	na	0.79	0.05
Ray_Hubbard_S020	Discharge Per Area	0.2	na	0.79	0.05
East_Fork_S050	Discharge Per Area	5	na	0.79	0.2
East_Fork_S070	Discharge Per Area	0.1	na	0.79	0.1
East_Fork_S060	Discharge Per Area	0.1	na	0.62	0.1
East_Fork_S080	Discharge Per Area	0.1	na	0.62	0.1
East_Fork_S090	Discharge Per Area	0.1	na	0.62	0.1
East_Fork_S110	Discharge Per Area	0.1	na	0.62	0.1
East_Fork_S100	Discharge Per Area	0.1	na	0.62	0.1
Trinity_River_S070	Discharge Per Area	0.1	na	0.89	0.05
East_Fork_S120	Discharge Per Area	0.1	na	0.89	0.05
Kings_Ck_S020	Discharge Per Area	0.1	na	0.90	0.12
Kings_Ck_S010	Discharge Per Area	0.1	na	0.90	0.12
Kings_Ck_S030	Discharge Per Area	0.1	na	0.90	0.12
Cedar_Ck_S040	Discharge Per Area	0.1	na	0.90	0.12
Cedar_Ck_S010	Discharge Per Area	0.1	na	1.00	0.1
New_Terrell_City_Lake_S010	Discharge Per Area	0.1	na	0.90	0.1
Cedar_Ck_S020	Discharge Per Area	0.1	na	0.90	0.12
Cedar_Ck_S030	Discharge Per Area	0.1	na	0.90	0.12
Trinity_River_S080	Discharge Per Area	0.1	na	0.89	0.05
Trinity_River_S090	Discharge Per Area	0.1	na	0.89	0.05
Chambers_Ck_S010	Discharge Per Area	0.1	na	0.79	0.1
Chambers_Ck_S020	Discharge Per Area	0.1	na	0.79	0.1
Chambers_Ck_S040	Discharge Per Area	0.1	na	0.79	0.1
Chambers_Ck_S030	Discharge Per Area	0.1	na	0.79	0.1
Waxahachie_Ck_S010	Discharge Per Area	0.1	na	0.89	0.05
Waxahachie_Ck_S020	Discharge Per Area	0.1	na	0.89	0.05
Waxahachie_Ck_S030	Discharge Per Area	0.1	na	0.89	0.05
Mustang_Ck_S010	Discharge Per Area	0.1	na	0.89	0.05
Bardwell_S010	Discharge Per Area	0.1	na	0.89	0.05
Chambers_Ck_S050	Discharge Per Area	0.1	na	0.79	0.1
Chambers_Ck_S060	Discharge Per Area	0.1	na	0.79	0.1
Chambers_Ck_S070	Discharge Per Area	0.1	na	0.79	0.1

Subbasin Name	Initial Type	Initial Discharge (CFS/MI2)	Initial Discharge (CFS)	Recession Constant	Ratio to Peak
Chambers_Ck_S080	Discharge Per Area	0.1	na	0.79	0.1
Post_Oak_Ck_S010	Discharge	na	0	1.00	0.05
Lake_Halbert_S010	Discharge Per Area	0.1	na	0.79	0.1
Navarro_Mills_S020	Discharge Per Area	0.1	na	0.89	0.05
Navarro_Mills_S030	Discharge Per Area	0.1	na	0.89	0.05
Navarro_Mills_S010	Discharge Per Area	0.1	na	0.89	0.05
Navarro_Mills_S040	Discharge Per Area	0.1	na	0.89	0.05
Richland_Ck_S010	Discharge Per Area	0.1	na	0.79	0.1
Richland_Ck_S020	Discharge	na	0	1.00	0.05
Richland-Chambers_S010	Discharge Per Area	0.1	na	0.79	0.1
Richland-Chambers_S020	Discharge Per Area	0.1	na	0.79	0.1
Tehuacana_Ck_S020	Discharge Per Area	0.1	na	0.89	0.05
Tehuacana_Ck_S010	Discharge Per Area	0.1	na	0.89	0.05
Trinity_River_S100	Discharge Per Area	0.1	na	0.89	0.05
Fairfield_Lake_S010	Discharge Per Area	0.1	na	0.89	0.05
Trinity_River_S110	Discharge Per Area	0.1	na	0.89	0.05
Big_Brown_Ck_S010	Discharge Per Area	0.1	na	0.89	0.05
Trinity_River_S120	Discharge Per Area	0.1	na	0.89	0.05
Trinity_River_S130	Discharge Per Area	0.1	na	0.79	0.1
Upper_Keechi_Ck_S030	Discharge Per Area	0.1	na	0.79	0.1
Upper_Keechi_Ck_S010	Discharge Per Area	2	na	0.79	0.1
Upper_Keechi_Ck_S020	Discharge Per Area	0.1	na	0.79	0.1
Upper_Keechi_Ck_S040	Discharge Per Area	0.1	na	0.79	0.1
Trinity_River_S140	Discharge Per Area	0.1	na	0.79	0.1
Little_Elkhart_S010	Discharge Per Area	0.1	na	0.79	0.1
Houston_County_Lake_S010	Discharge Per Area	1	na	0.79	0.1
Trinity_River_S150	Discharge Per Area	0.1	na	0.79	0.1
Trinity_River_S160	Discharge Per Area	0.1	na	0.79	0.1
Trinity_River_S170	Discharge Per Area	0.1	na	0.79	0.1
Trinity_River_S180	Discharge Per Area	0.1	na	0.79	0.1
Bedias_Ck_S010	Discharge Per Area	0.3	na	0.79	0.1
Bedias_Ck_S020	Discharge Per Area	0.1	na	0.79	0.1
Trinity_River_S190	Discharge Per Area	0.1	na	0.79	0.1
Livingston_S010	Discharge Per Area	0.1	na	0.79	0.1
Livingston_S030	Discharge Per Area	0.1	na	0.79	0.1

Subbasin Name	Initial Type	Initial Discharge (CFS/MI2)	Initial Discharge (CFS)	Recession Constant	Ratio to Peak
Livingston_S020	Discharge Per Area	0.1	na	0.79	0.1
Trinity_River_S200	Discharge Per Area	0.1	na	0.79	0.1
Long_King_Ck_S010	Discharge Per Area	1.5	na	0.90	0.1
Long_King_Ck_S020	Discharge Per Area	0.1	na	0.79	0.1
Trinity_River_S210	Discharge Per Area	0.1	na	0.79	0.1
Menard_Ck_S010	Discharge Per Area	0.3	na	0.79	0.1
Trinity_River_S220	Discharge Per Area	0.1	na	0.79	0.1
Trinity_River_S230	Discharge Per Area	0.1	na	0.79	0.1
Trinity_River_S240	Discharge Per Area	0.1	na	0.79	0.1
Trinity_River_S250	Discharge Per Area	0.1	na	0.79	0.1

Table 5: Modified Puls Routing Data

HEC-HMS Reach Name	Initial Subreaches
West_Fork_R010	1
West_Fork_R020	1
West_Fork_R030	1
West_Fork_R040	1
West_Fork_R050	1
West_Fork_R060	1
West_Fork_R070	1
Big_Cleveland_R010	1
West_Fork_R080	1
Lost_Ck_R010	5
Beans_Ck_R010	1
Big_Ck_R010	3
Big_Ck_R020	1
West_Fork_R120	7
West_Fork_R130	4
Big_Sandy_Ck_R020	4
Big_Sandy_Ck_R030	5
Brushy_Ck_R010	9
Brushy_Ck_R020	1

HEC-HMS Reach Name	Initial Subreaches
Big_Sandy_Ck_R040	3
Big_Sandy_Ck_R050	3
Big_Sandy_Ck_R060	6
West_Fork_R140	5
West_Fork_R150	4
Garrett_Ck_R010	4
Garrett_Ck_R020	5
Salt_Ck_R010	7
Salt_Ck_R020	5
Salt_Ck_R030	4
West_Fork_R160	5
Walnut_Ck_R020	1
Silver_Ck_R010	10
West_Fork_R200	2
West_Fork_R201	1
Clear_Fork_R030	1
Clear_Fork_R040	100
Clear_Fork_R050	1
West_Fork_R210	1
Marine_Ck_R010	1
West_Fork_R220	1
West_Fork_R230	1
West_Fork_R231	1
West_Fork_R240	1
West_Fork_R250	2
Village_Ck_R020	2
West_Fork_R260	1
West_Fork_R261	1
West_Fork_R262	2
West_Fork_R264	1
West_Fork_R270	1
West_Fork_R280	2
Big_Bear_Ck_R010	2
West_Fork_R290	2
Mountain_Ck_R020	2
Mountain_Ck_R030	2

HEC-HMS Reach Name	Initial Subreaches
West_Fork_R300	1
Elm_Fork_R060	8
Elm_Fork_R070	6
Elm_Fork_R080	10
Denton_Ck_R010	14
Denton_Ck_R030	8
Denton_Ck_R040	2
Denton_Ck_R050	3
Denton_Ck_R060	8
Elm_Fork_R090	2
Elm_Fork_R100	2
Elm_Fork_R120	7
Bachman_Branch_R010	1
Elm_Fork_R130	3
Trinity_River_R010	3
Trinity_River_R020	1
Trinity_River_R030	2
White_Rock_Ck_R020	5
Trinity_River_R040	1
Trinity_River_R050	2
Trinity_River_R060	8
Trinity_River_R070	6
East_Fork_R040	1
East_Fork_R050	4
East_Fork_R060	8
East_Fork_R070	10
East_Fork_R080	6
Trinity_River_R100	45
Trinity_River_R120	6
Chambers_Ck_R030	5
Chambers_Ck_R040	9
Richland_Ck_R020	14
Trinity_River_R130	5
Trinity_River_R140	4
Trinity_River_R150	4
Trinity_River_R160	8

HEC-HMS Reach Name	Initial Subreaches
Trinity_River_R170	12
Trinity_River_R180	1
Trinity_River_R190	1
Trinity_River_R200	12
Trinity_River_R210	10
Trinity_River_R220	6
Trinity_River_R230	4
Trinity_River_R240	5
Trinity_River_R250	4
Trinity_River_R260	10
Trinity_River_R270	10
Trinity_River_R280	12

Table 6: Muskingum Routing Data

HEC-HMS Reach Name	K (hrs)	X	Initial Subreaches
West_Fork_R090	1	0.25	1
West_Fork_R100	3	0.25	1
West_Fork_R110	3	0.25	1
West_Fork_R170	3	0.25	2
West_Fork_R180	2	0.25	2
Walnut_Ck_R010	1	0.25	1
West_Fork_R190	2	0.25	2
Bear_Ck_R010	1	0.25	1
Marys_Ck_R010	1	0.25	1
Village_Ck_R010	2	0.25	2
JPL_Walnut_Ck_R010	2	0.25	2
Mountain_Ck_R010	4	0.25	3
Clear_Ck_R010	0.8	0.3	1
Clear_Ck_R020	3.6	0.3	4
Spring_Ck_R010	1.5	0.4	2
Timber_Ck_R010	1.1	0.3	1
Elm_Fork_R030	2	0.3	2
Range_Ck_R010	5.5	0.2	6

HEC-HMS Reach Name	K (hrs)	X	Initial Subreaches
Elm_Fork_R020	1.1	0.3	1
Elm_Fork_R010	3.9	0.3	4
Brushy_Elm_Ck_R010	3.9	0.3	4
Elm_Fork_R050	3.7	0.2	4
Lake_Kiowa_R010	1.3	0.3	1
Elm_Fork_R040	1.6	0.3	2
Clear_Ck_R030	1.2	0.3	1
Clear_Ck_R040	7.7	0.2	8
Clear_Ck_R050	2.8	0.2	3
Clear_Ck_R060	5.8	0.2	6
Little_Elm_Ck_R010	6	0.2	6
Little_Elm_Ck_R020	0.5	0.2	1
Little_Elm_Ck_R030	1.8	0.2	2
Doe_Branch_R010	1.1	0.2	1
Hickory_Ck_R010	2	0.3	2
Hickory_Ck_R020	2	0.3	1
Hickory_Ck_R030	1.1	0.3	1
Denton_Ck_R020	2	0.25	1
Hackberry_Ck_R010	1	0.25	1
Elm_Fork_R110	1	0.25	1
White_Rock_Ck_R010	3	0.25	3
Five_Mile_Ck_R010	5	0.4	3
Tenmile_Ck_R010	5	0.4	3
Indian_Ck_R010	2	0.25	1
Indian_Ck_R020	2	0.2	2
Sister_Grove_Ck_R010	8	0.2	8
East_Fork_R010	4	0.2	4
East_Fork_R020	8	0.2	8
East_Fork_R030	1	0.2	1
Lavon_RayHubbard_R010	1	0.2	1
Rowlett_Ck_R010	4	0.2	4
Trinity_River_R080	1	0.4	1
Trinity_River_R090	1.5	0.4	1
Kings_Ck_R010	1	0.4	1
Kings_Ck_R020	6	0.4	3

HEC-HMS Reach Name	K (hrs)	X	Initial Subreaches
Cedar_Ck_R010	12	0.3	6
Cedar_Ck_R020	8	0.4	4
Cedar_Ck_R030	10	0.1	10
Chambers_Ck_R010	12	0.3	5
Chambers_Ck_R020	10	0.3	6
Waxahachie_Ck_R010	4	0.1	2
Waxahachie_Ck_R020	6	0.1	3
Waxahachie_Ck_R030	6	0.3	2
Post_Oak_Ck_R010	1.5	0.3	4
Richland_Ck_R010	4	0.1	2
Richland_Ck_R030	7	0.1	3
Richland_Ck_R040	1	0.4	1
Tehuacana_Ck_R010	8	0.4	4
Big_Brown_Ck_R010	2	0.4	1
Upper_Keechi_Ck_R010	6	0.25	3
Upper_Keechi_Ck_R020	8	0.25	1
Big_Elkhart_R010	1	0.25	1
Bedias_Ck_R010	6	0.25	3
Long_King_Ck_R010	8	0.25	4
Menard_Ck_R010	2	0.25	2

Table 7: Lag Routing Data

HEC-HMS Reach Name	Lag (Min)
Clear_Fork_R041	60
West_Fork_R251	60
West_Fork_R263	60

Table 8: Straddle Stagger Routing Data

HEC-HMS Reach Name	Lag (Min)	Duration (Min)
Clear_Fork_R010	60	60
Clear_Fork_R020	60	60

1.4 HEC-HMS MODEL CALIBRATION

After building the HEC-HMS model with its initial parameters, the Interagency Flood Risk Management (InFRM) team calibrated the model to verify it was accurately simulating the response of the watershed to a range of observed flood events, including large events similar to a 1% annual chance (100-yr) flood. A total of 17 recent storm events were used throughout different parts of the watershed to fine tune the model, as shown in Table 9. The model calibration and verification process undertaken during this study exceeds the standards of a typical FEMA floodplain study.

For these storms, the National Weather Service (NWS) hourly rainfall radar data allowed the team to fine tune the watershed model through detailed calibration. Prior to the late 1990s, the NWS radar data was not available for use during earlier modeling efforts. The final model results accurately simulate the observed response of the watershed, as it generally reproduced the timing, shape, and magnitudes of the observed floods. Table 9 lists the storms that were used to calibrate each portion of the watershed, and Figures 2 through 18 illustrate the total depth of rain for the major calibration storms and how that rain was distributed spatially throughout the Trinity River watershed. These plots were extracted from the HEC-MetVue meteorological program for visualizing and processing rainfall data.

Since the rain fell on different parts of the basin from one event to another, the calibration of each storm was focused on those areas of the basin that received the greatest and most intense rainfall. Calibration was also only performed when the USGS stream gages were recording for that event. Table 10 shows which storms were calibrated for each USGS stream gage.

Table 9: Storm Events Used for Model Calibration

Storm Event	West Fork above Grand Praire Gage	Elm Fork to Trinity Below Dallas Gage	Above Richland-Chambers Reservoir	Trinity below Dallas Gage and below Richland-Chambers Reservoir
Dec-91		Yes		
Apr-99				Yes
Jun-00	Yes			
Jun-04	Yes			
Nov-04				Yes
Oct-06				Yes
Mar-07	Yes			
Jun-07		Yes		Yes
Jul-07				Yes
Sep-09			Yes	
Oct-09			Yes	
Sep-10		Yes		Yes
May-15	Yes		Yes	Yes
Jun-15	Yes			
Oct-15			Yes	
Nov-15	Yes	Yes		Yes
Dec-15				Yes

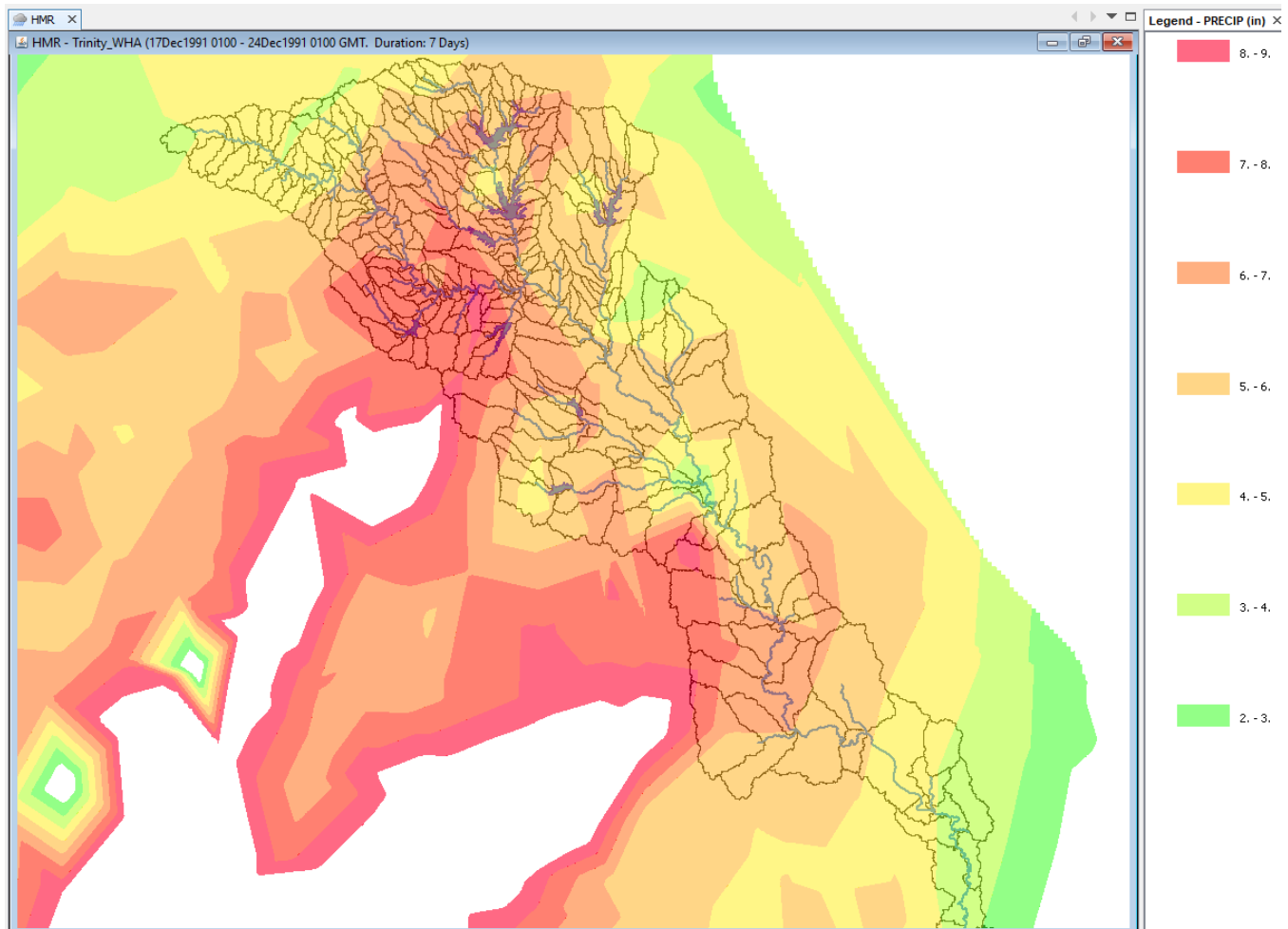


Figure 2: Rainfall Depths (inches) for the December 1991 Calibration Storm

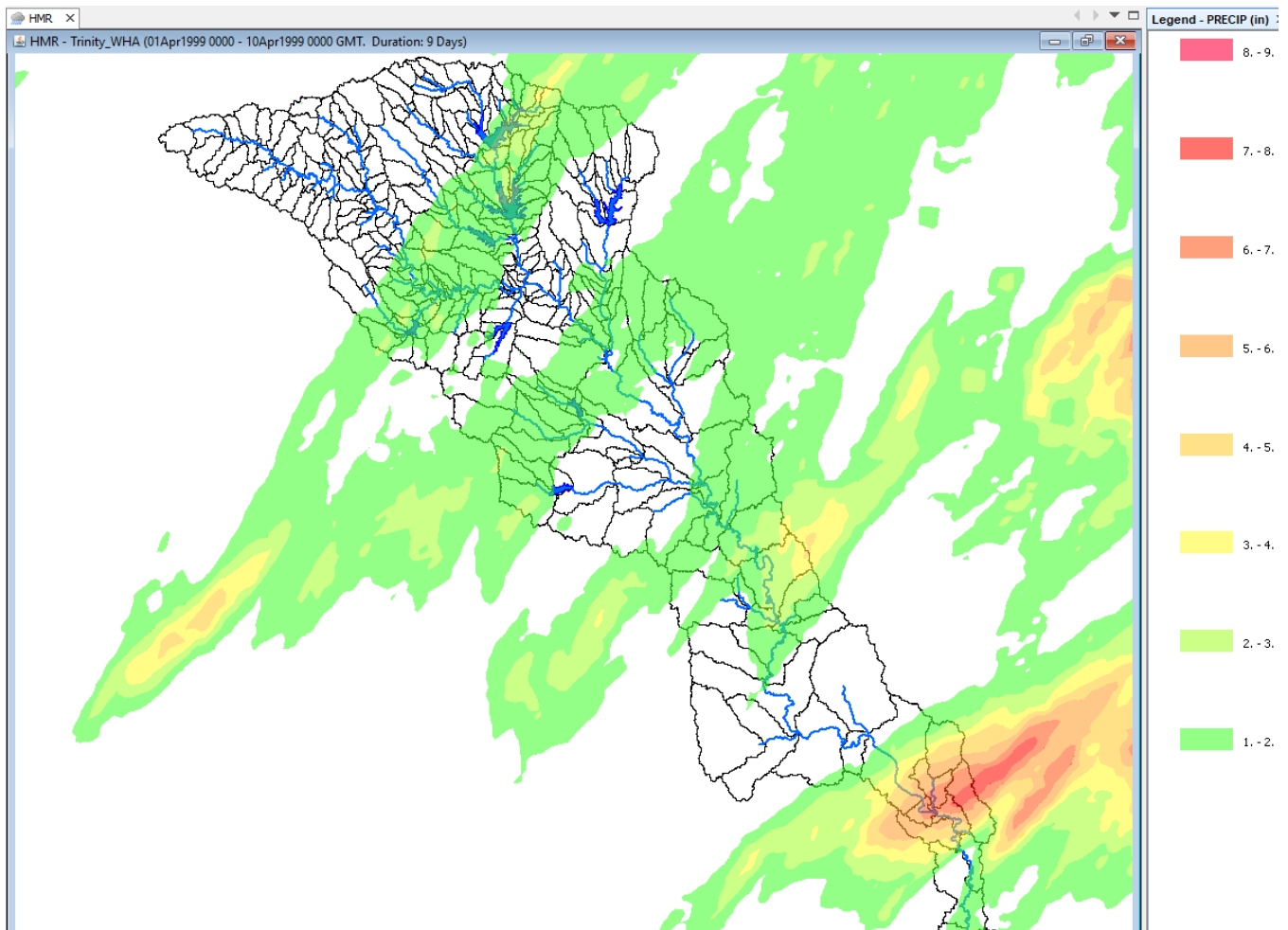


Figure 3: Rainfall Depths (inches) for the April 1999 Calibration Storm

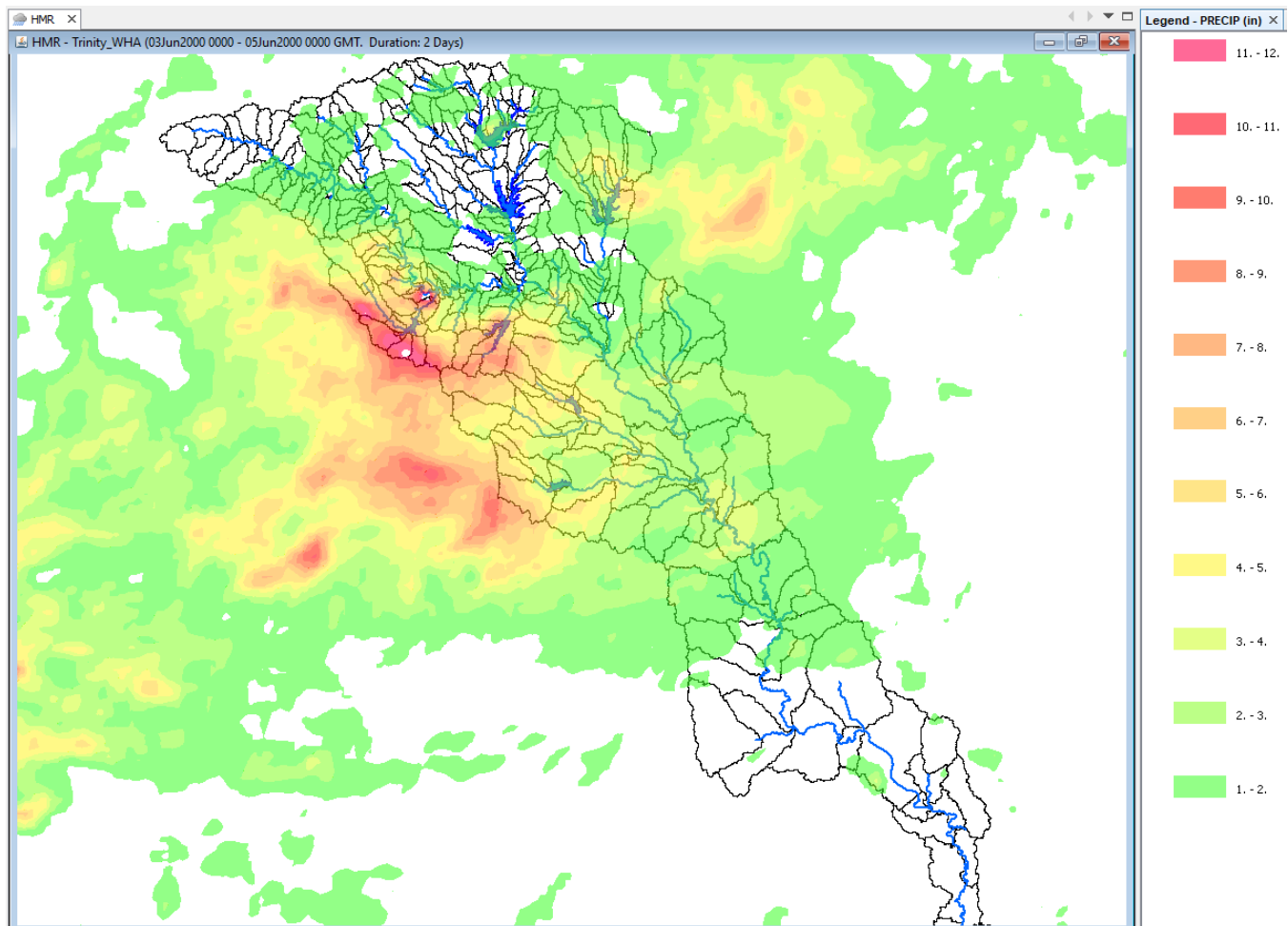


Figure 4: Rainfall Depths (inches) for the June 2000 Calibration Storm

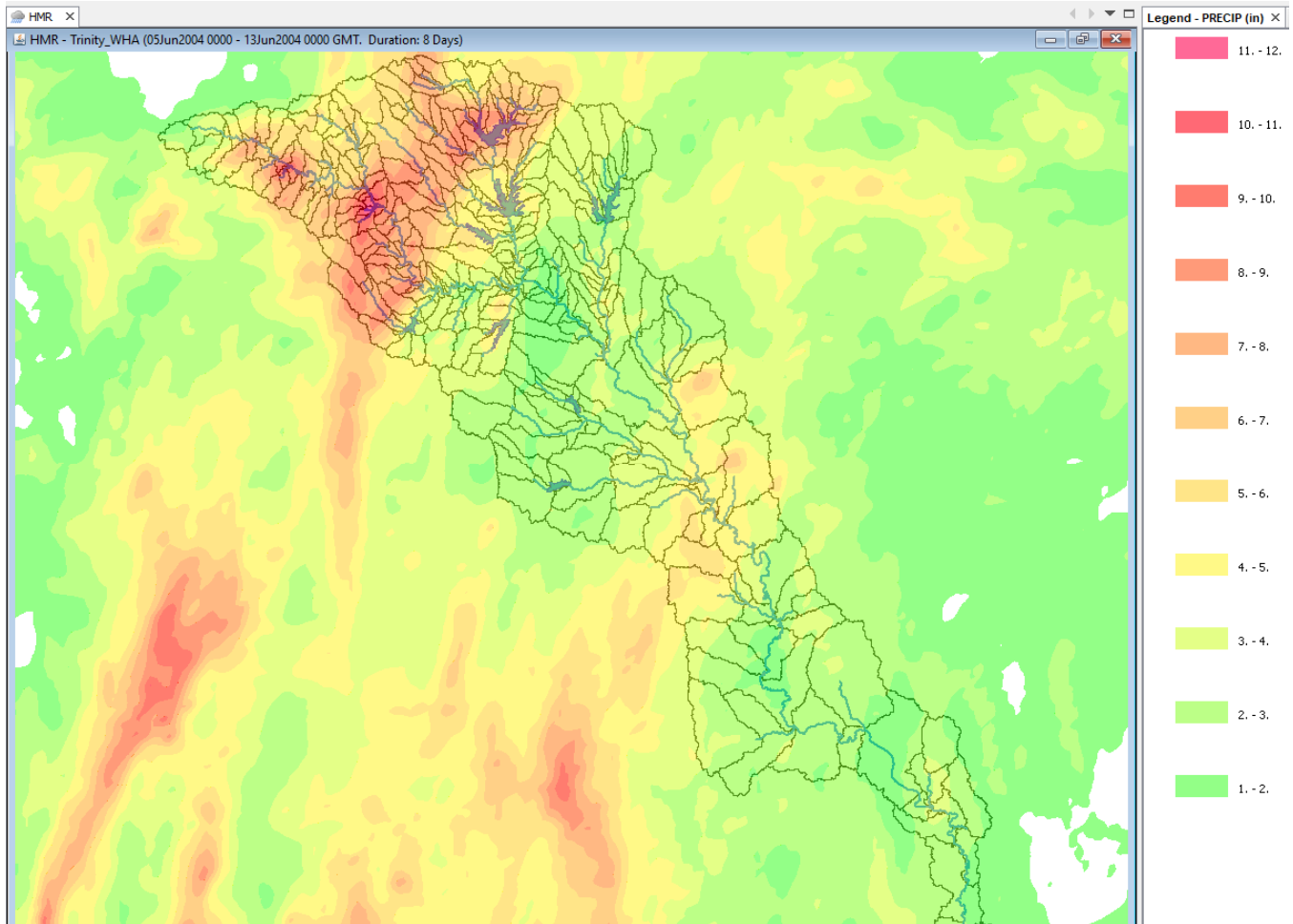


Figure 5: Rainfall Depths (inches) for the June 2004 Calibration Storm

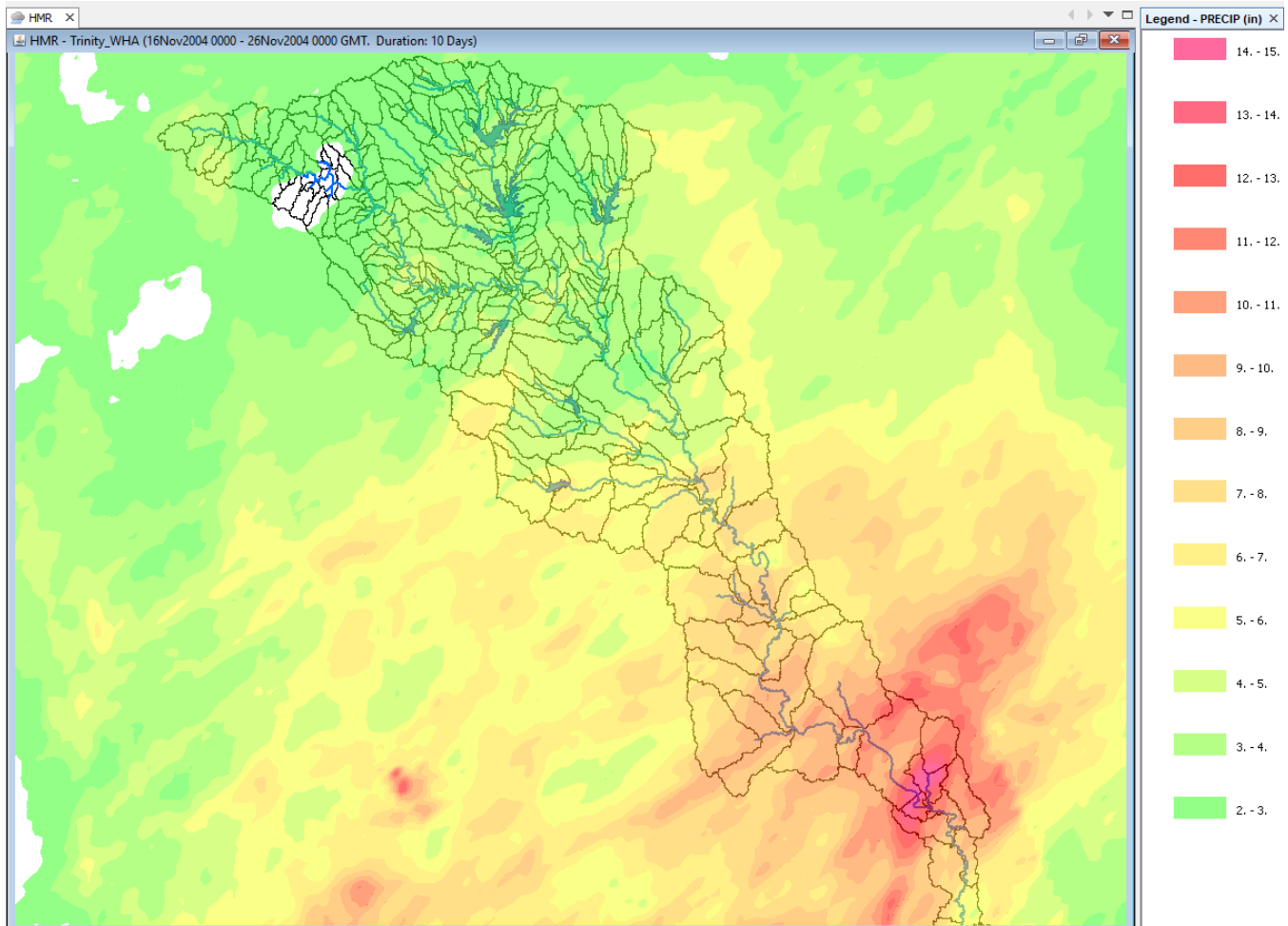


Figure 6: Rainfall Depths (inches) for the November 2004 Calibration Storm

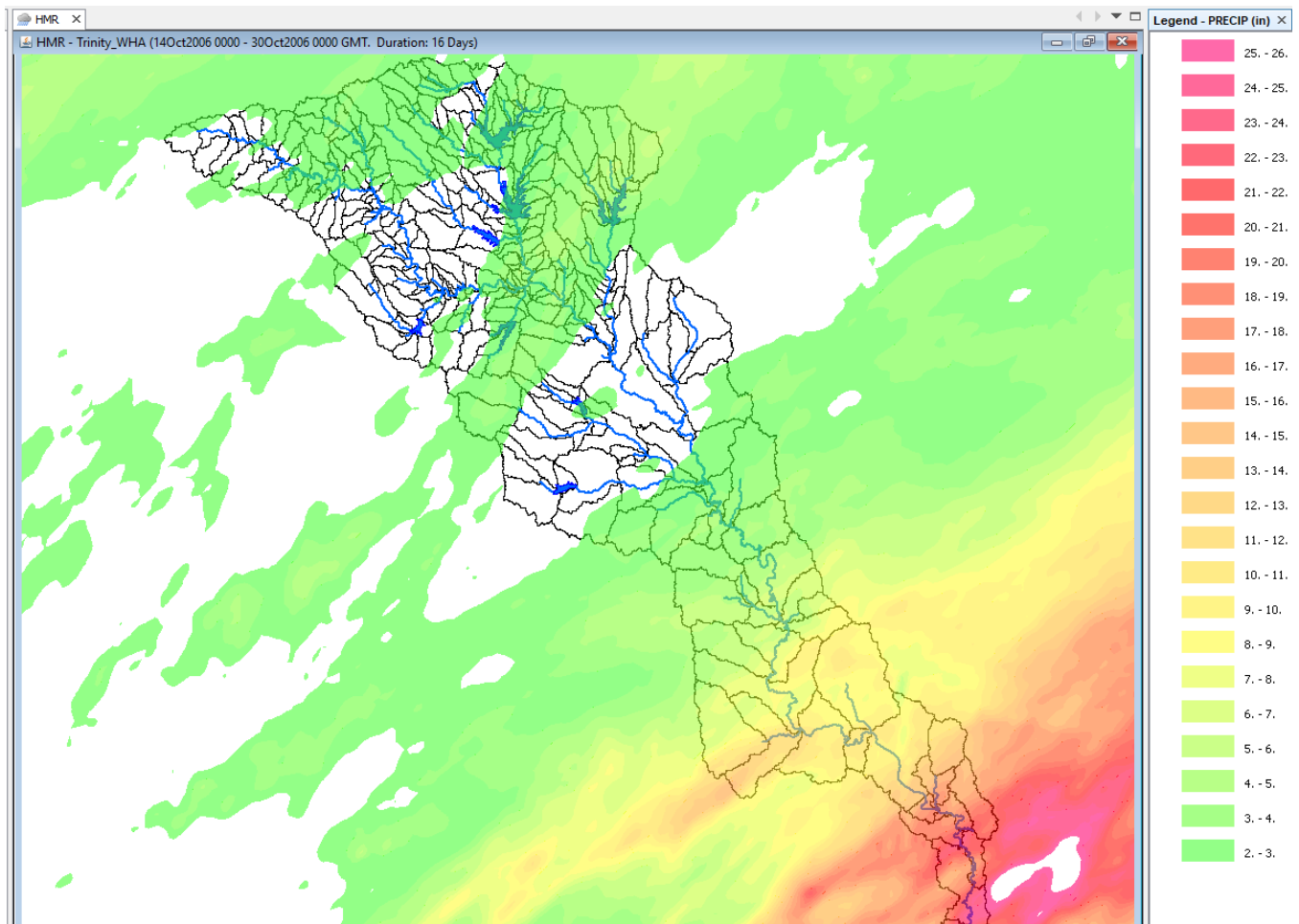


Figure 7: Rainfall Depths (inches) for the October 2006 Calibration Storm

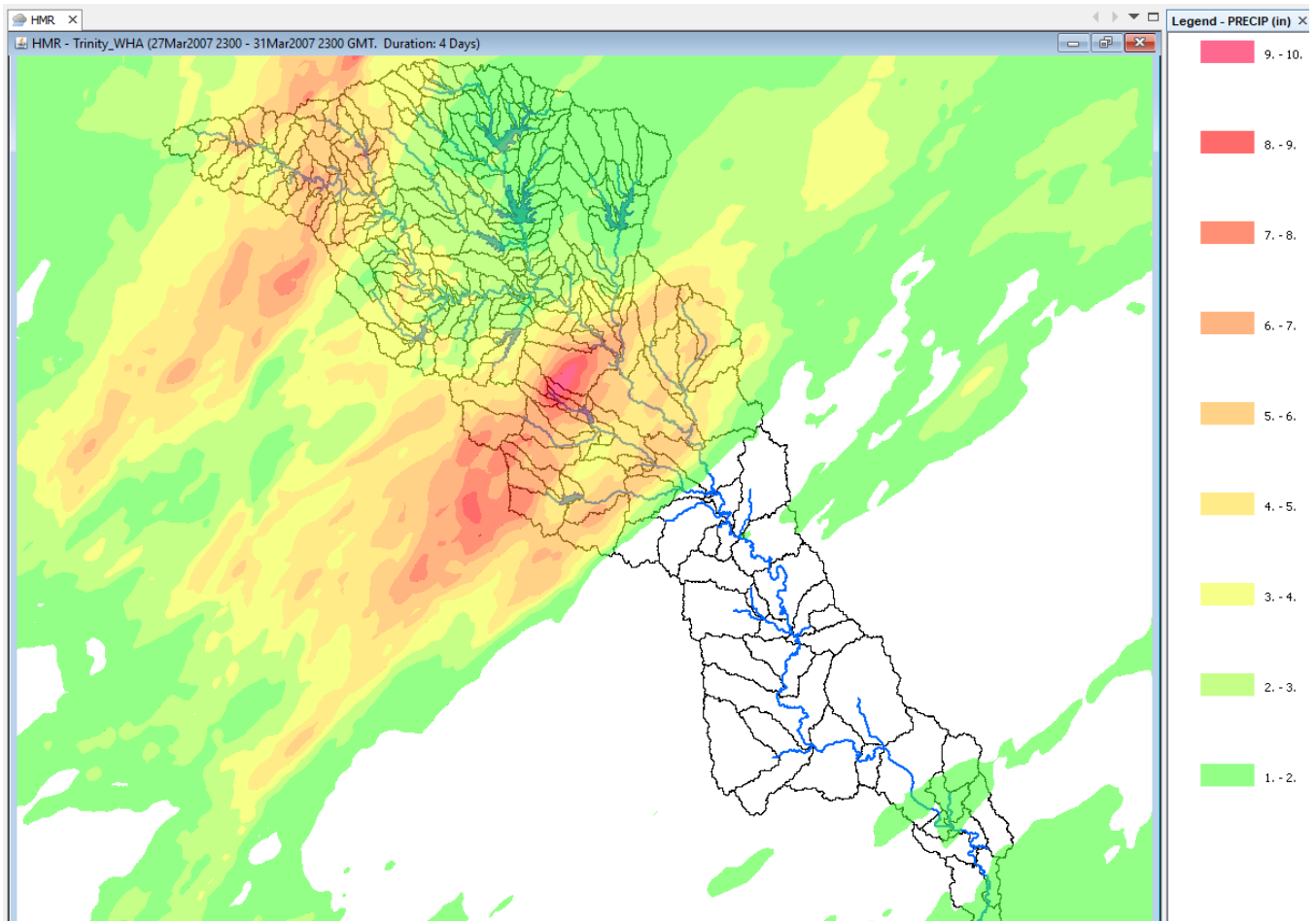


Figure 8: Rainfall Depths (inches) for the March 2007 Calibration Storm

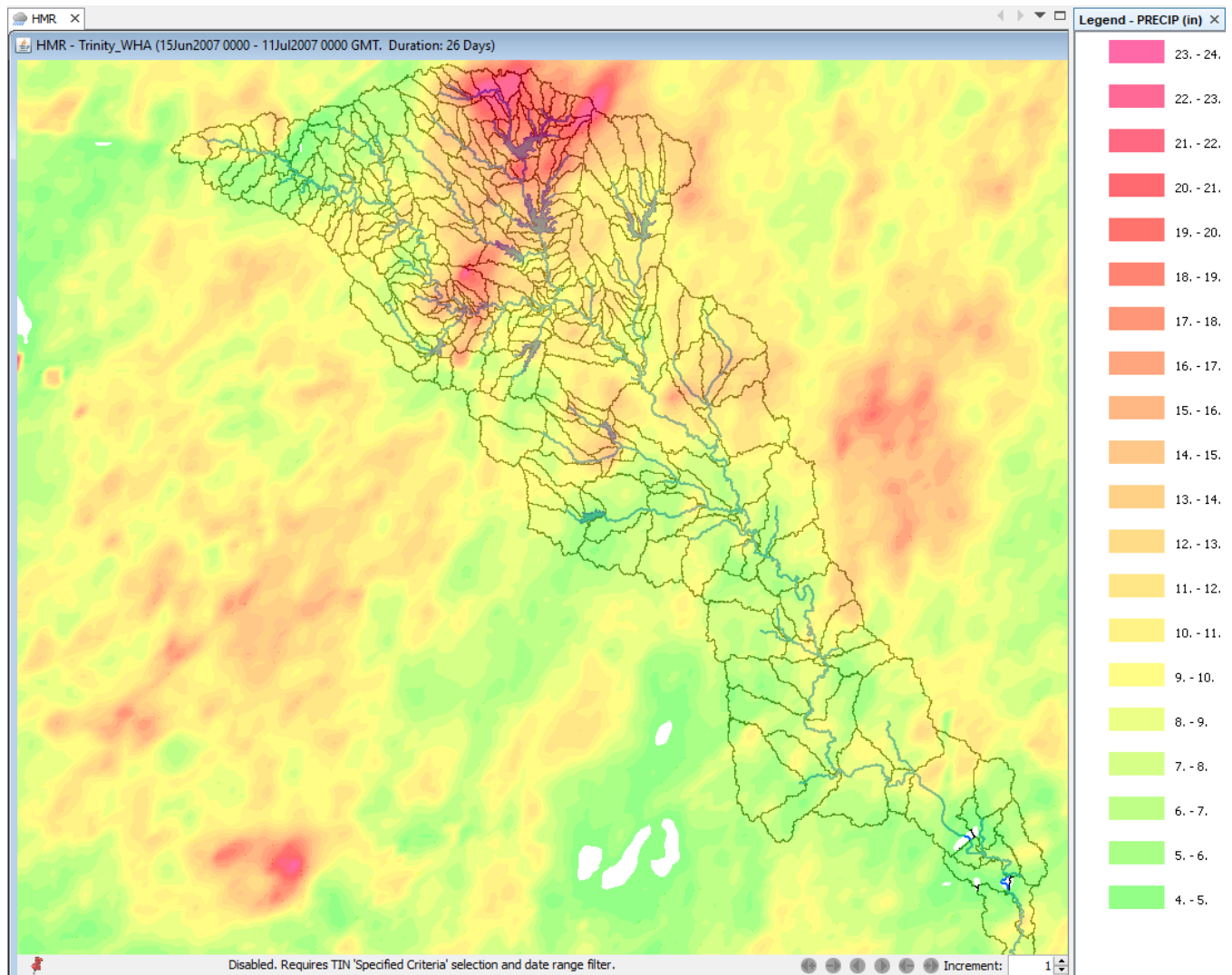


Figure 9: Rainfall Depths (inches) for the June 2007 Calibration Storm

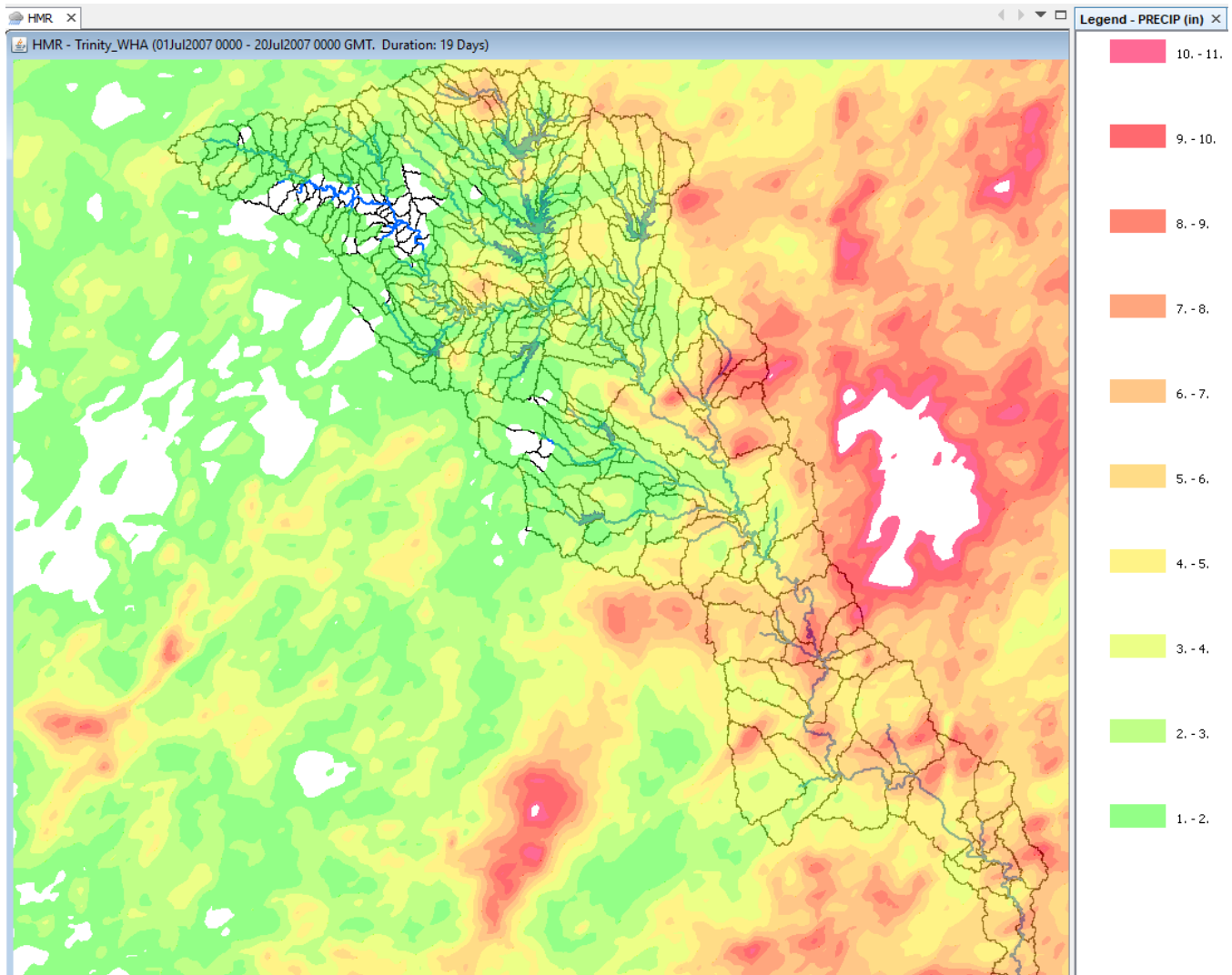


Figure 10: Rainfall Depths (inches) for the July 2007 Calibration Storm

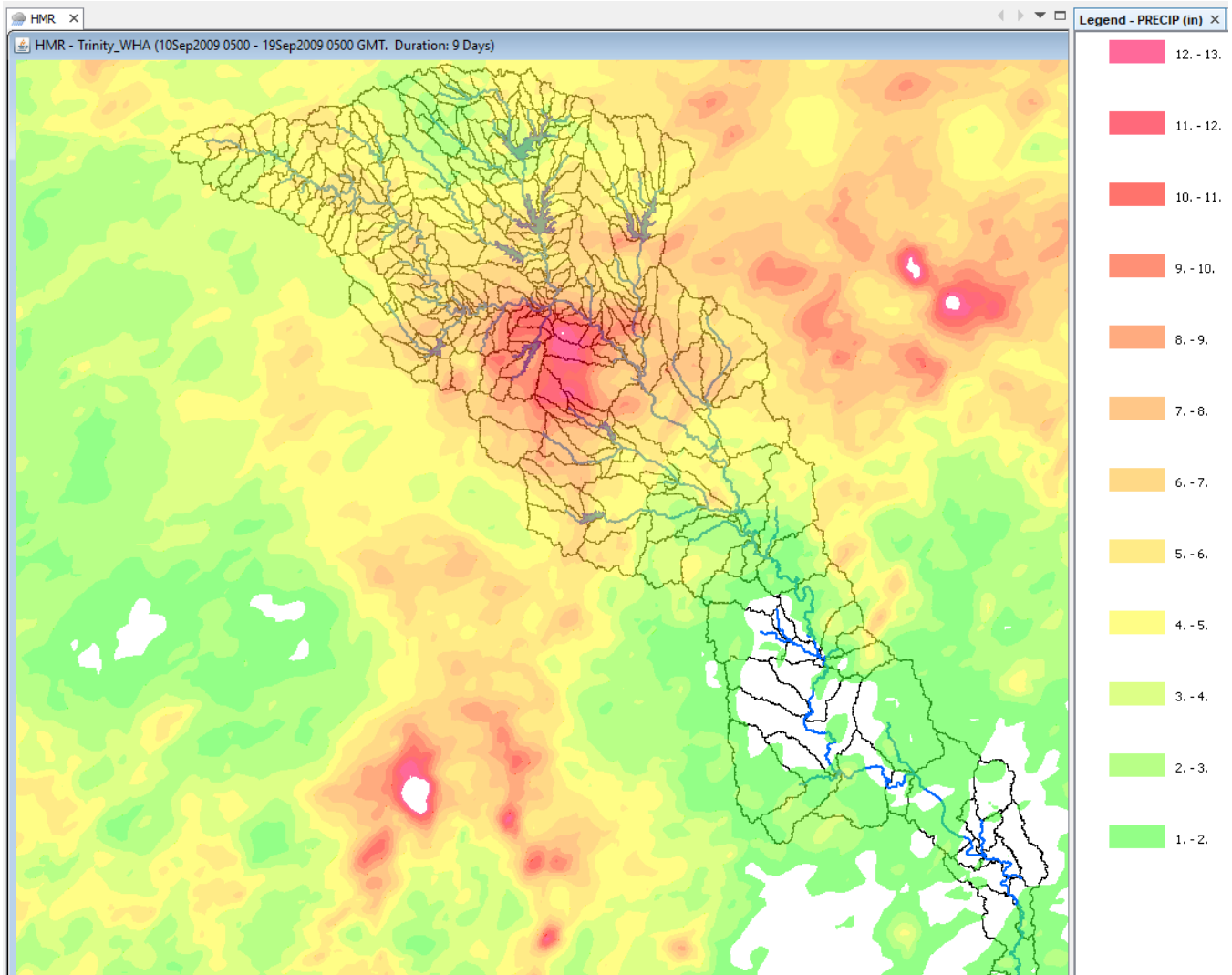


Figure 11: Rainfall Depths (inches) for the September 2009 Calibration Storm

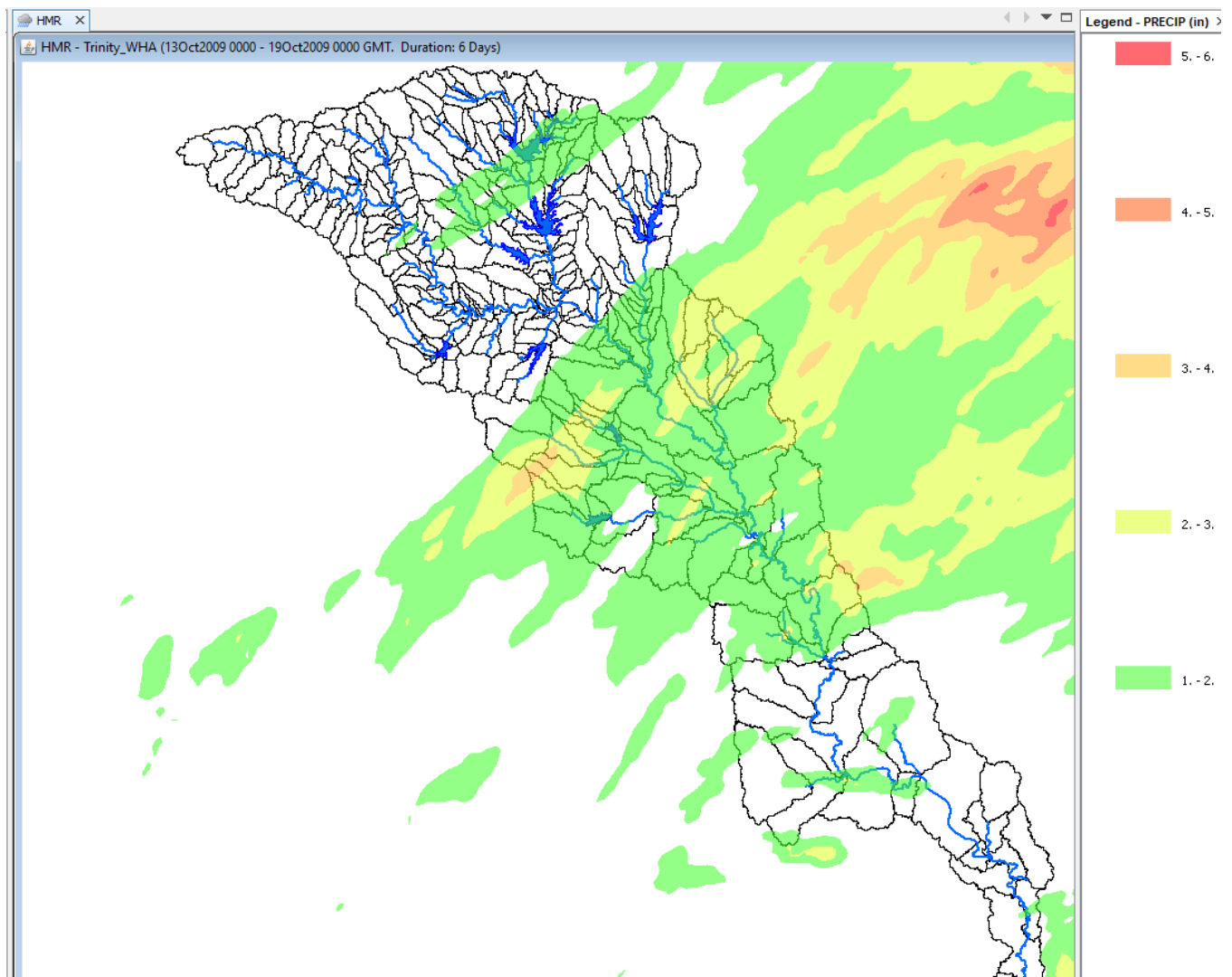


Figure 12: Rainfall Depths (inches) for the October 2009 Calibration Storm

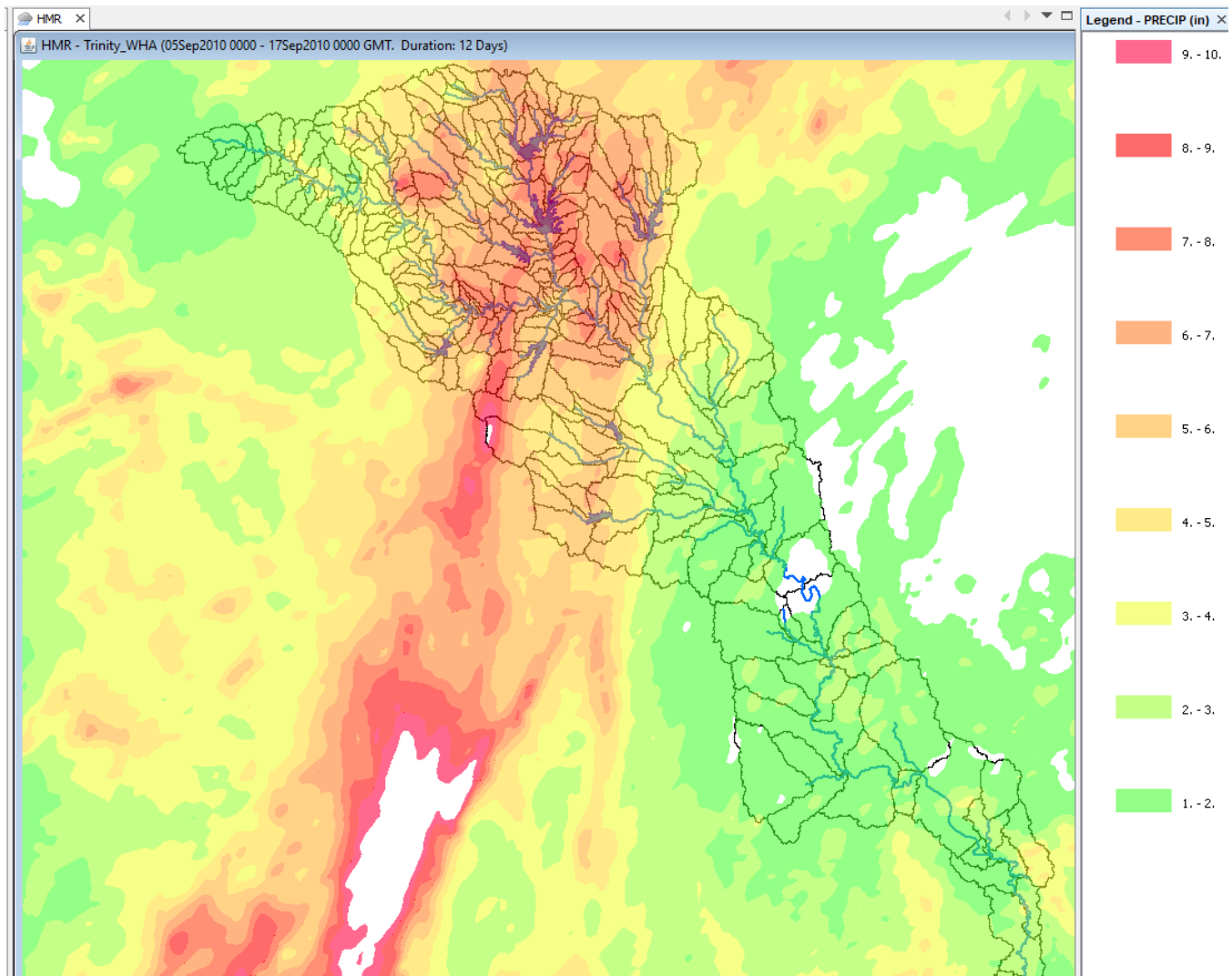


Figure 13: Rainfall Depths (inches) for the September 2010 Calibration Storm

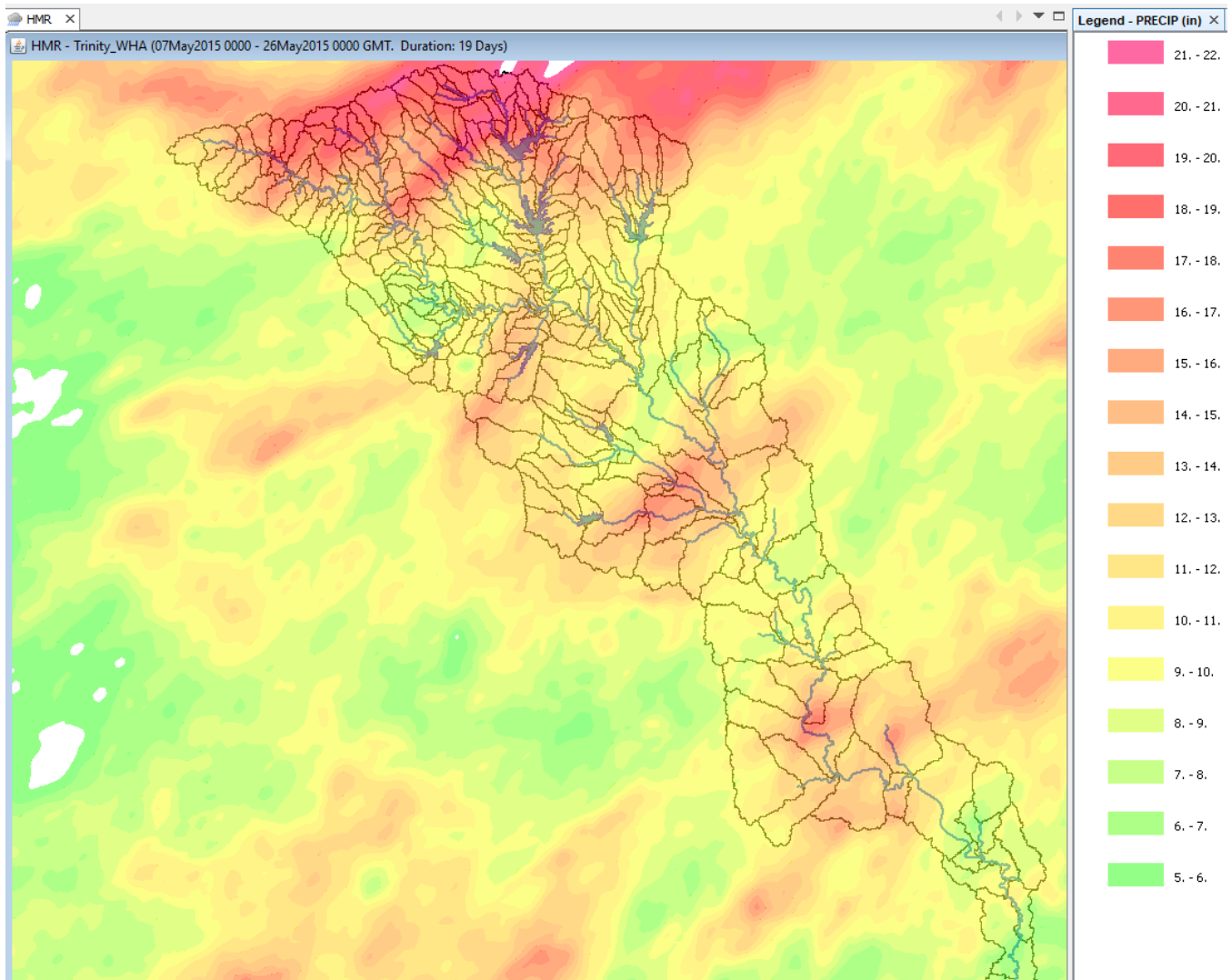


Figure 14: Rainfall Depths (inches) for the May 2015 Calibration Storm

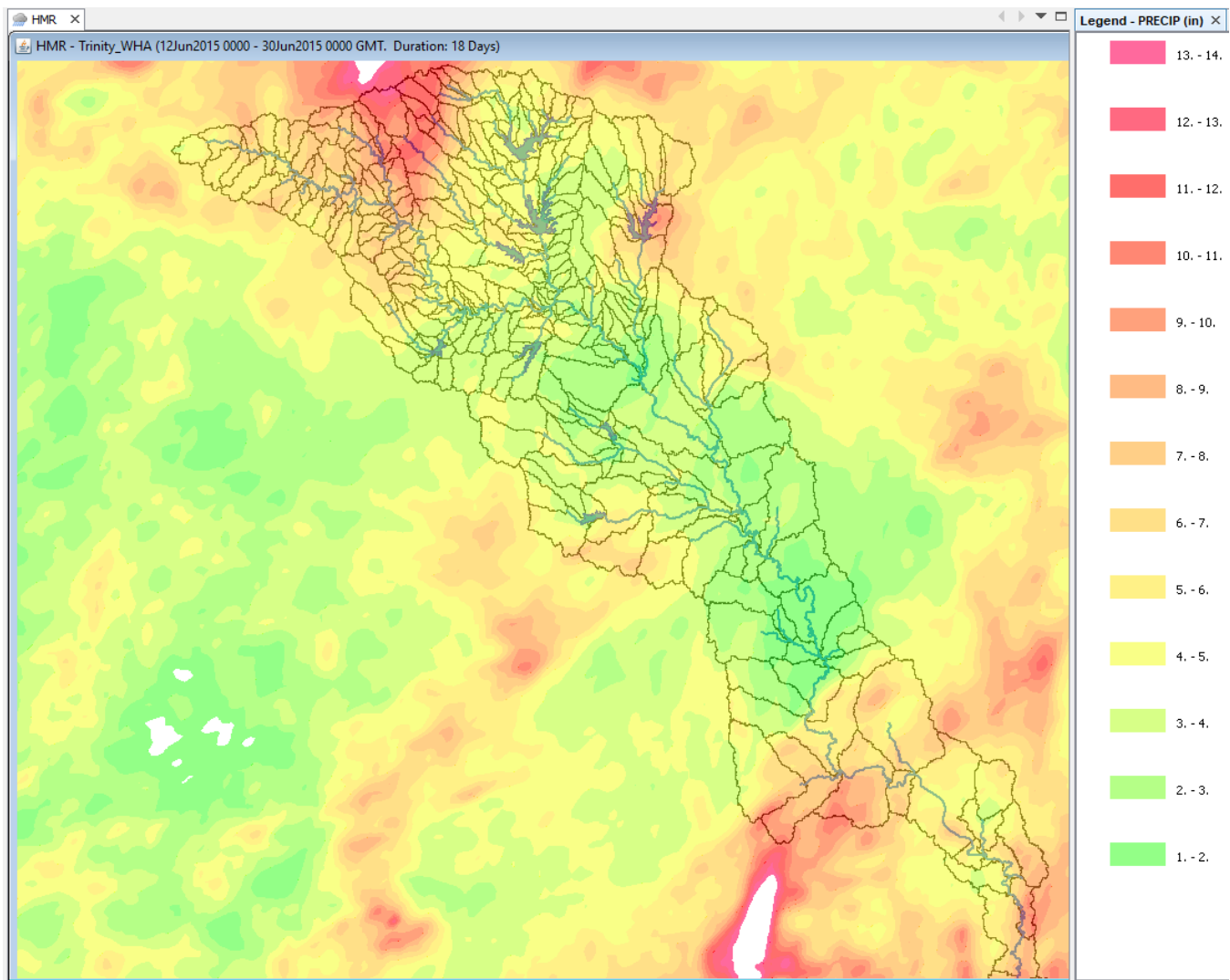


Figure 15: Rainfall Depths (inches) for the June 2015 Calibration Storm

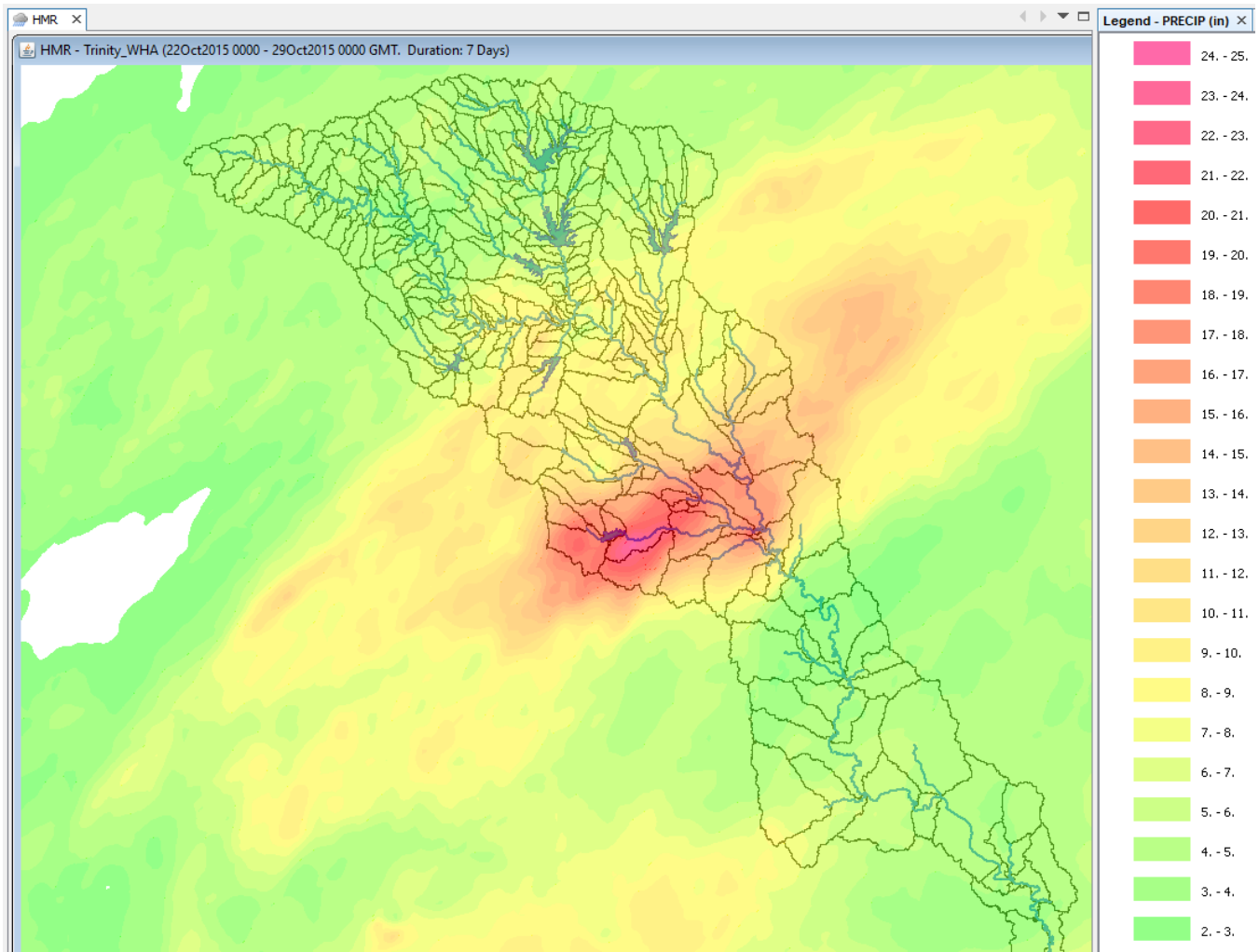


Figure 16: Rainfall Depths (inches) for the October 2015 Calibration Storm

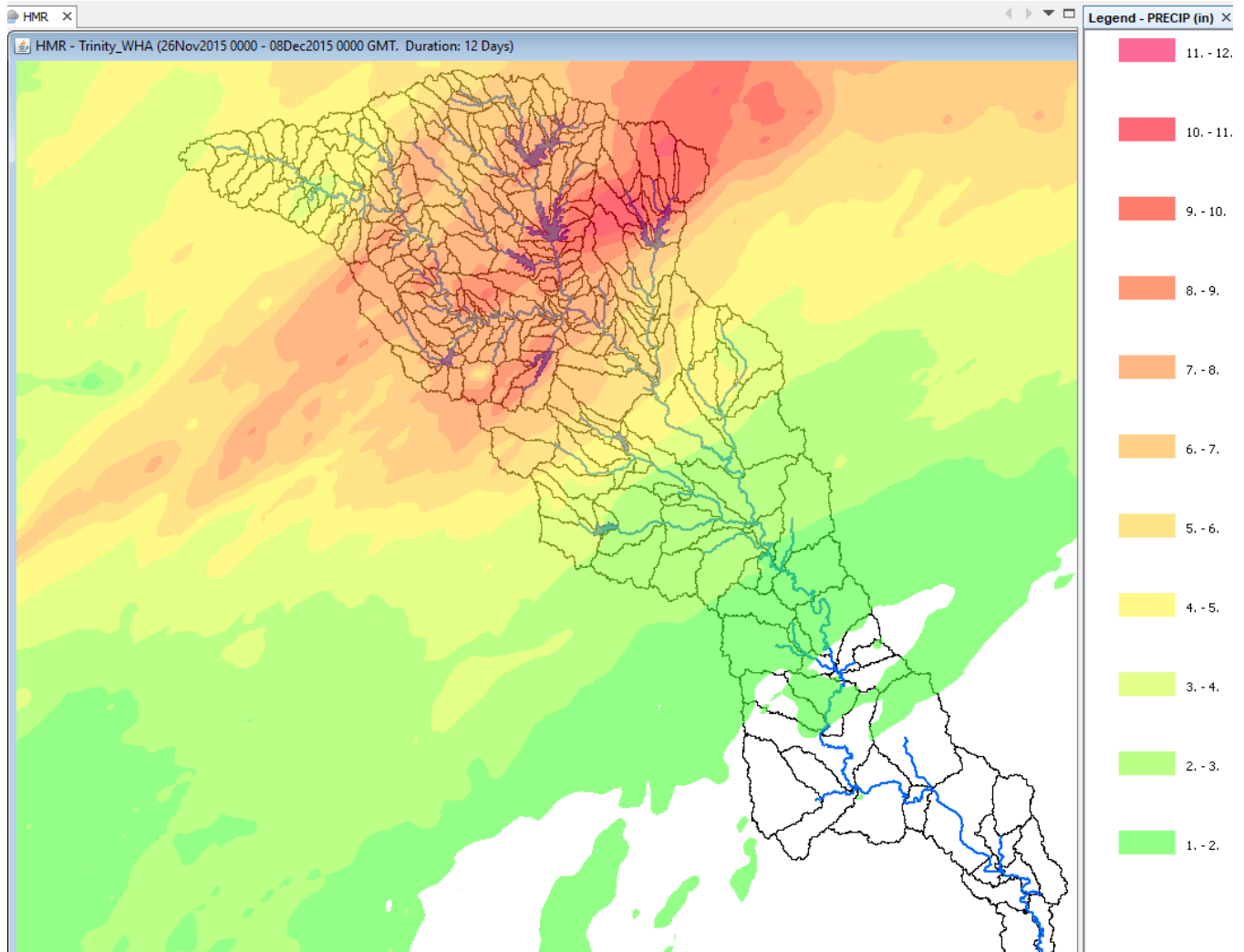


Figure 17: Rainfall Depths (inches) for the November 2015 Calibration Storm

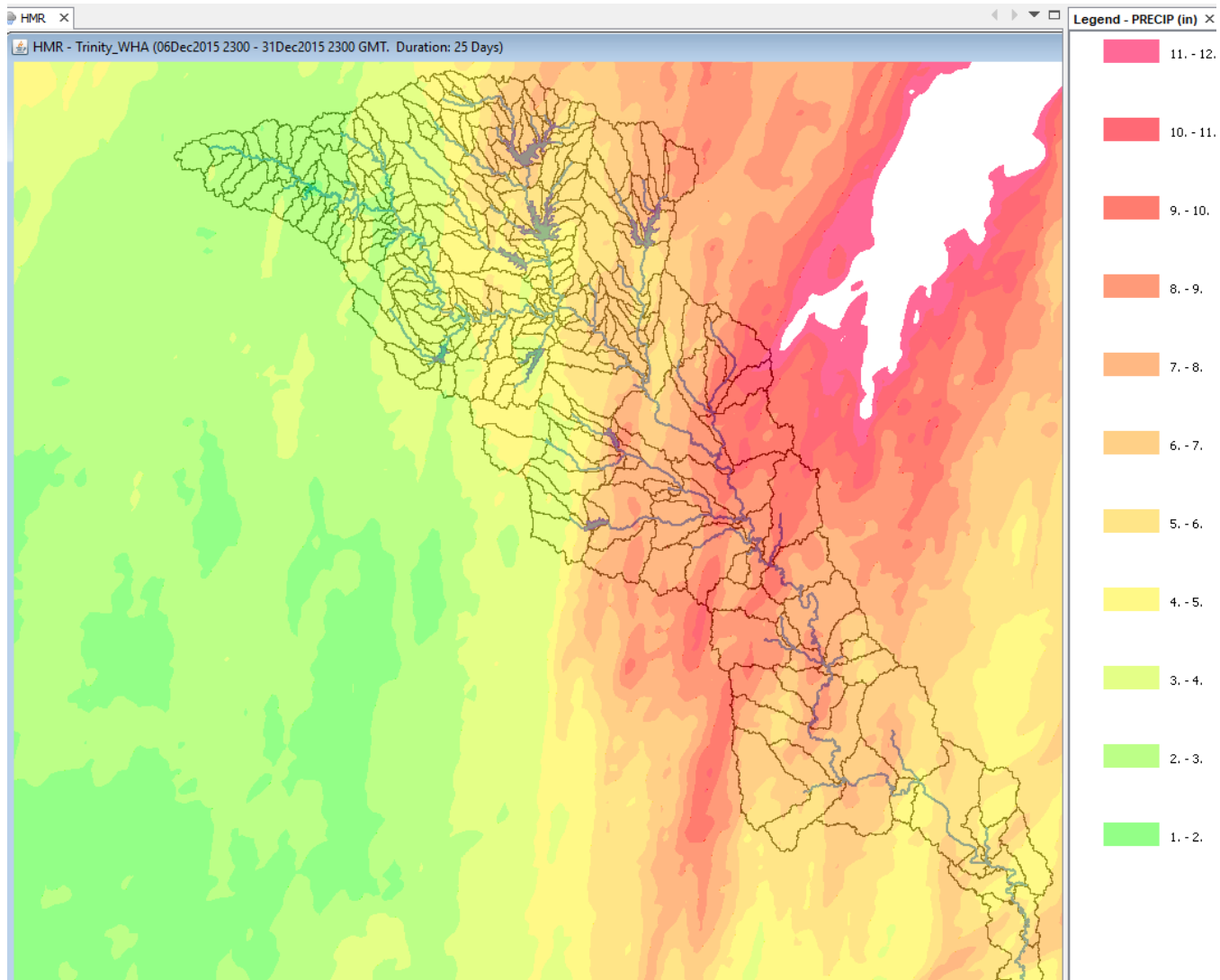


Figure 18: Rainfall Depths (inches) for the December 2015 Calibration Storm

Table 10: Calibrated Storm Events for Specific Gage Locations

USGS Gage Location	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West Fork Trinity River near Jacksboro, TX				Yes			Yes						Yes	Yes		Yes	
Big Sandy Creek nr Bridgeport at Hwy 114 bridge				Yes			Yes						Yes	Yes		Yes	
West Fork Trinity River near Boyd, TX - at FM 730 bridge				Yes			Yes						Yes	Yes		Yes	
Walnut Creek at Reno, TX at FM1542 bridge in Parker County				Yes			Yes						Yes	Yes		Yes	
Marys Creek at Benbrook			Yes	Yes			Yes									Yes	
Clear Fork Trinity River at Fort Worth				Yes			Yes						Yes	Yes		Yes	
West Fork Trinity River below the Clear Fork (West Fork at Fort Worth)				Yes			Yes						Yes	Yes		Yes	
West Fork Trinity River below Sycamore Creek (West Fork Trinity River at Beach Street)				Yes			Yes						Yes	Yes		Yes	
West Fork Trinity River at Grand Prairie				Yes			Yes						Yes	Yes		Yes	
Walnut Creek near Mansfield, TX	Yes											Yes				Yes	
Mountain Ck near Venus, TX	Yes							Yes				Yes				Yes	
Elm Fk Trinity Rv at Gainesville, TX	Yes							Yes				Yes				Yes	
Timber Ck nr Collinsville, TX	Yes							Yes				Yes				Yes	
Range Creek nr Collinsville, TX	Yes							Yes				Yes				Yes	
Clear Ck nr Sanger, TX	Yes							Yes				Yes				Yes	
Little Elm Ck nr Aubrey, TX								Yes				Yes				Yes	
Doe Br at Hwy 380 nr Prosper, TX								Yes				Yes				Yes	
Hickory Creek at Denton, TX												Yes				Yes	
Indian Creek at Carrollton, TX								Yes				Yes				Yes	
Denton Creek nr Justin, TX	Yes							Yes				Yes				Yes	

USGS Gage Location	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Elm Fork Trinity River near Carrollton	Yes							Yes				Yes				Yes	
Elm Fork Trinity River at Spur 348	Yes											Yes				Yes	
Trinity River at Dallas, TX	Yes							Yes				Yes				Yes	
White Rock Creek at Greenville Ave	Yes							Yes				Yes				Yes	
Trinity River below Honey Springs Branch (Trinity River below Dallas, TX)								Yes				Yes				Yes	
East Fork Trinity River near McKinney, TX								Yes					Yes			Yes	
Sister Grove Creek near Blue Ridge								Yes			Yes		Yes			Yes	
Indian Creek at SH 78 nr Farmersville, TX								Yes					Yes			Yes	Yes
Rowlett Creek near Sachse, TX								Yes					Yes			Yes	
East Fork Trinity River near Forney								Yes					Yes			Yes	
East Fork Trinity River near Crandall, TX					Yes			Yes				Yes					
Trinity River near Rosser, TX									Yes			Yes				Yes	
Kings Creek at SH34 near Kaufman, TX													Yes			Yes	Yes
Cedar Creek near Kemp, TX								Yes					Yes				Yes
Trinity River at Trinidad, TX									Yes				Yes				Yes
Chambers Creek near Rice, TX										Yes	Yes		Yes		Yes		
White Rock Creek at FM 308 near Irene, TX										Yes	Yes		Yes		Yes		
Tehuacana Creek near Streetman, TX					Yes				Yes				Yes	Yes			Yes
Trinity River near Oakwood, TX								Yes					Yes			Yes	
Upper Keechi Creek near Oakwood, TX									Yes				Yes				Yes
Trinity River near Crockett, TX									Yes				Yes			Yes	
Bedias Creek near Madisonville, TX													Yes	Yes			Yes

USGS Gage Location	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Long King Creek at Livingston, TX		Yes			Yes	Yes											
Menard Creek near Rye, TX		Yes				Yes							Yes				
Trinity River at Romayor, TX								Yes					Yes			Yes	
Trinity River at Liberty, TX								Yes					Yes			Yes	

1.4.1 Calibration Methodology

Following the initial parameter estimates, calibration simulations were made using observed hourly Next-Generation Radar (NEXRAD) Stage III gridded precipitation data obtained from the West Gulf River Forecast Center (WGRFC). For each storm event, the model's calculated flow hydrographs were compared to the observed USGS stream flow data at the gages. The model's parameters were then adjusted to improve the match between the simulated and observed hydrographs for the observed events. Calibration was performed for the 17 storm events previously listed in Table 9. Subbasin parameters that were adjusted during calibration included the subbasins' initial and constant loss rates, lag time, peaking coefficients, and baseflow parameters. For the routing reaches, the Muskingum parameters and the Modified Puls number of subreaches were adjusted as needed.

Calibration was generally performed from upstream to downstream, with all subbasins upstream of a specific gage receiving uniform adjustments, unless specific rainfall or observed flow patterns necessitated adjusting subbasin parameters on an individual basis. Generally, subbasin parameters were adjusted in a consistent order: first baseflow parameters, then loss rates, and then lag times and peaking coefficients. Routing subreaches were the last to be adjusted. The methods of adjustment for each parameter are summarized in Table 11.

To the extent possible, effort was made to calibrate the model's results to the volume, timing, peak magnitude, and shape of the observed flow hydrograph. However, imperfections in the observed rainfall data and streamflow data did not always allow for a perfect match. For example, the gridded NEXRAD rainfall data from the National Weather Service was only available on an hourly basis. This meant that intense bursts of rain that occurred in 15-min or 30-min timespans might not be adequately represented in the hourly rainfall data. It also meant that even though the model was being run on a 15-min time step, the timing of the hydrographs could only be calibrated to the nearest hour. Likewise, the observed flow values at the gages are calculated indirectly from the observed stage and a limited number of flow measurements. While abundant flow measurements were usually available in the low flow range, the number and quality of USGS flow measurements were often very limited in the high flow range, leading to uncertainty in some of the observed flow hydrographs. In cases where all aspects of the observed flow hydrograph could not be calibrated simultaneously, priority was given to matching the peak flow magnitude first, followed by the peak timing, which are the aspects of model calibration that are most relevant to the 1% annual chance (100-yr) flood estimation.

Table 11: HEC-HMS Calibration Approach

Parameter	Calibration Approach
Baseflow Parameters	First, the baseflow parameters were adjusted to match the observed flow rates at the start and end of each calibration event. The initial discharges for the subbasins upstream of a certain gage were adjusted uniformly up or down to match the initial observed discharge at that gage. Similarly, the recession constant was adjusted to match the slope of the recession limb of the observed hydrograph, and the ratio to peak was adjusted to match the observed discharge at the end of the calibration event. All baseflow parameters were adjusted uniformly for all subbasins upstream of a given gage.
Initial Loss (in)	After adjusting the baseflow parameters, the initial and constant losses were adjusted to calibrate the total volume of the flood hydrograph. The initial loss was increased or decreased until the timing and volume of the initial runoff generally matched the observed arrival of the flow hydrograph at the nearest downstream gage. All subbasins that were upstream of each gage were generally adjusted uniformly, unless specific rainfall and observed flow patterns necessitated adjusting the subbasin initial losses on an individual basis.
Constant Loss Rate (in/hr)	After adjusting the baseflow and initial loss parameters, the constant losses were adjusted to calibrate the total volume of the flood hydrograph. The subbasins' constant loss rates were increased or decreased until the volume and magnitude of the simulated hydrographs generally matched the observed volume of the flow hydrograph at the nearest downstream gage. The combination of the adjusted baseflow and loss rate parameters led to the total calibrated volume at the gage.
Lag Time (hours)	After adjusting the loss rates, the Snyder's lag times were the next parameters to be adjusted upstream of an individual gage. The Snyder's lag times were adjusted to match the timing of the observed peak flow at the gage. Normally, all of the subbasin lag times upstream of an individual gage were adjusted uniformly and proportionally to one another, unless the magnitude or shape of the observed hydrograph necessitated making individual adjustments. Efforts were also made to ensure that the adjusted lag times still fell within a reasonable range, using the lag times corresponding to 0% sand and 100% sand in the Fort Worth District regional lag time equation as a guide.
Peaking Coefficient	Peaking coefficients were adjusted to match the general shape of the observed flow hydrograph as higher peaking coefficients produce steeper, narrower flood hydrographs, and lower peaking coefficients produce flatter, wider flood hydrographs. An attempt was made to use the same peaking coefficient for all subbasins with similar watershed characteristics. For example, steep, hilly subbasins were given a higher peaking coefficient, whereas flatter subbasins, such as those near the coast, were given lower peaking coefficients. Efforts were also made to ensure that the adjusted peaking coefficients fell within the typical range of 0.4 to 0.8. In most cases, peaking coefficients were adjusted once and left alone between subsequent events.
Modified Puls Routing Subreaches	The number of subreaches in the Modified Puls routing reaches were the final parameters to be adjusted when necessary. Calibration of routing parameters focused on storms that fell near the upstream end of the watershed and were routed downstream with little intervening subbasin flow. Adjustments to the number of subreaches in a given routing reach were made in order to match the amount of attenuation in the peak flow that occurred from the upstream end of a reach to the downstream gage. In a very few cases, where an adjustment to the subreaches was not sufficient to match the observed downstream hydrograph, a factor was also applied to the reach's storage volume in the storage-discharge curve.

Parameter	Calibration Approach
Muskingum Routing Parameters	<p>For areas of the model that included Muskingum routing, the Muskingum k, X and subreach values were adjusted as needed. Calibration of the routing parameters focused on storms that fell near the upstream end of the watershed and were routed downstream with little intervening local flow. The Muskingum k values were adjusted to match the timing of the observed peak flow at the gage, while the Muskingum X values were adjusted to match the relative flatness or steepness of the hydrograph. Finally, adjustments to the number of subreaches were made in order to match the amount of attenuation in the peak flow that occurred from the upstream end of a reach to the downstream gage.</p>

1.4.2 Calibrated Parameters

The resulting calibrated subbasin and routing reach parameters that were adjusted for each storm event are shown in Tables 12 through 22.

Table 12: Calibrated Initial Losses (inches)

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S020				1.9			3						2.2	2.2		1.5	
West_Fork_S010				1.9			2.2						2.2	2.2		1.5	
West_Fork_S030				1.9			3						2.2	2.2		1.5	
West_Fork_S040				2.2			3						2.2	2.2		1.5	
West_Fork_S050				2.2			3						1.5	2.2		1.5	
West_Fork_S060				2.2			3						2.2	2.2		1.5	
West_Fork_S070				2.2			3						1.5	2.2		0.8	
West_Fork_S080				2.2			3						1.5	2.2		0.8	
West_Fork_S090				2.2			3						1.5	2.2		0.8	
West_Fork_S100				2.2			3						1.5	2.2		0.8	
West_Fork_S120				2.4			2.7						2.5	2.7		2.4	
West_Fork_S110				2.4			2.7						2.5	2.7		2.4	
Big_Cleveland_S010				2.4			2.7						2.5	2.2		2.4	
Big_Cleveland_S020				2.4			2.7						1.3	2.7		2.4	
West_Fork_S130				3			2.2						1.5	2.9		1	
Lost_Ck_S010				2.2			1.3						2.5	2.3		1.1	
Lost_Ck_S020				2.9			1.2						5	2		0.8	
West_Fork_S140				2.9			1.2						3	2		0.8	
West_Fork_S150				2.9			1.2						5	2		0.8	
West_Fork_S160				2.9			1.2						5	2		0.8	
Beans_Ck_S010				2.9			1.2						5	2		0.8	
Beans_Ck_S020				2.9			1.2						5	2		0.8	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Big_Ck_S010				2.9			1.2						3.5	2		0.8	
Big_Ck_S030				2.9			1.2						5	2		0.8	
Big_Ck_S020				2.9			1.2						5	2		0.8	
Bridgeport_S030				2.9			1.2						5	2		0.8	
Bridgeport_S010				2.9			1.2						5	2		0.8	
Bridgeport_S040				2.9			1.2						5	2		0.8	
Bridgeport_S020				2.9			1.2						5	2		0.8	
West_Fork_S170				1.6			0.8						5	5		2.2	
Dry_Ck_S010				1.6			0.8						5	5		2.2	
West_Fork_S180				1.6			0.8						5	5		2.2	
Amon_G_Carter_S030				2.2			1.3						3.5	1.5		0.9	
Amon_G_Carter_S010				2.2			1.3						3.5	1.5		0.9	
Amon_G_Carter_S020				2.2			1.3						3.5	1.5		0.9	
Big_Sandy_Ck_S010				1.5			1.6						0.5	2.5		1.5	
Big_Sandy_Ck_S020				1.5			2.5						1.7	2.5		1.5	
Brushy_Ck_S010				1.5			1.6						0.5	2.5		1.5	
Brushy_Ck_S020				1.5			2.5						2	2.5		1.5	
Brushy_Ck_S030				1.5			2.5						1.8	2.5		1.5	
Big_Sandy_Ck_S030				1.5			0.8						1.6	2.5		1.5	
Big_Sandy_Ck_S040				1.5			0.8						1.6	2.5		1.5	
Big_Sandy_Ck_S050				1.6			0.8						5	5		2.2	
West_Fork_S190				1.5			0.8						5	5		2.2	
West_Fork_S200				1.5			0.8						5	5		2.2	
Garrett_Ck_S020				1			0.8						5	5		2.2	
Garrett_Ck_S010				1			0.8						5	5		2.2	
Garrett_Ck_S030				1			0.8						5	5		2.2	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Salt_Ck_S010				1			0.8						5	5		2.2	
Salt_Ck_S020				1			0.8						5	5		2.2	
West_Fork_S210				1.5			2						5	3.5		2.4	
West_Fork_S220				2			0.3						4.5	2.5		2	
Eagle_Mountain_S010				2.5			0.3						4.5	2.5		2.5	
Eagle_Mountain_S020				2.5			0.3						4.5	2.5		2.5	
Walnut_Ck_S020				1.2			0.92						2	2.2		1.7	
Walnut_Ck_S010				1.2			0.92						2	2.2		3.7	
Walnut_Ck_S030				2			0.3						4.5	2.5		2.5	
Eagle_Mountain_S040				3			0.3						4.5	2.5		2.5	
Eagle_Mountain_S030				3			0.3						4.5	2.5		2.5	
Silver_Ck_S020				3.3			2.25						3.5	3		3	
Silver_Ck_S010				3.3			2.25						4.5	3		3	
Lake_Worth_S010				3.3			2.25						3.5	3		3	
Lake_Worth_S020				3.3			2.25						3.5	3		3	
West_Fork_S230				2			2						3	3		1.7	
Lk_Weatherford_S010				2.6			2.2						3.2	3.8		3	
Lk_Weatherford_S020				2.3			2.2						2.5	3.5		2.5	
Clear_Fork_S010				2.8			0.65						3	3		2.5	
Clear_Fork_S020				2.5			0.65						3	3		2.5	
Bear_Ck_S010				2.4			0.65						3	3		2.5	
Bear_Ck_S020				2.3			0.65						3	3		2.5	
Benbrook_S010				2.3			0.65						3	3		2.5	
Benbrook_S020				2.3			0.65						3	3		2.5	
Benbrook_S030				2.3			0.65						3	3		2.5	
Clear_Fork_S030				2			2.5						1	2.6		1.5	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Marys_Ck_S010			2.5	2.3			0.5						3.6	3.1		0.9	
Clear_Fork_S040				2			2.5						1.1	2.6		1.4	
Clear_Fork_S050				2			1.8						3	3		1.7	
West_Fork_S240				0			0						0.6	3		0.1	
Marine_Ck_S020				0			0						0.6	3		0.1	
Marine_Ck_S010				0			0						0.4	3		0.1	
West_Fork_S250				0			0						0.6	3		0.1	
West_Fork_S260				0			0						0.4	2.2		0.1	
West_Fork_S270				0			3						0.5	2.5		3.5	
Big_Fossil_Ck_S010				0			3						0.5	2.5		3.5	
LittleFossil_Ck_S010				0			3						0.5	2.5		3.5	
West_Fork_S280				3			3						0.5	2.5		3.5	
Village_Ck_S010				1			1.6						2.2	2.5		2.3	
Village_Ck_S020				2			0.5						1.5	3.5		0.5	
Lake_Arlington_S010				2			0.5						1.5	3.5		0.5	
Village_Ck_S030				3			3						0.5	2.5		3.5	
West_Fork_S290				2.5			2						3	1		0.5	
West_Fork_S300				2.5			2						3	1		0.5	
West_Fork_S310				2.5			2						3	1		0.5	
West_Fork_S320	3											2				3	
Big_Bear_Ck_S010	4											2				1.7	
Big_Bear_Ck_S020	3											2				3	
West_Fork_S330	3											2				3	
Joe_Pool_S020	1											3.5				1	
Joe_Pool_S030	0.4											3.7				2	
Joe_Pool_S040	0.2											3.5				0.2	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Joe_Pool_S010	0.6											3.2				0.7	
Joe_Pool_S050	0.2											3.5				0.2	
Mountain_Ck_S010	1.6											5				2.5	
Mountain_Ck_S020	1.6											5				2.5	
Mountain_Ck_S030	3											2				3	
West_Fork_S340	3											3				3	
Elm_Fork_S020	1							2				2				1.3	
Elm_Fork_S010	1							2				2				1.3	
Brushy_Elm_Ck_S010	1							2				2				1.2	
Brushy_Elm_Ck_S020	1							2				2				1.2	
Elm_Fork_S030	0.5							1.5				2				1.2	
Elm_Fork_S040	0.5							1.2				2.7				1	
Elm_Fork_S050	0.5							1.5				2				1	
Elm_Fork_S070	0.5							1.5				2				1	
Elm_Fork_S060	0.5							1.5				2				1	
Spring_Ck_S010	0.5							4.5				2				1	
Spring_Ck_S020	0.5							4				2				1	
Ray_Roberts_S010	0.5							5				2				1	
Timber_Ck_S010	0.5							1.6				2.9				2	
Timber_Ck_S030	0.5							1.5				2				1	
Timber_Ck_S020	0.5							4.5				2				1	
Ray_Roberts_S030	0.5							4				2				1	
Range_Ck_S010	0.5							1				2.84				0.9	
Range_Ck_S020	0.5							1.5				2				1	
Lake_Kiowa_S020	0.5							4				2				1	
Lake_Kiowa_S010	0.5							1.5				2				1	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Ray_Roberts_S020	0.5							4				2				1	
Range_Ck_S030	0.5							4				2				1	
Buck_Ck_S010	0.5							4.5				2				1	
Ray_Roberts_S050	0.5							4.5				2				1	
Ray_Roberts_S040	0.5							5				2				1	
Ray_Roberts_S060	0.5							4.5				2				1	
Timber_Ck_S040	0.5							4.5				2				1	
Elm_Fork_S080	0.1							2				2.8				2.5	
Clear_Ck_S010	0.3							1.5				1.45				2.5	
Clear_Ck_S020	0.3							1.5				1.45				2.5	
Clear_Ck_S030	0.3							1.5				1.45				2.5	
Clear_Ck_S040	0.3							3				2				2.5	
Clear_Ck_S050	0.3							3				2				2.5	
Clear_Ck_S070	0.3							2.5				1.45				2	
Clear_Ck_S060	0.5							2.5				1.45				1	
Clear_Ck_S080	0.3							3				2				0.8	
Clear_Ck_S090	0.3							3				2				1.4	
Clear_Ck_S110	0.3							2				2.8				2.5	
Clear_Ck_S100	0.3							2				2.8				2.5	
Clear_Ck_S120	0.3							2				2.8				2.5	
Little_Elm_Ck_S010	0.3							3.75				3.5				2.5	
Little_Elm_Ck_S020	0.3							1.3				3.7				2.5	
Little_Elm_Ck_S030	0.1							3				3				2.5	
Pecan_Ck_S010	0.1							3				3				2.5	
Doe_Branch_S010	0.1							0.35				2.7				2	
Doe_Branch_S020	0.1							2				3				2.7	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Lewisville_S030	0.1							2				3				2.5	
Hickory_Ck_S020	0.3							2				2.3				1.2	
Hickory_Ck_S010	0.3							2				2.9				1.2	
Hickory_Ck_S030	0.3							2				2.8				1.2	
Hickory_Ck_S040	0.3							2				2.1				1.4	
Hickory_Ck_S050	0.1							2				3				2.5	
Lewisville_S010	0.1							2				3				2.5	
Lewisville_S040	0.1							2				3				2.5	
Lewisville_S050	0.1							2				3				2.5	
Lewisville_S020	0.1							2				3				2.5	
Elm_Fork_S090	3											5				4.2	
Elm_Fork_S110	3.95											5.5				4.1	
Elm_Fork_S100	3											5.5				4.2	
Elm_Fork_S120	4.5											5.5				4.5	
Denton_Ck_S010	0.7							1				3				2	
Denton_Ck_S020	0.7							1				3				3	
Denton_Ck_S030	0.4							1				3				3	
Denton_Ck_S040	0.35							2.1				2.5				1.3	
Denton_Ck_S050	0.5							1.4				2.7				1.3	
Denton_Ck_S060	0.5							1.4				2.7				1.3	
Denton_Ck_S070	0.5							1.4				2.7				1.3	
Grapevine_S010	0.5							1.4				2.4				1	
Denton_Ck_S080	3.5											5				3.6	
Elm_Fork_S130	4											5.5				3	
Hackberry_Ck_S010	3											5.5				3.5	
Hackberry_Ck_S020	3											5.5				3	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Hackberry_Ck_S030	3											5				3	
Elm_Fork_S140	5											5				4	
Elm_Fork_S150	3											3				3	
Bachman_Branch_S010	3											2				3	
Bachman_Branch_S020	3											2				3	
Elm_Fork_S160	3											2				3	
Trinity_River_S010	4											4				3	
Trinity_River_S020	5											6				5	
White_Rock_Ck_S010	0.5											5				3	
White_Rock_Ck_S020	3											5				2	
White_Rock_Ck_S030	3											5				2	
White_Rock_Ck_S040	3											5				2	
Trinity_River_S030	3											5				3	
Fivemile_Ck_S010									1			1.5				0.8	
Trinity_River_S040									1			1.5				0.8	
Trinity_River_S050									1			1.5				0.8	
Tenmile_Ck_S010									1			1.5				0.8	
Tenmile_Ck_S020									1			1.5				0.8	
Trinity_River_S060									1			1.5				0.5	
Indian_Ck_S010								0					0.5			1	1.5
Indian_Ck_S030								1.5					1.5			1.5	
Indian_Ck_S020								1.5					1.5			1.5	
Indian_Ck_S040								1.5					1.5			1.5	
Sister_Grove_S010								0.1					0.8			1	
Sister_Grove_S020								1.5					1.5			1.5	
East_Fork_S020								1.5					0			0	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
East_Fork_S010								1.5					0			0	
East_Fork_S030								0.5					0			0	
East_Fork_S040								1.5					1.5			1.5	
Wilson_Ck_S010								1.5					1.5			1.5	
Lavon_S010								1.5					1.5			1.5	
Lavon_S020								1.5					1.5			1.5	
Rowlett_Ck_S010								0.5					1			1.2	
Ray_Hubbard_S010								0.5					1.5			2	
Ray_Hubbard_S020								0.5					1.5			2	
East_Fork_S050								0.4					0			0	
East_Fork_S070					1.5			2				8					
East_Fork_S060					1.5			2				8					
East_Fork_S080					1.5			2				8					
East_Fork_S090					1.5			2				8					
East_Fork_S110					1.5			2				8					
East_Fork_S100					1.5			2				8					
Trinity_River_S070									1.5			2				0.5	
East_Fork_S120									1.5			2				1	
Kings_Ck_S020													0.4			0.6	0.8
Kings_Ck_S010													0.3			0.4	0.8
Kings_Ck_S030								1.6					1.2			1.2	0
Cedar_Ck_S040								1.6					3			1.2	0
Cedar_Ck_S010								1					0.4				0.8
New_Terrell_City_Lake_S010								3					1			0	0
Cedar_Ck_S020								1.6					1.2			1.2	0
Cedar_Ck_S030								1.6					1.2			1.2	0

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Trinity_River_S080									2				3				2
Trinity_River_S090								2					2.5			2	
Chambers_Ck_S010										4.1	0		1.2		3		
Chambers_Ck_S020										4.2	0		1.2		3		
Chambers_Ck_S040										4	0		1.2		3.5		
Chambers_Ck_S030										4	0		1.2		3.5		
Waxahachie_Ck_S010										5	0.15		3		1.5		
Waxahachie_Ck_S020										3.2	0		1.2		1		
Waxahachie_Ck_S030										4.5	0		2		2		
Mustang_Ck_S010										4.5	0		2		2		
Bardwell_S010										4.5	0		2		2		
Chambers_Ck_S050										4	0.1		2		3.5		
Chambers_Ck_S060										3.5	0.1		2		3.5		
Chambers_Ck_S070										3.5	0.1		2.5		5		
Chambers_Ck_S080										0	0		3		2		
Post_Oak_Ck_S010										0	0		3		2		
Lake_Halbert_S010										1.2	0		0.01		0		
Navarro_Mills_S020										2.2	0.02		2		1.5		
Navarro_Mills_S030										2.2	0.02		2		1.5		
Navarro_Mills_S010										2.98	0.2		4.3		1.5		
Navarro_Mills_S040										2.2	0.02		1		1.5		
Richland_Ck_S010										0	0		3		2		
Richland_Ck_S020										0	0		3		2		
Richland-Chambers_S010										0	0		3		2		
Richland-Chambers_S020										0	0		3		2		
Tehuacana_Ck_S020								2					2.5			2	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Tehuacana_Ck_S010					0.1				0.1				0.1				0.1
Trinity_River_S100								1					2.5			2	
Fairfield_Lake_S010								1					2.5			2	
Trinity_River_S110								1					2.5			2	
Big_Brown_Ck_S010								1					2.5			2	
Trinity_River_S120													2.5			2	
Trinity_River_S130									2				2			2	
Upper_Keechi_Ck_S030									2				2			2	
Upper_Keechi_Ck_S010									0.8				1.5				1.4
Upper_Keechi_Ck_S020									2				2			2	
Upper_Keechi_Ck_S040									2				2			2	
Trinity_River_S140									2				2			2	
Little_Elkhart_S010									2				2			2	
Houston_County_Lake_S010					5								5			0	
Trinity_River_S150									2				2			2	
Trinity_River_S160					0.6			2					0.6				0.5
Trinity_River_S170					0.6			2					0.6				0.5
Trinity_River_S180					0.6			2					0.6				0.5
Bedias_Ck_S010													0				0.6
Bedias_Ck_S020					0.6			2					0.6				0.5
Trinity_River_S190					0.6			2					0.6				0.5
Livingston_S010					0.6			2					0.6				0.5
Livingston_S030					0.6			2					0.6				0.5
Livingston_S020					0.6			2					0.6				0.5
Trinity_River_S200								0					3.5			1	
Long_King_Ck_S010		0.9			1.2	1.6											

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Long_King_Ck_S020								0					3.5			1	
Trinity_River_S210								0					3.5			1	
Menard_Ck_S010		0.1				1.4							0.1				
Trinity_River_S220								0					3.5			1	
Trinity_River_S230								0					1.5			1	
Trinity_River_S240								0					1.5			1	
Trinity_River_S250								0					1.5			1	

Table 13: Calibrated Constant Losses (inches per hour)

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S020				0.14			0.22						0.25	0.16		0.06	
West_Fork_S010				0.14			0.22						0.25	0.16		0.06	
West_Fork_S030				0.14			0.22						0.17	0.12		0.06	
West_Fork_S040				0.14			0.22						0.2	0.14		0.06	
West_Fork_S050				0.14			0.22						0.23	0.16		0.06	
West_Fork_S060				0.14			0.22						0.22	0.14		0.06	
West_Fork_S070				0.14			0.2						0.26	0.16		0.04	
West_Fork_S080				0.14			0.2						0.2	0.14		0.04	
West_Fork_S090				0.14			0.2						0.27	0.16		0.04	
West_Fork_S100				0.14			0.2						0.23	0.16		0.04	
West_Fork_S120				0.18			0.16						0.23	0.24		0.05	
West_Fork_S110				0.18			0.16						0.29	0.24		0.05	
Big_Cleveland_S010				0.18			0.16						0.23	0.24		0.05	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Big_Cleveland_S020				0.18			0.16						0.24	0.24		0.05	
West_Fork_S130				0.3			0.1						0.5	0.14		0.06	
Lost_Ck_S010				0.225			0.02						0.5	0.08		0.04	
Lost_Ck_S020				0.22			0.26						0.5	0.25		0.15	
West_Fork_S140				0.22			0.26						0.5	0.25		0.15	
West_Fork_S150				0.22			0.26						0.5	0.25		0.15	
West_Fork_S160				0.22			0.26						0.5	0.25		0.15	
Beans_Ck_S010				0.22			0.26						0.5	0.25		0.15	
Beans_Ck_S020				0.22			0.26						0.5	0.25		0.15	
Big_Ck_S010				0.22			0.26						0.5	0.26		0.15	
Big_Ck_S030				0.22			0.26						0.5	0.26		0.15	
Big_Ck_S020				0.22			0.26						0.5	0.26		0.15	
Bridgeport_S030				0.22			0.26						0.5	0.25		0.15	
Bridgeport_S010				0.22			0.26						0.5	0.26		0.15	
Bridgeport_S040				0.22			0.26						0.5	0.25		0.15	
Bridgeport_S020				0.22			0.26						0.5	0.25		0.15	
West_Fork_S170				0.22			0.4						0.45	0.5		0.12	
Dry_Ck_S010				0.22			0.4						0.45	0.5		0.12	
West_Fork_S180				0.42			0.4						0.45	0.5		0.19	
Amon_G_Carter_S030				0.2			0.16						0.28	0.13		0.05	
Amon_G_Carter_S010				0.2			0.16						0.2	0.13		0.06	
Amon_G_Carter_S020				0.2			0.16						0.28	0.13		0.06	
Big_Sandy_Ck_S010				0.14			0.04						0.3	0.2		0.05	
Big_Sandy_Ck_S020				0.14			0.09						0.2	0.2		0.07	
Brushy_Ck_S010				0.14			0.04						0.3	0.19		0.05	
Brushy_Ck_S020				0.14			0.12						0.22	0.23		0.07	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Brushy_Ck_S030				0.14			0.12						0.23	0.25		0.2	
Big_Sandy_Ck_S030				0.14			0.32						0.2	0.24		0.2	
Big_Sandy_Ck_S040				0.14			0.32						0.2	0.26		0.2	
Big_Sandy_Ck_S050				0.42			0.4						0.45	0.5		0.19	
West_Fork_S190				0.42			0.4						0.45	0.5		0.19	
West_Fork_S200				0.18			0.32						0.5	0.5		0.2	
Garrett_Ck_S020				0.23			0.32						0.5	0.5		0.16	
Garrett_Ck_S010				0.23			0.32						0.5	0.5		0.16	
Garrett_Ck_S030				0.26			0.32						0.5	0.5		0.18	
Salt_Ck_S010				0.26			0.32						0.5	0.5		0.18	
Salt_Ck_S020				0.28			0.32						0.5	0.5		0.2	
West_Fork_S210				0.08			0.32						0.17	0.16		0.22	
West_Fork_S220				0.16			0.36						0.5	0.16		0.09	
Eagle_Mountain_S010				0.16			0.36						0.5	0.16		0.09	
Eagle_Mountain_S020				0.16			0.36						0.5	0.16		0.09	
Walnut_Ck_S020				0.01			0.26						0.1	0.17		0.08	
Walnut_Ck_S010				0.01			0.24						0.1	0.16		0.07	
Walnut_Ck_S030				0.16			0.36						0.5	0.3		0.09	
Eagle_Mountain_S040				0.16			0.36						0.5	0.3		0.09	
Eagle_Mountain_S030				0.16			0.36						0.5	0.45		0.09	
Silver_Ck_S020				0.01			0.5						0.2	0.2		0.12	
Silver_Ck_S010				0.01			0.5						0.2	0.2		0.12	
Lake_Worth_S010				0.01			0.5						0.2	0.2		0.12	
Lake_Worth_S020				0.01			0.5						0.2	0.2		0.12	
West_Fork_S230				0.2			0.14						0.15	0.09		0.08	
Lk_Weatherford_S010				0.23			0.24						0.48	0.32		0.16	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Lk_Weatherford_S020				0.22			0.13						0.24	0.18		0.14	
Clear_Fork_S010				0.09			0.26						0.23	0.11		0.09	
Clear_Fork_S020				0.09			0.15						0.17	0.09		0.09	
Bear_Ck_S010				0.09			0.23						0.18	0.08		0.07	
Bear_Ck_S020				0.09			0.22						0.14	0.07		0.06	
Benbrook_S010				0.09			0.13						0.12	0.05		0.04	
Benbrook_S020				0.09			0.22						0.14	0.07		0.06	
Benbrook_S030				0.09			0.19						0.1	0.04		0.03	
Clear_Fork_S030				0.12			0.14						0.12	0.12		0.08	
Marys_Ck_S010			0.5	0.15			0.01						0.3	0.1		0.01	
Clear_Fork_S040				0.12			0.14						0.24	0.08		0.05	
Clear_Fork_S050				0.2			0.1						0.15	0.07		0.08	
West_Fork_S240				0.11			0.01						0.05	0.24		0.04	
Marine_Ck_S020				0.04			0.01						0.05	0.24		0.04	
Marine_Ck_S010				0.03			0.01						0.05	0.24		0.04	
West_Fork_S250				0.07			0.01						0.05	0.24		0.04	
West_Fork_S260				0.05			0.01						0.08	0.16		0.04	
West_Fork_S270				0.12			0.16						0.3	0.16		0.07	
Big_Fossil_Ck_S010				0.12			0.16						0.3	0.16		0.07	
LittleFossil_Ck_S010				0.12			0.16						0.3	0.16		0.07	
West_Fork_S280				0.12			0.16						0.2	0.16		0.07	
Village_Ck_S010				0.05			0.16						0.12	0.16		0.04	
Village_Ck_S020				0.01			0.01						0.12	0.15		0.03	
Lake_Arlington_S010				0.01			0.01						0.12	0.13		0.02	
Village_Ck_S030				0.12			0.16						0.2	0.16		0.07	
West_Fork_S290				0.12			0.16						0.3	0.15		0.2	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S300				0.12			0.16						0.3	0.15		0.2	
West_Fork_S310				0.12			0.16						0.3	0.15		0.2	
West_Fork_S320	0.2											0.2				0.3	
Big_Bear_Ck_S010	0.1											0.2				0.08	
Big_Bear_Ck_S020	0.2											0.2				0.3	
West_Fork_S330	0.2											0.2				0.3	
Joe_Pool_S020	0.01											0.1				0.04	
Joe_Pool_S030	0.06											0.09				0.03	
Joe_Pool_S040	0.01											0.05				0.03	
Joe_Pool_S010	0.01											0.04				0.04	
Joe_Pool_S050	0.01											0.05				0.03	
Mountain_Ck_S010	0.1											0.2				0.06	
Mountain_Ck_S020	0.1											0.2				0.06	
Mountain_Ck_S030	0.2											0.2				0.3	
West_Fork_S340	0.3											0.3				0.3	
Elm_Fork_S020	0.04							0.3				0.25				0.1	
Elm_Fork_S010	0.04							0.3				0.25				0.1	
Brushy_Elm_Ck_S010	0.04							0.3				0.2				0.1	
Brushy_Elm_Ck_S020	0.03							0.2				0.2				0.02	
Elm_Fork_S030	0.03							0.15				0.28				0.1	
Elm_Fork_S040	0.02							0.01				0.28				0.02	
Elm_Fork_S050	0.04							0.05				0.25				0.02	
Elm_Fork_S070	0.04							0.05				0.25				0.02	
Elm_Fork_S060	0.03							0.05				0.25				0.02	
Spring_Ck_S010	0.03							0.15				0.25				0.02	
Spring_Ck_S020	0.03							0.15				0.25				0.02	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Ray_Roberts_S010	0.04							0.2				0.25				0.1	
Timber_Ck_S010	0.01							0.04				0.1				0.02	
Timber_Ck_S030	0.03							0.05				0.25				0.02	
Timber_Ck_S020	0.03							0.05				0.25				0.02	
Ray_Roberts_S030	0.04							0.1				0.25				0.02	
Range_Ck_S010	0.03							0.05				0.11				0.02	
Range_Ck_S020	0.04							0.05				0.25				0.02	
Lake_Kiowa_S020	0.04							0.15				0.25				0.02	
Lake_Kiowa_S010	0.04							0.15				0.25				0.02	
Ray_Roberts_S020	0.03							0.15				0.25				0.02	
Range_Ck_S030	0.04							0.15				0.25				0.02	
Buck_Ck_S010	0.04							0.15				0.25				0.02	
Ray_Roberts_S050	0.03							0.15				0.25				0.02	
Ray_Roberts_S040	0.04							0.2				0.25				0.02	
Ray_Roberts_S060	0.04							0.15				0.25				0.02	
Timber_Ck_S040	0.03							0.15				0.25				0.02	
Elm_Fork_S080	0.01							0.2				0.35				0.02	
Clear_Ck_S010	0.12							0.2				0.4				0.05	
Clear_Ck_S020	0.12							0.2				0.4				0.05	
Clear_Ck_S030	0.12							0.2				0.4				0.05	
Clear_Ck_S040	0.12							0.2				0.24				0.15	
Clear_Ck_S050	0.12							0.25				0.24				0.2	
Clear_Ck_S070	0.12							0.2				0.2				0.2	
Clear_Ck_S060	0.12							0.2				0.2				0.1	
Clear_Ck_S080	0.08							0.35				0.1				0.07	
Clear_Ck_S090	0.08							0.35				0.1				0.06	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Clear_Ck_S110	0.01							0.2				0.35				0.02	
Clear_Ck_S100	0.01							0.2				0.35				0.02	
Clear_Ck_S120	0.01							0.2				0.35				0.02	
Little_Elm_Ck_S010	0.1							0.04				0.18				0.07	
Little_Elm_Ck_S020	0.1							0.2				0.18				0.04	
Little_Elm_Ck_S030	0.01							0.2				0.35				0.02	
Pecan_Ck_S010	0.01							0.2				0.35				0.02	
Doe_Branch_S010	0.01							0.15				0.2				0.2	
Doe_Branch_S020	0.01							0.15				0.35				0.02	
Lewisville_S030	0.01							0.15				0.35				0.02	
Hickory_Ck_S020	0.01							0.2				0.06				0.03	
Hickory_Ck_S010	0.01							0.2				0.06				0.03	
Hickory_Ck_S030	0.01							0.2				0.08				0.03	
Hickory_Ck_S040	0.01							0.2				0.18				0.09	
Hickory_Ck_S050	0.01							0.2				0.35				0.02	
Lewisville_S010	0.01							0.1				0.35				0.02	
Lewisville_S040	0.01							0.1				0.35				0.02	
Lewisville_S050	0.01							0.1				0.35				0.02	
Lewisville_S020	0.01							0.1				0.35				0.02	
Elm_Fork_S090	0.05											0.5				0.04	
Elm_Fork_S110	0.05											0.5				0.06	
Elm_Fork_S100	0.05											0.5				0.04	
Elm_Fork_S120	0.05											0.5				0.04	
Denton_Ck_S010	0.22							0.15				0.28				0.2	
Denton_Ck_S020	0.28							0.15				0.28				0.02	
Denton_Ck_S030	0.1							0.15				0.29				0.02	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Denton_Ck_S040	0.01							0.23				0.18				0.02	
Denton_Ck_S050	0.03							0.15				0.15				0.1	
Denton_Ck_S060	0.02							0.15				0.14				0.09	
Denton_Ck_S070	0.02							0.15				0.15				0.04	
Grapevine_S010	0.02							0.21				0.12				0.02	
Denton_Ck_S080	0.05											0.5				0.06	
Elm_Fork_S130	0.1											0.5				0.04	
Hackberry_Ck_S010	0.05											0.5				0.04	
Hackberry_Ck_S020	0.05											0.5				0.04	
Hackberry_Ck_S030	0.05											0.5				0.04	
Elm_Fork_S140	0.15											0.5				0.04	
Elm_Fork_S150	0.3											0.3				0.3	
Bachman_Branch_S010	0.1											0.1				0.3	
Bachman_Branch_S020	0.1											0.1				0.3	
Elm_Fork_S160	0.2											0.1				0.3	
Trinity_River_S010	0.3											0.3				0.3	
Trinity_River_S020	0.3											0.5				0.3	
White_Rock_Ck_S010	0.02											0.5				0.02	
White_Rock_Ck_S020	0.05											0.5				0.02	
White_Rock_Ck_S030	0.05											0.5				0.02	
White_Rock_Ck_S040	0.15											0.5				0.15	
Trinity_River_S030	0.15											0.5				0.1	
Fivemile_Ck_S010									0.12			0.35				0.22	
Trinity_River_S040									0.12			0.35				0.22	
Trinity_River_S050									0.12			0.35				0.22	
Tenmile_Ck_S010									0.12			0.35				0.22	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Tenmile_Ck_S020									0.12			0.35				0.22	
Trinity_River_S060									0.12			0.35				0.16	
Indian_Ck_S010								0.08					0.08			0.18	0.18
Indian_Ck_S030								0.12					0.11			0.05	
Indian_Ck_S020								0.12					0.08			0.02	
Indian_Ck_S040								0.12					0.08			0.04	
Sister_Grove_S010								0.2					0.14			0.19	
Sister_Grove_S020								0.12					0.08			0.07	
East_Fork_S020								0.08					0.55			0.28	
East_Fork_S010								0.08					0.55			0.28	
East_Fork_S030								0.08					0.4			0.3	
East_Fork_S040								0.08					0.06			0.05	
Wilson_Ck_S010								0.08					0.06			0.06	
Lavon_S010								0.08					0.06			0.02	
Lavon_S020								0.08					0.06			0.04	
Rowlett_Ck_S010								0.06					0.1			0.02	
Ray_Hubbard_S010								0.05					0.15			0.03	
Ray_Hubbard_S020								0.05					0.15			0.03	
East_Fork_S050								0.01					0.03			0.03	
East_Fork_S070					0.08			0.04				0.2					
East_Fork_S060					0.08			0.04				0.2					
East_Fork_S080					0.08			0.04				0.2					
East_Fork_S090					0.08			0.04				0.2					
East_Fork_S110					0.1			0.04				0.25					
East_Fork_S100					0.08			0.04				0.2					
Trinity_River_S070									0.2			0.35				0.22	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
East_Fork_S120									0.2			0.35				0.13	
Kings_Ck_S020													0.05			0.03	0.08
Kings_Ck_S010													0.05			0.01	0.09
Kings_Ck_S030								0.06					0.4			0.02	0.2
Cedar_Ck_S040								0.1					0.4			0.02	0.24
Cedar_Ck_S010								0.05					0.03				0.04
New_Terrell_City_Lake_S010								0.06					0.06			0	0.03
Cedar_Ck_S020								0.06					0.4			0.02	0.2
Cedar_Ck_S030								0.06					0.4			0.02	0.2
Trinity_River_S080									0.06				0.1				0.05
Trinity_River_S090								0.04					0.16			0.28	
Chambers_Ck_S010										0.04	0		0.15		0.24		
Chambers_Ck_S020										0.04	0		0.15		0.24		
Chambers_Ck_S040										0.35	0		0.1		0.16		
Chambers_Ck_S030										0.3	0		0.1		0.16		
Waxahachie_Ck_S010										0.1	0.22		0.1		0.65		
Waxahachie_Ck_S020										0.1	0		0.1		0.5		
Waxahachie_Ck_S030										0.01	0.05		0.2		0.3		
Mustang_Ck_S010										0.01	0.05		0.2		0.3		
Bardwell_S010										0.01	0.05		0.2		0.3		
Chambers_Ck_S050										0.15	0		0.1		0.24		
Chambers_Ck_S060										0.15	0		0.1		0.24		
Chambers_Ck_S070										0.15	0		0.1		0.4		
Chambers_Ck_S080										0.1	0.01		0.4		0.1		
Post_Oak_Ck_S010										0.1	0.01		0.4		0.1		
Lake_Halbert_S010										0.22	0.01		0.11		0.01		

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Navarro_Mills_S020										0.45	0.01		0.08		0.1		
Navarro_Mills_S030										0.45	0.01		0.08		0.1		
Navarro_Mills_S010										0.01	0.13		0.12		0.6		
Navarro_Mills_S040										0.45	0.01		0.08		0.1		
Richland_Ck_S010										0.1	0.01		0.4		0.1		
Richland_Ck_S020										0.1	0.01		0.4		0.1		
Richland-Chambers_S010										0.1	0.01		0.4		0.1		
Richland-Chambers_S020										0.1	0.01		0.4		0.1		
Tehuacana_Ck_S020								0.04					0.16			0.28	
Tehuacana_Ck_S010					0.01				0				0.01				0.05
Trinity_River_S100								0.04					0.16			0.28	
Fairfield_Lake_S010								0.04					0.16			0.28	
Trinity_River_S110								0.04					0.16			0.28	
Big_Brown_Ck_S010								0.04					0.16			0.32	
Trinity_River_S120													0.16			0.32	
Trinity_River_S130									0.4				0.24			0.3	
Upper_Keechi_Ck_S030									0.4				0.24			0.3	
Upper_Keechi_Ck_S010									0.1				0.3				0.04
Upper_Keechi_Ck_S020									0.4				0.24			0.3	
Upper_Keechi_Ck_S040									0.4				0.24			0.3	
Trinity_River_S140									0.4				0.24			0.3	
Little_Elkhart_S010									0.4				0.24			0.3	
Houston_County_Lake_S010					0.08								0.4			0.3	
Trinity_River_S150									0.4				0.24			0.3	
Trinity_River_S160					0.22			0.32					0.2				0.1
Trinity_River_S170					0.22			0.32					0.2				0.1

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Trinity_River_S180					0.22			0.32					0.2				0.1
Bedias_Ck_S010													0.01				0.02
Bedias_Ck_S020					0.22			0.32					0.2				0.1
Trinity_River_S190					0.22			0.32					0.2				0.1
Livingston_S010					0.22			0.32					0.2				0.1
Livingston_S030					0.22			0.32					0.2				0.1
Livingston_S020					0.22			0.32					0.2				0.1
Trinity_River_S200								0.32					0.4			0.2	
Long_King_Ck_S010		0.12			0.12	0.15											
Long_King_Ck_S020								0.32					0.4			0.2	
Trinity_River_S210								0.32					0.4			0.2	
Menard_Ck_S010		0.01				0.26							0.7				
Trinity_River_S220								0.32					0.4			0.2	
Trinity_River_S230								0.2					0.07			0.21	
Trinity_River_S240								0.2					0.07			0.21	
Trinity_River_S250								0.2					0.07			0.21	

Table 14: Calibrated Snyder's Lag Time (hours)

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S020				7.6			7.6						7.6	7.6		7.6	
West_Fork_S010				6.2			6.2						6.2	6.2		6.2	
West_Fork_S030				8.6			8.6						8.6	8.6		8.6	
West_Fork_S040				7.6			7.6						7.6	7.6		6.6	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S050				6.2			6.2						6.2	6.2		4.5	
West_Fork_S060				8.7			8.7						8.7	7.8		6.7	
West_Fork_S070				6.7			6.7						7.0	6.7		7.0	
West_Fork_S080				4.3			4.3						4.3	4.3		4.3	
West_Fork_S090				7.3			7.3						7.1	7.3		7.1	
West_Fork_S100				7.2			6.1						6.1	7.2		6.1	
West_Fork_S120				8.5			8.5						8.5	8.5		8.5	
West_Fork_S110				7.6			7.6						6.4	7.6		6.4	
Big_Cleveland_S010				7.7			7.7						7.7	7.7		7.7	
Big_Cleveland_S020				7.4			7.4						6.4	7.4		6.4	
West_Fork_S130				5.0			5.0						3.5	5.0		5.0	
Lost_Ck_S010				4.0			4.0						4.0	4.0		4.8	
Lost_Ck_S020				4.4			4.4						3.6	3.6		3.6	
West_Fork_S140				5.4			5.4						5.0	5.0		5.0	
West_Fork_S150				6.1			6.1						5.5	5.5		5.5	
West_Fork_S160				5.1			5.1						5.2	5.2		5.2	
Beans_Ck_S010				5.0			5.0						4.7	4.7		4.7	
Beans_Ck_S020				3.1			3.1						2.2	2.2		2.2	
Big_Ck_S010				5.6			5.6						5.6	5.6		5.6	
Big_Ck_S030				4.2			4.2						3.7	3.7		3.7	
Big_Ck_S020				4.1			4.1						3.3	3.3		3.3	
Bridgeport_S030				6.2			6.2						6.1	6.1		6.1	
Bridgeport_S010				5.3			5.3						5.5	5.5		5.5	
Bridgeport_S040				5.5			5.5						5.2	5.2		5.2	
Bridgeport_S020				5.0			5.0						4.3	4.3		4.3	
West_Fork_S170				6.7			6.7						4.0	4.5		4.0	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Dry_Ck_S010				6.5			6.5						4.4	4.4		4.4	
West_Fork_S180				2.9			2.0						2.0	2.0		2.0	
Amon_G_Carter_S030				5.2			5.2						5.2	5.2		5.2	
Amon_G_Carter_S010				5.6			5.6						5.6	5.6		5.6	
Amon_G_Carter_S020				5.3			5.3						5.3	5.3		5.3	
Big_Sandy_Ck_S010				6.5			5.4						6.5	5.4		6.5	
Big_Sandy_Ck_S020				7.7			7.3						7.7	7.7		7.7	
Brushy_Ck_S010				6.8			6.8						6.8	6.8		6.8	
Brushy_Ck_S020				6.9			5.9						6.9	6.9		6.9	
Brushy_Ck_S030				5.7			5.7						3.7	5.7		5.7	
Big_Sandy_Ck_S030				5.0			5.0						5.0	5.0		5.0	
Big_Sandy_Ck_S040				7.5			7.5						7.5	7.5		7.5	
Big_Sandy_Ck_S050				4.2			4.2						4.2	4.2		4.2	
West_Fork_S190				3.6			3.6						2.4	2.4		2.4	
West_Fork_S200				4.4			4.4						4.4	4.4		4.4	
Garrett_Ck_S020				5.9			5.9						3.0	3.0		3.0	
Garrett_Ck_S010				6.8			6.8						3.5	3.5		3.5	
Garrett_Ck_S030				2.9			2.9						1.5	1.5		1.5	
Salt_Ck_S010				5.7			4.7						2.4	2.4		2.4	
Salt_Ck_S020				4.9			4.2						2.1	2.1		2.1	
West_Fork_S210				4.6			4.6						4.1	4.6		4.6	
West_Fork_S220				4.5			6.4						6.5	6.5		5.2	
Eagle_Mountain_S010				3.5			5.3						5.3	5.3		4.2	
Eagle_Mountain_S020				2.5			5.1						5.1	5.1		4.1	
Walnut_Ck_S020				2.6			3.6						2.9	3.6		3.6	
Walnut_Ck_S010				2.5			3.4						2.5	3.4		3.0	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Walnut_Ck_S030				2.8			2.8						3.3	3.3		3.3	
Eagle_Mountain_S040				3.0			3.0						3.6	3.6		3.6	
Eagle_Mountain_S030				3.4			3.4						4.4	4.4		4.4	
Silver_Ck_S020				5.0			5.0						5.0	5.0		5.0	
Silver_Ck_S010				4.9			4.9						4.9	4.9		4.9	
Lake_Worth_S010				4.5			4.5						4.5	4.5		4.5	
Lake_Worth_S020				3.0			3.0						3.0	3.6		3.6	
West_Fork_S230				3.6			3.6						3.6	3.6		4.5	
Lk_Weatherford_S010				6.2			8.0						8.0	8.0		7.0	
Lk_Weatherford_S020				2.0			2.0						2.5	2.5		2.0	
Clear_Fork_S010				11.0			11.0						11.0	11.0		11.0	
Clear_Fork_S020				2.9			2.9						2.9	2.9		2.9	
Bear_Ck_S010				5.0			6.0						6.0	6.0		6.0	
Bear_Ck_S020				1.7			1.7						1.7	1.7		1.7	
Benbrook_S010				4.0			5.0						5.0	5.0		5.0	
Benbrook_S020				3.5			2.4						2.4	2.4		2.4	
Benbrook_S030				1.8			1.8						1.8	1.8		1.8	
Clear_Fork_S030				0.9			0.9						0.9	0.9		0.9	
Marys_Ck_S010			1.9	1.9			2.4									2.5	
Clear_Fork_S040				1.7			1.7						1.2	1.2		1.5	
Clear_Fork_S050				0.9			0.9						0.9	0.9		1.5	
West_Fork_S240				0.7			0.6						0.7	0.9		0.7	
Marine_Ck_S020				1.0			0.7						1.0	1.2		1.0	
Marine_Ck_S010				1.0			1.0						1.0	1.0		1.0	
West_Fork_S250				1.7			1.7						1.7	1.9		1.7	
West_Fork_S260				2.3			2.3						2.3	2.3		2.3	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S270				1.9			1.9						1.9	1.9		1.9	
Big_Fossil_Ck_S010				3.6			3.6						3.6	3.6		3.6	
LittleFossil_Ck_S010				2.3			2.3						2.3	2.3		2.3	
West_Fork_S280				2.9			2.9						2.9	2.9		2.9	
Village_Ck_S010				5.9			5.0						3.5	3.5		5.0	
Village_Ck_S020				1.6			1.6						1.6	1.6		1.6	
Lake_Arlington_S010				1.4			1.4						1.4	1.4		1.4	
Village_Ck_S030				5.4			5.4						5.4	5.4		5.4	
West_Fork_S290				4.9			4.9						4.9	4.9		4.9	
West_Fork_S300				3.5			3.5						3.5	3.5		3.5	
West_Fork_S310				0.8			0.8						0.8	0.8		0.8	
West_Fork_S320	2.0											1.4				1.4	
Big_Bear_Ck_S010	8.0											8.6				8.0	
Big_Bear_Ck_S020	3.2											3.2				3.2	
West_Fork_S330	2.3											2.3				2.3	
Joe_Pool_S020	6.1											6.1				6.1	
Joe_Pool_S030	5.6											6.6				8.0	
Joe_Pool_S040	1.0											1.0				1.0	
Joe_Pool_S010	3.2											4.5				4.3	
Joe_Pool_S050	1.5											2.0				1.5	
Mountain_Ck_S010	2.3											2.3				2.3	
Mountain_Ck_S020	1.3											1.3				1.3	
Mountain_Ck_S030	1.8											1.3				1.3	
West_Fork_S340	0.7											2.4				2.4	
Elm_Fork_S020	6.3							4.4				4.4				4.4	
Elm_Fork_S010	4.2							3.6				3.6				3.6	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Brushy_Elm_Ck_S010	2.7							2.7				2.7				2.7	
Brushy_Elm_Ck_S020	3.0							3.0				3.0				3.0	
Elm_Fork_S030	3.9							3.9				3.9				3.9	
Elm_Fork_S040	3.7							3.7				3.7				3.7	
Elm_Fork_S050	4.4							4.4				4.4				4.4	
Elm_Fork_S070	5.1							5.1				5.1				5.1	
Elm_Fork_S060	3.7							3.7				3.7				3.7	
Spring_Ck_S010	3.6							3.6				3.6				3.6	
Spring_Ck_S020	2.5							2.5				2.5				2.5	
Ray_Roberts_S010	1.5							1.5				1.5				1.5	
Timber_Ck_S010	7.5							5.1				7.5				7.5	
Timber_Ck_S030	4.1							4.1				4.1				4.1	
Timber_Ck_S020	1.9							1.9				1.9				1.9	
Ray_Roberts_S030	1.5							1.5				1.5				1.5	
Range_Ck_S010	7.0							2.8				7.0				7.0	
Range_Ck_S020	4.9							4.9				4.9				4.9	
Lake_Kiowa_S020	2.4							2.4				2.4				2.4	
Lake_Kiowa_S010	3.1							3.1				3.1				3.1	
Ray_Roberts_S020	1.0							1.0				1.0				1.0	
Range_Ck_S030	3.8							3.8				3.8				3.8	
Buck_Ck_S010	4.5							4.5				4.5				4.5	
Ray_Roberts_S050	1.0							1.0				1.0				1.0	
Ray_Roberts_S040	1.7							1.7				1.7				1.7	
Ray_Roberts_S060	1.0							1.0				1.0				1.0	
Timber_Ck_S040	2.0							2.0				2.0				2.0	
Elm_Fork_S080	3.9							5.9				3.9				5.9	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Clear_Ck_S010	5.1							5.1				5.1				5.1	
Clear_Ck_S020	4.4							4.4				4.4				4.4	
Clear_Ck_S030	2.0							2.0				2.0				2.0	
Clear_Ck_S040	3.9							3.9				3.9				3.9	
Clear_Ck_S050	6.2							6.2				6.2				6.2	
Clear_Ck_S070	3.7							3.7				3.7				3.7	
Clear_Ck_S060	1.5							1.1				1.1				1.1	
Clear_Ck_S080	9.0							8.5				9.0				6.5	
Clear_Ck_S090	8.0							7.5				8.0				4.5	
Clear_Ck_S110	2.9							4.8				2.9				4.8	
Clear_Ck_S100	3.2							5.2				3.2				5.2	
Clear_Ck_S120	4.3							6.9				4.3				6.9	
Little_Elm_Ck_S010	4.0							4.0				7.0				7.0	
Little_Elm_Ck_S020	4.7							4.7				8.0				8.0	
Little_Elm_Ck_S030	6.1							6.1				6.1				8.4	
Pecan_Ck_S010	6.4							6.4				6.4				6.4	
Doe_Branch_S010	5.3							4.4				5.5				5.3	
Doe_Branch_S020	3.6							3.6				3.6				7.0	
Lewisville_S030	2.3							4.4				2.3				4.4	
Hickory_Ck_S020	5.4							5.4				4.5				5.4	
Hickory_Ck_S010	4.0							4.0				3.5				4.0	
Hickory_Ck_S030	3.5							3.5				3.5				3.5	
Hickory_Ck_S040	3.1							3.1				3.1				3.1	
Hickory_Ck_S050	2.1							2.1				2.1				2.1	
Lewisville_S010	3.5							3.5				3.5				4.5	
Lewisville_S040	2.3							2.3				2.3				2.3	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Lewisville_S050	2.2							2.2				2.2				2.2	
Lewisville_S020	1.6							1.6				1.6				1.6	
Elm_Fork_S090	5.1											5.1				5.1	
Elm_Fork_S110	3.0											3.0				3.0	
Elm_Fork_S100	5.3											6.5				6.0	
Elm_Fork_S120	6.6											6.6				6.6	
Denton_Ck_S010	7.0							7.0				7.0				7.0	
Denton_Ck_S020	7.0							7.0				7.0				7.0	
Denton_Ck_S030	4.0							4.0				4.0				4.0	
Denton_Ck_S040	6.0							3.9				3.9				3.9	
Denton_Ck_S050	5.0							4.8				4.8				4.8	
Denton_Ck_S060	6.0							4.9				4.9				4.9	
Denton_Ck_S070	8.0							6.7				6.7				6.7	
Grapevine_S010	4.0							2.5				2.0				2.0	
Denton_Ck_S080	4.6											4.6				4.6	
Elm_Fork_S130	3.0											3.0				2.3	
Hackberry_Ck_S010	2.1											2.1				1.8	
Hackberry_Ck_S020	1.6											1.6				1.1	
Hackberry_Ck_S030	1.2											1.2				0.9	
Elm_Fork_S140	2.9											2.9				2.2	
Elm_Fork_S150	1.5											1.5				1.1	
Bachman_Branch_S010	1.4											1.4				1.0	
Bachman_Branch_S020	1.3											1.3				1.0	
Elm_Fork_S160	1.0											1.0				0.7	
Trinity_River_S010	2.0											2.0				1.5	
Trinity_River_S020	2.0											2.0				2.0	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
White_Rock_Ck_S010	2.6											2.6				2.6	
White_Rock_Ck_S020	1.1											1.1				1.1	
White_Rock_Ck_S030	1.3											1.3				1.3	
White_Rock_Ck_S040	1.9											2.5				1.9	
Trinity_River_S030	1.6											2.7				1.6	
Fivemile_Ck_S010												3.1				3.1	
Trinity_River_S040												3.0				3.0	
Trinity_River_S050												9.0				9.0	
Tenmile_Ck_S010												6.5				6.5	
Tenmile_Ck_S020												5.0				5.0	
Trinity_River_S060												10.0				10.0	
Indian_Ck_S010								13.0					13.0			12.0	13.0
Indian_Ck_S030								10.0					13.0			10.0	
Indian_Ck_S020								7.1					9.0			7.1	
Indian_Ck_S040								5.0					6.3			5.0	
Sister_Grove_S010								12.0					13.0			12.5	
Sister_Grove_S020								6.0					7.8			6.0	
East_Fork_S020								13.0					13.0			12.0	
East_Fork_S010								8.5					6.0			7.8	
East_Fork_S030								4.8					4.8			4.8	
East_Fork_S040								5.0					7.2			5.0	
Wilson_Ck_S010								10.0					11.4			10.0	
Lavon_S010								5.0					6.7			5.0	
Lavon_S020								4.0					6.1			4.0	
Rowlett_Ck_S010								5.3					3.3			4.0	
Ray_Hubbard_S010								4.0					6.0			6.0	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Ray_Hubbard_S020								4.0					6.5			6.5	
East_Fork_S050								9.9					9.9			9.9	
East_Fork_S070					3.5			3.5				3.5					
East_Fork_S060					7.9			7.9				7.9					
East_Fork_S080					5.4			5.4				5.4					
East_Fork_S090					7.4			7.4				7.4					
East_Fork_S110					5.2			5.2				5.2					
East_Fork_S100					5.7			5.7				5.7					
Trinity_River_S070												9.5				9.5	
East_Fork_S120												9.0				9.0	
Kings_Ck_S020													28.0			28.0	28.0
Kings_Ck_S010													22.0			22.0	22.0
Kings_Ck_S030								7.3					7.3			9.0	7.3
Cedar_Ck_S040								8.2					7.0			10.0	6.0
Cedar_Ck_S010								23.0					25.0				19.0
New_Terrell_City_Lake_S010								3.7					3.7			3.7	
Cedar_Ck_S020								6.0					6.0			7.5	6.0
Cedar_Ck_S030								6.5					6.5			8.0	6.5
Trinity_River_S080													28.0				
Trinity_River_S090								12.0					12.0			12.0	
Chambers_Ck_S010										16.0	10.0		11.0		9.0		
Chambers_Ck_S020										11.8	8.0		8.5		6.5		
Chambers_Ck_S040										11.5	11.5		11.5		11.5		
Chambers_Ck_S030										13.0	13.0		13.0		13.0		
Waxahachie_Ck_S010										3.9	3.9		3.9		5.2		
Waxahachie_Ck_S020										3.0	3.0		3.0		3.0		

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Waxahachie_Ck_S030										5.6	5.6		5.6		4.4		
Mustang_Ck_S010										5.4	5.4		5.4		4.3		
Bardwell_S010										3.5	3.5		3.5		2.8		
Chambers_Ck_S050										10.0	10.0		10.0		10.0		
Chambers_Ck_S060										5.5	5.5		5.5		5.5		
Chambers_Ck_S070										5.5	5.5		5.5		5.5		
Chambers_Ck_S080											7.7		7.7		5.2		
Post_Oak_Ck_S010											4.0		4.0		2.7		
Lake_Halbert_S010										1.9	1.9		1.9		1.9		
Navarro_Mills_S020										7.2	7.2		7.2		6.2		
Navarro_Mills_S030										10.4	10.4		10.4		9.0		
Navarro_Mills_S010										3.5	3.5		3.5		4.4		
Navarro_Mills_S040										5.7	5.7		5.7		4.9		
Richland_Ck_S010											9.3		9.3		6.3		
Richland_Ck_S020											8.4		8.4		5.7		
Richland-Chambers_S010											9.5		9.5		6.4		
Richland-Chambers_S020											8.4		8.4		5.7		
Tehuacana_Ck_S020								16.0					16.0			16.0	
Tehuacana_Ck_S010					7.4				7.4				7.4				7.8
Trinity_River_S100								17.0					17.0			17.0	
Fairfield_Lake_S010								5.5					5.5			5.5	
Trinity_River_S110								19.3					19.3			19.3	
Big_Brown_Ck_S010								11.1					11.1			11.1	
Trinity_River_S120								18.7					18.7			18.7	
Trinity_River_S130								28.5					28.5			28.5	
Upper_Keechi_Ck_S030								17.3					17.3			17.3	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Upper_Keechi_Ck_S010									7.0				9.0				8.0
Upper_Keechi_Ck_S020								9.0					9.0			9.0	
Upper_Keechi_Ck_S040								7.7					7.7			7.7	
Trinity_River_S140								1.6					1.6			1.6	
Little_Elkhart_S010								11.6					11.6			11.6	
Houston_County_Lake_S010					3.5								3.5			3.5	
Trinity_River_S150								11.6					11.6			11.6	
Trinity_River_S160					14.0			14.0					14.0				14.0
Trinity_River_S170					17.8			17.8					17.8				17.8
Trinity_River_S180					24.2			24.2					24.2				24.2
Bedias_Ck_S010													32.5				40.0
Bedias_Ck_S020					16.2			16.2					16.2				16.2
Trinity_River_S190					17.8			17.8					17.8				17.8
Livingston_S010					17.1			17.1					17.1				17.1
Livingston_S030					6.0			6.0					6.0				6.0
Livingston_S020					5.0			5.0					5.0				5.0
Trinity_River_S200								5.5					5.5			5.5	
Long_King_Ck_S010		7.5			7.5	7.3											
Long_King_Ck_S020								10.8					10.8			10.8	
Trinity_River_S210								8.5					8.5			8.5	
Menard_Ck_S010		31.0				27.0							24.0				
Trinity_River_S220								13.0					13.0			13.0	
Trinity_River_S230								16.6					16.6			16.6	
Trinity_River_S240								20.5					20.5			20.5	
Trinity_River_S250								19.0					19.0			19.0	

Table 15: Calibrated Snyder's Peaking Coefficient

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S020				0.72			0.72						0.70	0.72		0.70	
West_Fork_S010				0.72			0.72						0.70	0.72		0.70	
West_Fork_S030				0.72			0.72						0.70	0.72		0.70	
West_Fork_S040				0.72			0.72						0.70	0.72		0.70	
West_Fork_S050				0.72			0.72						0.70	0.72		0.70	
West_Fork_S060				0.72			0.72						0.70	0.72		0.70	
West_Fork_S070				0.72			0.72						0.70	0.72		0.70	
West_Fork_S080				0.65			0.72						0.70	0.72		0.65	
West_Fork_S090				0.65			0.72						0.70	0.72		0.65	
West_Fork_S100				0.65			0.72						0.70	0.72		0.65	
West_Fork_S120				0.56			0.72						0.65	0.72		0.65	
West_Fork_S110				0.56			0.72						0.56	0.72		0.65	
Big_Cleveland_S010				0.56			0.72						0.65	0.72		0.65	
Big_Cleveland_S020				0.56			0.72						0.65	0.72		0.65	
West_Fork_S130				0.56			0.56						0.56	0.65		0.56	
Lost_Ck_S010				0.50			0.55						0.50	0.55		0.50	
Lost_Ck_S020				0.70			0.72						0.60	0.70		0.70	
West_Fork_S140				0.70			0.72						0.60	0.70		0.70	
West_Fork_S150				0.70			0.72						0.60	0.70		0.70	
West_Fork_S160				0.70			0.72						0.60	0.70		0.70	
Beans_Ck_S010				0.70			0.72						0.60	0.70		0.70	
Beans_Ck_S020				0.70			0.72						0.60	0.70		0.70	
Big_Ck_S010				0.70			0.72						0.60	0.70		0.70	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Big_Ck_S030				0.70			0.72						0.60	0.70		0.70	
Big_Ck_S020				0.70			0.72						0.60	0.70		0.70	
Bridgeport_S030				0.70			0.72						0.60	0.70		0.70	
Bridgeport_S010				0.70			0.72						0.60	0.70		0.70	
Bridgeport_S040				0.70			0.72						0.60	0.70		0.70	
Bridgeport_S020				0.70			0.72						0.60	0.70		0.70	
West_Fork_S170				0.70			0.70						0.60	0.60		0.60	
Dry_Ck_S010				0.70			0.70						0.60	0.60		0.60	
West_Fork_S180				0.70			0.70						0.60	0.60		0.60	
Amon_G_Carter_S030				0.70			0.70						0.60	0.60		0.60	
Amon_G_Carter_S010				0.70			0.70						0.60	0.60		0.60	
Amon_G_Carter_S020				0.70			0.70						0.60	0.60		0.60	
Big_Sandy_Ck_S010				0.42			0.72						0.60	0.70		0.70	
Big_Sandy_Ck_S020				0.42			0.72						0.72	0.60		0.70	
Brushy_Ck_S010				0.42			0.72						0.72	0.70		0.70	
Brushy_Ck_S020				0.42			0.72						0.72	0.60		0.70	
Brushy_Ck_S030				0.42			0.72						0.72	0.60		0.70	
Big_Sandy_Ck_S030				0.60			0.60						0.70	0.60		0.60	
Big_Sandy_Ck_S040				0.56			0.60						0.70	0.60		0.60	
Big_Sandy_Ck_S050				0.70			0.70						0.60	0.60		0.60	
West_Fork_S190				0.70			0.70						0.60	0.60		0.60	
West_Fork_S200				0.70			0.70						0.60	0.60		0.60	
Garrett_Ck_S020				0.70			0.70						0.60	0.60		0.60	
Garrett_Ck_S010				0.70			0.70						0.60	0.60		0.60	
Garrett_Ck_S030				0.70			0.70						0.60	0.60		0.60	
Salt_Ck_S010				0.70			0.70						0.60	0.60		0.60	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Salt_Ck_S020				0.70			0.70						0.60	0.60		0.60	
West_Fork_S210				0.70			0.70						0.60	0.60		0.60	
West_Fork_S220				0.72			0.72						0.65	0.65		0.65	
Eagle_Mountain_S010				0.72			0.72						0.65	0.65		0.65	
Eagle_Mountain_S020				0.72			0.72						0.65	0.65		0.65	
Walnut_Ck_S020				0.78			0.76						0.78	0.76		0.78	
Walnut_Ck_S010				0.78			0.76						0.78	0.76		0.78	
Walnut_Ck_S030				0.72			0.72						0.65	0.65		0.65	
Eagle_Mountain_S040				0.72			0.72						0.65	0.65		0.65	
Eagle_Mountain_S030				0.72			0.72						0.65	0.65		0.65	
Silver_Ck_S020				0.59			0.59						0.59	0.59		0.59	
Silver_Ck_S010				0.59			0.59						0.59	0.59		0.59	
Lake_Worth_S010				0.59			0.59						0.59	0.59		0.59	
Lake_Worth_S020				0.59			0.59						0.59	0.59		0.59	
West_Fork_S230				0.70			0.70						0.72	0.70		0.72	
Lk_Weatherford_S010				0.66			0.66						0.66	0.50		0.60	
Lk_Weatherford_S020				0.68			0.68						0.68	0.60		0.60	
Clear_Fork_S010				0.65			0.65						0.65	0.65		0.65	
Clear_Fork_S020				0.65			0.63						0.63	0.63		0.63	
Bear_Ck_S010				0.68			0.68						0.68	0.68		0.68	
Bear_Ck_S020				0.65			0.62						0.62	0.62		0.62	
Benbrook_S010				0.65			0.62						0.62	0.62		0.62	
Benbrook_S020				0.65			0.62						0.62	0.62		0.62	
Benbrook_S030				0.65			0.63						0.63	0.63		0.63	
Clear_Fork_S030				0.70			0.70						0.70	0.70		0.70	
Marys_Ck_S010			0.78	0.78			0.83									0.83	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Clear_Fork_S040				0.70			0.70						0.70	0.60		0.70	
Clear_Fork_S050				0.70			0.70						0.72	0.70		0.72	
West_Fork_S240				0.70			0.72						0.72	0.70		0.70	
Marine_Ck_S020				0.70			0.72						0.72	0.70		0.70	
Marine_Ck_S010				0.70			0.72						0.72	0.70		0.70	
West_Fork_S250				0.70			0.72						0.72	0.70		0.70	
West_Fork_S260				0.53			0.53						0.53	0.53		0.50	
West_Fork_S270				0.70			0.70						0.70	0.70		0.70	
Big_Fossil_Ck_S010				0.70			0.70						0.70	0.70		0.70	
LittleFossil_Ck_S010				0.70			0.70						0.70	0.70		0.70	
West_Fork_S280				0.70			0.70						0.70	0.70		0.70	
Village_Ck_S010				0.70			0.65						0.60	0.60		0.60	
Village_Ck_S020				0.70			0.70						0.60	0.70		0.70	
Lake_Arlington_S010				0.70			0.70						0.60	0.70		0.70	
Village_Ck_S030				0.70			0.70						0.70	0.70		0.70	
West_Fork_S290				0.70			0.70						0.70	0.70		0.70	
West_Fork_S300				0.70			0.70						0.70	0.70		0.70	
West_Fork_S310				0.70			0.70						0.70	0.70		0.70	
West_Fork_S320	0.70											0.70				0.70	
Big_Bear_Ck_S010	0.70											0.70				0.70	
Big_Bear_Ck_S020	0.70											0.70				0.70	
West_Fork_S330	0.70											0.70				0.70	
Joe_Pool_S020	0.70											0.70				0.70	
Joe_Pool_S030	0.70											0.70				0.70	
Joe_Pool_S040	0.70											0.70				0.70	
Joe_Pool_S010	0.70											0.70				0.70	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Joe_Pool_S050	0.70											0.70				0.70	
Mountain_Ck_S010	0.70											0.70				0.70	
Mountain_Ck_S020	0.70											0.70				0.70	
Mountain_Ck_S030	0.70											0.70				0.70	
West_Fork_S340	0.70											0.70				0.70	
Elm_Fork_S020	0.70							0.70				0.70				0.70	
Elm_Fork_S010	0.70							0.70				0.70				0.70	
Brushy_Elm_Ck_S010	0.70							0.70				0.70				0.70	
Brushy_Elm_Ck_S020	0.70							0.70				0.70				0.70	
Elm_Fork_S030	0.70							0.70				0.70				0.70	
Elm_Fork_S040	0.70							0.70				0.70				0.70	
Elm_Fork_S050	0.70							0.70				0.70				0.70	
Elm_Fork_S070	0.70							0.70				0.70				0.70	
Elm_Fork_S060	0.70							0.70				0.70				0.70	
Spring_Ck_S010	0.70							0.70				0.70				0.70	
Spring_Ck_S020	0.70							0.70				0.70				0.70	
Ray_Roberts_S010	0.70							0.70				0.70				0.70	
Timber_Ck_S010	0.75							0.78				0.75				0.75	
Timber_Ck_S030	0.70							0.70				0.70				0.70	
Timber_Ck_S020	0.70							0.70				0.70				0.70	
Ray_Roberts_S030	0.70							0.70				0.70				0.70	
Range_Ck_S010	0.75							0.75				0.75				0.75	
Range_Ck_S020	0.70							0.70				0.70				0.70	
Lake_Kiowa_S020	0.70							0.70				0.70				0.70	
Lake_Kiowa_S010	0.70							0.70				0.70				0.70	
Ray_Roberts_S020	0.70							0.70				0.70				0.70	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Range_Ck_S030	0.70							0.70				0.70				0.70	
Buck_Ck_S010	0.70							0.70				0.70				0.70	
Ray_Roberts_S050	0.70							0.70				0.70				0.70	
Ray_Roberts_S040	0.70							0.70				0.70				0.70	
Ray_Roberts_S060	0.70							0.70				0.70				0.70	
Timber_Ck_S040	0.62							0.62				0.62				0.62	
Elm_Fork_S080	0.62							0.62				0.62				0.62	
Clear_Ck_S010	0.62							0.62				0.62				0.62	
Clear_Ck_S020	0.65							0.65				0.65				0.65	
Clear_Ck_S030	0.62							0.62				0.62				0.62	
Clear_Ck_S040	0.65							0.65				0.65				0.65	
Clear_Ck_S050	0.60							0.60				0.60				0.60	
Clear_Ck_S070	0.65							0.65				0.65				0.65	
Clear_Ck_S060	0.62							0.62				0.62				0.62	
Clear_Ck_S080	0.62							0.62				0.65				0.62	
Clear_Ck_S090	0.62							0.62				0.65				0.62	
Clear_Ck_S110	0.62							0.62				0.62				0.62	
Clear_Ck_S100	0.62							0.62				0.62				0.62	
Clear_Ck_S120	0.62							0.62				0.62				0.62	
Little_Elm_Ck_S010	0.62							0.70				0.69				0.69	
Little_Elm_Ck_S020	0.62							0.62				0.68				0.68	
Little_Elm_Ck_S030	0.62							0.62				0.62				0.62	
Pecan_Ck_S010	0.62							0.62				0.62				0.62	
Doe_Branch_S010	0.47							0.62				0.40				0.47	
Doe_Branch_S020	0.62							0.62				0.62				0.62	
Lewisville_S030	0.62							0.62				0.62				0.62	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Hickory_Ck_S020	0.72							0.72				0.72				0.72	
Hickory_Ck_S010	0.72							0.72				0.72				0.72	
Hickory_Ck_S030	0.72							0.72				0.72				0.72	
Hickory_Ck_S040	0.72							0.72				0.72				0.72	
Hickory_Ck_S050	0.62							0.62				0.62				0.62	
Lewisville_S010	0.62							0.62				0.62				0.62	
Lewisville_S040	0.62							0.62				0.62				0.62	
Lewisville_S050	0.62							0.62				0.62				0.62	
Lewisville_S020	0.62							0.62				0.62				0.62	
Elm_Fork_S090	0.62											0.62				0.62	
Elm_Fork_S110	0.70											0.70				0.70	
Elm_Fork_S100	0.70											0.62				0.70	
Elm_Fork_S120	0.62											0.62				0.62	
Denton_Ck_S010	0.70							0.70				0.70				0.70	
Denton_Ck_S020	0.70							0.70				0.70				0.70	
Denton_Ck_S030	0.70							0.70				0.70				0.70	
Denton_Ck_S040	0.70							0.62				0.70				0.70	
Denton_Ck_S050	0.70							0.70				0.70				0.70	
Denton_Ck_S060	0.70							0.70				0.70				0.70	
Denton_Ck_S070	0.70							0.70				0.70				0.70	
Grapevine_S010	0.70							0.70				0.70				0.70	
Denton_Ck_S080	0.70											0.70				0.70	
Elm_Fork_S130	0.70											0.70				0.70	
Hackberry_Ck_S010	0.70											0.70				0.70	
Hackberry_Ck_S020	0.70											0.70				0.70	
Hackberry_Ck_S030	0.70											0.70				0.70	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Elm_Fork_S140	0.70											0.70				0.70	
Elm_Fork_S150	0.70											0.70				0.70	
Bachman_Branch_S010	0.70											0.70				0.70	
Bachman_Branch_S020	0.70											0.70				0.70	
Elm_Fork_S160	0.70											0.70				0.70	
Trinity_River_S010	0.70											0.70				0.70	
Trinity_River_S020	0.70											0.70				0.70	
White_Rock_Ck_S010	0.70											0.70				0.70	
White_Rock_Ck_S020	0.70											0.70				0.70	
White_Rock_Ck_S030	0.70											0.70				0.70	
White_Rock_Ck_S040	0.70											0.70				0.70	
Trinity_River_S030	0.70											0.70				0.70	
Fivemile_Ck_S010												0.72				0.72	
Trinity_River_S040												0.72				0.72	
Trinity_River_S050												0.72				0.72	
Tenmile_Ck_S010												0.72				0.72	
Tenmile_Ck_S020												0.72				0.72	
Trinity_River_S060												0.72				0.72	
Indian_Ck_S010								0.53					0.40			0.45	0.45
Indian_Ck_S030								0.60					0.60			0.60	
Indian_Ck_S020								0.60					0.60			0.60	
Indian_Ck_S040								0.60					0.60			0.60	
Sister_Grove_S010								0.50					0.40			0.45	
Sister_Grove_S020								0.60					0.60			0.60	
East_Fork_S020								0.60					0.35			0.55	
East_Fork_S010								0.60					0.35			0.55	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
East_Fork_S030								0.55					0.55			0.55	
East_Fork_S040								0.60					0.60			0.60	
Wilson_Ck_S010								0.60					0.45			0.60	
Lavon_S010								0.60					0.60			0.60	
Lavon_S020								0.60					0.60			0.60	
Rowlett_Ck_S010								0.55					0.55			0.72	
Ray_Hubbard_S010								0.50					0.40			0.55	
Ray_Hubbard_S020								0.50					0.40			0.55	
East_Fork_S050								0.70					0.70			0.70	
East_Fork_S070					0.30			0.35				0.25					
East_Fork_S060					0.30			0.35				0.25					
East_Fork_S080					0.30			0.35				0.25					
East_Fork_S090					0.30			0.35				0.25					
East_Fork_S110					0.30			0.35				0.25					
East_Fork_S100					0.30			0.35				0.25					
Trinity_River_S070												0.72				0.72	
East_Fork_S120												0.72				0.72	
Kings_Ck_S020													0.63			0.63	0.63
Kings_Ck_S010													0.63			0.63	0.63
Kings_Ck_S030								0.63					0.65			0.55	0.60
Cedar_Ck_S040								0.50					0.70			0.55	0.60
Cedar_Ck_S010								0.55					0.75				0.60
New_Terrell_City_Lake_S010								0.45					0.45			0.55	
Cedar_Ck_S020								0.55					0.65			0.55	0.60
Cedar_Ck_S030								0.55					0.65			0.55	0.60
Trinity_River_S080													0.70				

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Trinity_River_S090								0.65					0.65			0.65	
Chambers_Ck_S010										0.60	0.70		0.60		0.70		
Chambers_Ck_S020										0.60	0.70		0.60		0.70		
Chambers_Ck_S040										0.60	0.70		0.60		0.70		
Chambers_Ck_S030										0.60	0.70		0.60		0.70		
Waxahachie_Ck_S010										0.42	0.42		0.42		0.78		
Waxahachie_Ck_S020										0.50	0.50		0.50		0.50		
Waxahachie_Ck_S030										0.47	0.47		0.47		0.47		
Mustang_Ck_S010										0.47	0.47		0.47		0.47		
Bardwell_S010										0.38	0.38		0.38		0.38		
Chambers_Ck_S050										0.60	0.70		0.60		0.70		
Chambers_Ck_S060										0.60	0.70		0.60		0.70		
Chambers_Ck_S070										0.60	0.70		0.60		0.70		
Chambers_Ck_S080											0.46		0.46		0.53		
Post_Oak_Ck_S010											0.32		0.32		0.37		
Lake_Halbert_S010										0.46	0.46		0.46		0.46		
Navarro_Mills_S020										0.38	0.38		0.38		0.71		
Navarro_Mills_S030										0.38	0.38		0.38		0.70		
Navarro_Mills_S010										0.42	0.42		0.42		0.76		
Navarro_Mills_S040										0.40	0.40		0.40		0.75		
Richland_Ck_S010											0.43		0.43		0.50		
Richland_Ck_S020											0.41		0.41		0.47		
Richland-Chambers_S010											0.39		0.39		0.46		
Richland-Chambers_S020											0.39		0.39		0.46		
Tehuacana_Ck_S020								0.65					0.65			0.65	
Tehuacana_Ck_S010					0.72				0.72				0.72				0.72

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Trinity_River_S100								0.65					0.65			0.65	
Fairfield_Lake_S010								0.65					0.65			0.65	
Trinity_River_S110								0.65					0.65			0.65	
Big_Brown_Ck_S010								0.65					0.65			0.65	
Trinity_River_S120								0.65					0.65			0.65	
Trinity_River_S130								0.60					0.60			0.60	
Upper_Keechi_Ck_S030								0.60					0.60			0.60	
Upper_Keechi_Ck_S010									0.55				0.70				0.60
Upper_Keechi_Ck_S020								0.60					0.60			0.60	
Upper_Keechi_Ck_S040								0.60					0.60			0.60	
Trinity_River_S140								0.60					0.60			0.60	
Little_Elkhart_S010								0.60					0.60			0.60	
Houston_County_Lake_S010					0.45								0.45			0.45	
Trinity_River_S150								0.60					0.60			0.60	
Trinity_River_S160					0.55			0.55					0.55				0.55
Trinity_River_S170					0.55			0.55					0.55				0.55
Trinity_River_S180					0.55			0.55					0.55				0.55
Bedias_Ck_S010													0.70				0.74
Bedias_Ck_S020					0.55			0.55					0.55				0.55
Trinity_River_S190					0.55			0.55					0.55				0.55
Livingston_S010					0.55			0.55					0.55				0.55
Livingston_S030					0.55			0.55					0.55				0.55
Livingston_S020					0.55			0.55					0.55				0.55
Trinity_River_S200								0.50					0.50			0.50	
Long_King_Ck_S010		0.55			0.36	0.35											
Long_King_Ck_S020								0.50					0.50			0.50	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Trinity_River_S210								0.50					0.50			0.50	
Menard_Ck_S010		0.80				0.78							0.40				
Trinity_River_S220								0.50					0.50			0.50	
Trinity_River_S230								0.49					0.49			0.49	
Trinity_River_S240								0.49					0.49			0.49	
Trinity_River_S250								0.50					0.50			0.50	

Table 16: Calibrated Initial Baseflow (cfs per sq mi)

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S020				0.1			0.0						0.0	0.1		0.0	
West_Fork_S010				0.2			0.0						0.0	0.1		0.0	
West_Fork_S030				0.2			0.0						0.0	0.1		0.0	
West_Fork_S040				0.2			0.0						0.0	0.2		0.0	
West_Fork_S050				0.3			0.0						0.0	0.3		0.0	
West_Fork_S060				0.1			0.0						0.0	0.1		0.0	
West_Fork_S070				0.2			0.0						0.0	0.2		0.0	
West_Fork_S080				0.5			0.0						0.0	0.4		0.0	
West_Fork_S090				0.3			0.0						0.0	0.2		0.0	
West_Fork_S100				0.3			0.0						0.0	0.2		0.0	
West_Fork_S120				0.2			0.0						0.0	0.2		0.0	
West_Fork_S110				0.5			0.0						0.0	0.4		0.0	
Big_Cleveland_S010				0.2			0.0						0.0	0.2		0.0	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Big_Cleveland_S020				0.2			0.0						0.0	0.2		0.0	
West_Fork_S130				0.5			0.0						0.0	0.4		0.0	
Lost_Ck_S010				0.2			0.3						0.2	0.2		0.2	
Lost_Ck_S020				0.7			0.0						0.7	0.7		0.7	
West_Fork_S140				0.0			0.0						0.0	0.0		0.0	
West_Fork_S150				0.0			0.0						0.0	0.0		0.0	
West_Fork_S160				0.0			0.0						0.0	0.0		0.0	
Beans_Ck_S010				0.0			0.0						0.0	0.0		0.0	
Beans_Ck_S020				0.0			0.0						0.0	0.0		0.0	
Big_Ck_S010				0.0			0.0						0.0	0.0		0.0	
Big_Ck_S030				0.0			0.0						0.0	0.0		0.0	
Big_Ck_S020				0.0			0.0						0.0	0.0		0.0	
Bridgeport_S030				0.0			0.0						0.0	0.0		0.0	
Bridgeport_S010				0.0			0.0						0.0	0.0		0.0	
Bridgeport_S040				0.0			0.0						0.0	0.0		0.0	
Bridgeport_S020				0.0			0.0						0.0	0.0		0.0	
West_Fork_S170				0.0			0.1						0.0	0.0		0.0	
Dry_Ck_S010				0.0			0.2						0.0	0.0		0.0	
West_Fork_S180				0.0			0.0						0.0	0.0		0.0	
Amon_G_Carter_S030				0.0			0.0						0.0	0.0		0.0	
Amon_G_Carter_S010				0.0			0.0						0.0	0.0		0.0	
Amon_G_Carter_S020				0.0			0.0						0.0	0.0		0.0	
Big_Sandy_Ck_S010				0.0			0.0						0.0	0.0		0.0	
Big_Sandy_Ck_S020				0.0			0.0						0.0	0.0		0.0	
Brushy_Ck_S010				0.0			0.0						0.0	0.0		0.0	
Brushy_Ck_S020				0.0			0.0						0.0	0.0		0.0	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Brushy_Ck_S030				0.0			0.0						0.0	0.0		0.0	
Big_Sandy_Ck_S030				0.0			0.0						0.0	0.0		0.0	
Big_Sandy_Ck_S040				0.0			0.0						0.0	0.0		0.0	
Big_Sandy_Ck_S050				0.0			0.3						0.0	0.0		0.0	
West_Fork_S190				0.0			0.2						0.0	0.0		0.0	
West_Fork_S200				0.0			0.0						0.0	0.0		0.0	
Garrett_Ck_S020				0.0			0.2						0.0	0.0		0.0	
Garrett_Ck_S010				0.0			0.2						0.0	0.0		0.0	
Garrett_Ck_S030				0.0			0.0						0.0	0.0		0.0	
Salt_Ck_S010				0.0			0.2						0.0	0.0		0.0	
Salt_Ck_S020				0.0			0.0						0.0	0.0		0.0	
West_Fork_S210				0.0			0.0						0.0	0.0		0.0	
West_Fork_S220				0.0			0.0						0.0	0.0		0.0	
Eagle_Mountain_S010				0.0			0.0						0.0	0.0		0.0	
Eagle_Mountain_S020				0.0			0.0						0.0	0.0		0.0	
Walnut_Ck_S020				0.0			0.0						0.0	0.0		0.0	
Walnut_Ck_S010				0.0			0.0						0.0	0.0		0.0	
Walnut_Ck_S030				0.0			0.0						0.0	0.0		0.0	
Eagle_Mountain_S040				0.0			0.0						0.0	0.0		0.0	
Eagle_Mountain_S030				0.0			0.0						0.0	0.0		0.0	
Silver_Ck_S020				0.0			0.0						0.0	0.0		0.0	
Silver_Ck_S010				0.0			0.0						0.0	0.0		0.0	
Lake_Worth_S010				0.0			0.0						0.0	0.0		0.0	
Lake_Worth_S020				0.0			0.0						0.0	0.0		0.0	
West_Fork_S230				0.3			1.4						0.8	0.8		2.0	
Lk_Weatherford_S010				0.0			0.0						0.8	0.0		0.8	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Lk_Weatherford_S020				0.1			0.1						0.8	0.0		0.8	
Clear_Fork_S010				0.1			0.1						0.8	0.0		0.8	
Clear_Fork_S020				0.8			0.8						0.8	0.0		0.8	
Bear_Ck_S010				0.8			0.8						0.8	0.0		0.8	
Bear_Ck_S020				0.8			0.8						0.8	0.0		0.8	
Benbrook_S010				0.8			0.8						0.8	0.0		0.8	
Benbrook_S020				0.8			0.8						0.8	0.0		0.8	
Benbrook_S030				0.8			0.8						0.8	0.0		0.8	
Clear_Fork_S030				0.8			0.4						0.8	0.8		0.4	
Marys_Ck_S010			0.1	0.8			0.8						0.5	0.5		0.1	
Clear_Fork_S040				0.3			1.4						0.8	0.4		0.4	
Clear_Fork_S050				0.4			0.8						0.8	0.8		2.0	
West_Fork_S240				2.0			0.8						0.8	5.0		0.8	
Marine_Ck_S020				0.4			0.8						0.8	5.0		0.8	
Marine_Ck_S010				2.0			0.8						0.8	5.0		0.8	
West_Fork_S250				2.0			0.8						0.8	5.0		0.8	
West_Fork_S260				2.0			0.8						0.8	5.0		0.8	
West_Fork_S270				0.8			1.5						3.0	3.0		0.9	
Big_Fossil_Ck_S010				2.0			0.8						3.0	3.0		0.9	
LittleFossil_Ck_S010				0.8			1.5						3.0	3.0		0.9	
West_Fork_S280				0.8			1.5						3.0	3.0		0.9	
Village_Ck_S010				0.8			1.5						0.2	0.2		0.1	
Village_Ck_S020				0.4			1.1						0.8	0.8		0.8	
Lake_Arlington_S010				0.8			0.8						0.8	0.8		0.8	
Village_Ck_S030				0.8			0.8						3.0	3.0		0.9	
West_Fork_S290				0.8			1.5						3.0	3.0		0.9	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S300				0.8			1.5						3.0	3.0		0.9	
West_Fork_S310				0.8			1.5						3.0	3.0		0.9	
West_Fork_S320	0.0											0.0				0.0	
Big_Bear_Ck_S010	0.0											0.0				0.0	
Big_Bear_Ck_S020	0.0											0.0				0.0	
West_Fork_S330	0.0											0.0				0.0	
Joe_Pool_S020	0.1											0.1				0.1	
Joe_Pool_S030	0.2											0.0				0.0	
Joe_Pool_S040	0.1											0.1				0.1	
Joe_Pool_S010	0.0											0.0				0.1	
Joe_Pool_S050	0.1											0.1				0.1	
Mountain_Ck_S010	0.1											0.0				0.1	
Mountain_Ck_S020	0.1											0.0				0.1	
Mountain_Ck_S030	0.0											0.0				0.0	
West_Fork_S340	0.0											0.0				0.0	
Elm_Fork_S020	0.8							0.2				0.0				0.1	
Elm_Fork_S010	0.8							0.2				0.0				0.1	
Brushy_Elm_Ck_S010	0.8							0.2				0.0				0.1	
Brushy_Elm_Ck_S020	0.8							0.2				0.0				0.1	
Elm_Fork_S030	0.8							0.2				0.0				0.1	
Elm_Fork_S040	0.8							0.2				0.0				0.1	
Elm_Fork_S050	0.1							0.0				0.0				0.1	
Elm_Fork_S070	0.1							0.0				0.0				0.1	
Elm_Fork_S060	0.1							0.0				0.0				0.1	
Spring_Ck_S010	0.1							0.0				0.0				0.1	
Spring_Ck_S020	0.1							0.0				0.0				0.1	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Ray_Roberts_S010	0.1							0.0				0.0				0.1	
Timber_Ck_S010	0.1							0.0				0.0				0.0	
Timber_Ck_S030	0.1							0.0				0.0				0.0	
Timber_Ck_S020	0.1							0.0				0.0				0.0	
Ray_Roberts_S030	0.1							0.0				0.0				0.0	
Range_Ck_S010	0.1							0.0				0.0				0.0	
Range_Ck_S020	0.1							0.0				0.0				0.0	
Lake_Kiowa_S020	0.1							0.0				0.0				0.0	
Lake_Kiowa_S010	0.1							0.0				0.0				0.0	
Ray_Roberts_S020	0.1							0.0				0.0				0.1	
Range_Ck_S030	0.1							0.0				0.0				0.0	
Buck_Ck_S010	0.1							0.0				0.0				0.0	
Ray_Roberts_S050	0.1							0.0				0.0				0.0	
Ray_Roberts_S040	0.8							0.0				0.8				0.0	
Ray_Roberts_S060	0.1							0.0				0.0				0.0	
Timber_Ck_S040	0.1							0.0				0.0				0.0	
Elm_Fork_S080	0.1							0.1				0.0				0.1	
Clear_Ck_S010	0.5							0.1				0.1				0.1	
Clear_Ck_S020	0.5							0.1				0.1				0.1	
Clear_Ck_S030	0.5							0.1				0.1				0.1	
Clear_Ck_S040	0.5							0.1				0.1				0.1	
Clear_Ck_S050	0.5							0.1				0.1				0.1	
Clear_Ck_S070	0.5							0.1				0.1				0.1	
Clear_Ck_S060	0.5							0.1				0.1				0.1	
Clear_Ck_S080	0.5							0.1				0.1				0.1	
Clear_Ck_S090	0.5							0.1				0.1				0.1	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Clear_Ck_S110	0.1							0.1				0.0				0.1	
Clear_Ck_S100	0.1							0.1				0.0				0.1	
Clear_Ck_S120	0.1							0.1				0.0				0.1	
Little_Elm_Ck_S010	0.1							0.0				0.0				0.1	
Little_Elm_Ck_S020	0.1							0.0				0.0				0.1	
Little_Elm_Ck_S030	0.1							0.1				0.0				0.1	
Pecan_Ck_S010	0.1							0.1				0.0				0.1	
Doe_Branch_S010	0.1							0.1				2.0				0.4	
Doe_Branch_S020	0.1							0.1				0.0				0.1	
Lewisville_S030	0.1							0.1				0.0				0.1	
Hickory_Ck_S020	0.1							0.1				0.0				0.1	
Hickory_Ck_S010	0.1							0.1				0.0				0.1	
Hickory_Ck_S030	0.1							0.1				0.0				0.1	
Hickory_Ck_S040	0.1							0.1				0.0				0.1	
Hickory_Ck_S050	0.1							0.1				0.0				0.1	
Lewisville_S010	0.1							0.1				0.0				0.1	
Lewisville_S040	0.1							0.1				0.0				0.1	
Lewisville_S050	0.1							0.1				0.0				0.1	
Lewisville_S020	0.1							0.1				0.0				0.1	
Elm_Fork_S090	6.0											0.0				0.0	
Elm_Fork_S110	6.0											0.2				0.4	
Elm_Fork_S100	6.0											0.0				0.0	
Elm_Fork_S120	6.0											0.0				0.0	
Denton_Ck_S010	0.4							0.2				0.1				0.0	
Denton_Ck_S020	0.4							0.2				0.1				0.0	
Denton_Ck_S030	0.4							0.2				0.1				0.0	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Denton_Ck_S040	0.4							0.2				0.1				0.0	
Denton_Ck_S050	0.0							0.3				0.2				0.3	
Denton_Ck_S060	0.0							0.3				0.2				0.3	
Denton_Ck_S070	0.0							0.3				0.2				0.3	
Grapevine_S010	0.0							0.3				0.2				0.3	
Denton_Ck_S080	6.0											0.0				6.0	
Elm_Fork_S130	0.0											0.0				0.0	
Hackberry_Ck_S010	0.0											0.0				0.0	
Hackberry_Ck_S020	0.0											0.0				0.0	
Hackberry_Ck_S030	0.0											0.0				0.0	
Elm_Fork_S140	0.0											0.0				0.0	
Elm_Fork_S150	0.0											0.0				0.0	
Bachman_Branch_S010	0.0											0.0				0.0	
Bachman_Branch_S020	0.0											0.0				0.0	
Elm_Fork_S160	0.0											0.0				0.0	
Trinity_River_S010	0.0											0.0				0.0	
Trinity_River_S020	0.0											0.0				0.0	
White_Rock_Ck_S010	1.0											0.3				0.5	
White_Rock_Ck_S020	1.0											0.0				0.5	
White_Rock_Ck_S030	1.0											0.0				0.5	
White_Rock_Ck_S040	0.0											0.0				0.0	
Trinity_River_S030	0.0											0.0				0.0	
Fivemile_Ck_S010												1.7				3.4	
Trinity_River_S040												0.0				3.0	
Trinity_River_S050												0.0				3.0	
Tenmile_Ck_S010												0.0				3.0	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Tenmile_Ck_S020												0.0				3.0	
Trinity_River_S060												0.0				3.0	
Indian_Ck_S010								3.6					2.5			0.1	0.2
Indian_Ck_S030								0.6					0.6			0.6	
Indian_Ck_S020								0.6					0.6			0.6	
Indian_Ck_S040								0.6					0.6			0.3	
Sister_Grove_S010								4.0					1.0			0.3	
Sister_Grove_S020								0.6					0.6			0.3	
East_Fork_S020								1.7					0.4			0.1	
East_Fork_S010								1.6					0.4			0.1	
East_Fork_S030								0.6					0.4			0.6	
East_Fork_S040								0.6					0.6			0.6	
Wilson_Ck_S010								0.6					0.6			0.6	
Lavon_S010								0.6					0.6			0.6	
Lavon_S020								0.6					0.6			0.6	
Rowlett_Ck_S010								1.0					2.6			1.4	
Ray_Hubbard_S010								0.2					0.2			0.2	
Ray_Hubbard_S020								0.2					0.2			0.2	
East_Fork_S050								0.1					5.0			0.1	
East_Fork_S070					1.2			0.1				0.0					
East_Fork_S060					1.2			0.1				0.0					
East_Fork_S080					1.2			0.1				0.0					
East_Fork_S090					1.2			0.1				0.0					
East_Fork_S110					1.2			0.1				0.0					
East_Fork_S100					1.2			0.1				0.0					
Trinity_River_S070												0.0				3.0	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
East_Fork_S120												0.0				3.0	
Kings_Ck_S020													0.8			0.2	0.1
Kings_Ck_S010													0.8			0.2	0.1
Kings_Ck_S030								0.1					0.1			0.1	0.3
Cedar_Ck_S040								0.1					0.1			0.1	0.3
Cedar_Ck_S010								0.0					0.1				0.0
New_Terrell_City_Lake_S010								0.1					0.1			0.1	
Cedar_Ck_S020								0.1					0.1			0.1	0.3
Cedar_Ck_S030								0.1					0.1			0.1	0.3
Trinity_River_S080													0.0				
Trinity_River_S090								1.0					1.0			0.0	
Chambers_Ck_S010										0.0	6.0		0.1		0.1		
Chambers_Ck_S020										0.0	6.0		0.1		0.1		
Chambers_Ck_S040										0.0	5.0		0.1		0.1		
Chambers_Ck_S030										0.0	5.0		0.1		0.1		
Waxahachie_Ck_S010										0.1	7.8		0.2		0.1		
Waxahachie_Ck_S020										0.1	30.0		12.0		0.1		
Waxahachie_Ck_S030										0.1	0.1		0.1		0.1		
Mustang_Ck_S010										0.1	0.1		0.1		0.1		
Bardwell_S010										0.1	0.1		0.1		0.1		
Chambers_Ck_S050										0.0	5.0		0.1		0.1		
Chambers_Ck_S060										0.0	5.0		0.1		0.1		
Chambers_Ck_S070										0.1	5.0		0.1		0.1		
Chambers_Ck_S080											0.1		0.1		0.1		
Post_Oak_Ck_S010											0.1		0.1		0.1		
Lake_Halbert_S010										0.1	0.0		0.1		2.0		

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Navarro_Mills_S020										0.1	3.0		0.1		0.1		
Navarro_Mills_S030										0.1	3.0		0.1		0.1		
Navarro_Mills_S010										0.1	5.0		1.5		0.1		
Navarro_Mills_S040										0.1	3.0		0.1		0.1		
Richland_Ck_S010											0.1		0.1		0.1		
Richland_Ck_S020											0.1		0.1		0.1		
Richland-Chambers_S010											0.1		0.1		0.1		
Richland-Chambers_S020											0.1		0.1		0.1		
Tehuacana_Ck_S020								1.0					1.0			0.0	
Tehuacana_Ck_S010					0.3				0.9				0.7				0.1
Trinity_River_S100								1.0					1.0			0.0	
Fairfield_Lake_S010								1.0					1.0			0.0	
Trinity_River_S110								1.0					1.0			0.0	
Big_Brown_Ck_S010								1.0					1.0			0.0	
Trinity_River_S120								1.0					1.0			0.0	
Trinity_River_S130								0.1					5.0			0.0	
Upper_Keechi_Ck_S030								0.1					5.0			0.0	
Upper_Keechi_Ck_S010									0.3				0.6				0.4
Upper_Keechi_Ck_S020								0.1					5.0			0.0	
Upper_Keechi_Ck_S040								0.1					5.0			0.0	
Trinity_River_S140								0.1					5.0			0.0	
Little_Elkhart_S010								0.1					5.0			0.0	
Houston_County_Lake_S010					1.0								1.0			1.0	
Trinity_River_S150								0.1					5.0			0.0	
Trinity_River_S160					3.0			0.1					6.0				0.1
Trinity_River_S170					3.0			0.1					6.0				0.1

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Trinity_River_S180					3.0			0.1					6.0				0.1
Bedias_Ck_S010													2.9				0.0
Bedias_Ck_S020					3.0			0.1					6.0				0.1
Trinity_River_S190					3.0			0.1					6.0				0.1
Livingston_S010					3.0			0.1					6.0				0.1
Livingston_S030					3.0			0.1					6.0				0.1
Livingston_S020					3.0			0.1					6.0				0.1
Trinity_River_S200								0.1					3.0			0.0	
Long_King_Ck_S010		0.3			0.1	0.1											
Long_King_Ck_S020								0.1					3.0			0.0	
Trinity_River_S210								0.1					3.0			0.0	
Menard_Ck_S010		0.8				0.5							0.7				
Trinity_River_S220								0.1					3.0			0.0	
Trinity_River_S230								0.1					0.0			0.0	
Trinity_River_S240								0.1					0.0			0.0	
Trinity_River_S250								0.1					0.1			0.0	

Table 17: Calibrated Baseflow Recession Constant

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S020				0.6			0.6						0.6	0.8		0.8	
West_Fork_S010				0.6			0.6						0.6	0.8		0.8	
West_Fork_S030				0.6			0.6						0.6	0.8		0.8	
West_Fork_S040				0.6			0.6						0.6	0.8		0.8	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S050				0.6			0.6						0.6	0.8		0.8	
West_Fork_S060				0.6			0.5						0.5	0.8		0.8	
West_Fork_S070				0.6			0.5						0.5	0.8		0.8	
West_Fork_S080				0.6			0.6						0.6	0.8		0.8	
West_Fork_S090				0.6			0.6						0.6	0.8		0.8	
West_Fork_S100				0.6			0.5						0.5	0.8		0.8	
West_Fork_S120				0.6			0.5						0.5	0.8		0.8	
West_Fork_S110				0.6			0.6						0.6	0.7		0.7	
Big_Cleveland_S010				0.6			0.5						0.5	0.8		0.8	
Big_Cleveland_S020				0.6			0.6						0.6	0.8		0.8	
West_Fork_S130				0.6			0.6						0.6	0.7		0.7	
Lost_Ck_S010				0.8			0.7						0.8	0.8		0.8	
Lost_Ck_S020				0.8			0.6						0.4	0.8		0.6	
West_Fork_S140				0.8			0.6						0.4	0.8		0.7	
West_Fork_S150				0.8			0.6						0.4	0.8		0.6	
West_Fork_S160				0.8			0.6						0.6	0.8		0.8	
Beans_Ck_S010				0.8			0.6						0.6	0.8		0.9	
Beans_Ck_S020				0.8			0.6						0.6	0.8		0.9	
Big_Ck_S010				0.8			0.6						0.7	0.8		0.9	
Big_Ck_S030				0.8			0.6						0.6	0.8		1.0	
Big_Ck_S020				0.8			0.6						0.7	0.8		0.9	
Bridgeport_S030				0.8			0.6						0.7	0.8		0.9	
Bridgeport_S010				0.8			0.6						0.6	0.8		0.8	
Bridgeport_S040				0.8			0.6						0.4	0.8		0.7	
Bridgeport_S020				0.8			0.6						0.4	0.8		0.6	
West_Fork_S170				0.7			0.7						0.7	0.7		0.7	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Dry_Ck_S010				0.7			0.7						0.7	0.7		0.7	
West_Fork_S180				0.7			0.7						0.7	0.7		0.7	
Amon_G_Carter_S030				0.7			0.7						0.7	0.8		0.8	
Amon_G_Carter_S010				0.7			0.7						0.7	0.8		0.8	
Amon_G_Carter_S020				0.7			0.7						0.7	0.8		0.8	
Big_Sandy_Ck_S010				0.7			0.7						0.5	0.7		0.7	
Big_Sandy_Ck_S020				0.7			0.7						0.5	0.7		0.7	
Brushy_Ck_S010				0.7			0.7						0.5	0.7		0.7	
Brushy_Ck_S020				0.7			0.7						0.5	0.7		0.7	
Brushy_Ck_S030				0.7			0.7						0.5	0.7		0.7	
Big_Sandy_Ck_S030				0.7			0.7						0.5	0.7		0.7	
Big_Sandy_Ck_S040				0.7			0.7						0.5	0.7		0.7	
Big_Sandy_Ck_S050				0.7			0.7						0.7	0.7		0.7	
West_Fork_S190				0.7			0.7						0.7	0.7		0.7	
West_Fork_S200				0.7			0.7						0.7	0.7		0.7	
Garrett_Ck_S020				0.7			0.7						0.7	0.7		0.7	
Garrett_Ck_S010				0.7			0.7						0.7	0.7		0.7	
Garrett_Ck_S030				0.7			0.7						0.7	0.7		0.7	
Salt_Ck_S010				0.7			0.7						0.7	0.7		0.7	
Salt_Ck_S020				0.7			0.7						0.7	0.7		0.7	
West_Fork_S210				0.7			0.7						0.7	0.7		0.7	
West_Fork_S220				0.5			0.5						0.5	0.7		0.7	
Eagle_Mountain_S010				0.5			0.5						0.5	0.7		0.7	
Eagle_Mountain_S020				0.5			0.5						0.5	0.7		0.7	
Walnut_Ck_S020				0.5			0.5						0.7	0.7		0.7	
Walnut_Ck_S010				0.5			0.5						0.7	0.7		0.7	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Walnut_Ck_S030				0.5			0.5						0.5	0.7		0.7	
Eagle_Mountain_S040				0.5			0.5						0.5	0.7		0.7	
Eagle_Mountain_S030				0.5			0.5						0.5	0.7		0.7	
Silver_Ck_S020				0.8			0.5						0.5	0.5		0.5	
Silver_Ck_S010				0.8			0.5						0.5	0.5		0.5	
Lake_Worth_S010				0.8			0.5						0.5	0.5		0.5	
Lake_Worth_S020				0.8			0.5						0.5	0.5		0.5	
West_Fork_S230				0.7			0.7						0.7	0.7		0.7	
Lk_Weatherford_S010				0.7			0.7						0.7	0.8		0.7	
Lk_Weatherford_S020				0.7			0.7						0.7	0.8		0.7	
Clear_Fork_S010				0.7			0.7						0.7	0.7		0.7	
Clear_Fork_S020				0.7			0.7						0.7	0.7		0.7	
Bear_Ck_S010				0.7			0.7						0.7	0.7		0.7	
Bear_Ck_S020				0.7			0.7						0.7	0.7		0.7	
Benbrook_S010				0.7			0.7						0.7	0.7		0.7	
Benbrook_S020				0.7			0.7						0.7	0.7		0.7	
Benbrook_S030				0.7			0.7						0.7	0.7		0.7	
Clear_Fork_S030				0.7			0.7						0.7	0.7		0.8	
Marys_Ck_S010			0.7	0.7			0.7						0.8	0.8		0.7	
Clear_Fork_S040				0.7			0.7						0.7	0.7		0.8	
Clear_Fork_S050				0.7			0.7						0.7	0.7		0.7	
West_Fork_S240				0.7			0.7						0.7	0.7		0.7	
Marine_Ck_S020				0.7			0.7						0.7	0.7		0.7	
Marine_Ck_S010				0.7			0.7						0.7	0.7		0.7	
West_Fork_S250				0.7			0.7						0.7	0.7		0.7	
West_Fork_S260				0.7			0.7						0.7	0.7		0.7	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S270				0.7			0.7						0.7	0.7		0.7	
Big_Fossil_Ck_S010				0.7			0.7						0.7	0.7		0.7	
LittleFossil_Ck_S010				0.7			0.7						0.7	0.7		0.7	
West_Fork_S280				0.7			0.7						0.7	0.7		0.7	
Village_Ck_S010				0.6			0.6						0.6	0.7		0.6	
Village_Ck_S020				0.5			0.5						0.6	0.5		0.6	
Lake_Arlington_S010				0.5			0.5						0.6	0.5		0.6	
Village_Ck_S030				0.7			0.7						0.7	0.7		0.7	
West_Fork_S290				0.7			0.7						0.7	0.7		0.7	
West_Fork_S300				0.7			0.7						0.7	0.7		0.7	
West_Fork_S310				0.7			0.7						0.7	0.7		0.7	
West_Fork_S320	0.7											0.7				0.7	
Big_Bear_Ck_S010	0.4											0.7				0.4	
Big_Bear_Ck_S020	0.4											0.7				0.4	
West_Fork_S330	0.7											0.7				0.7	
Joe_Pool_S020	0.5											0.3				0.5	
Joe_Pool_S030	0.5											0.5				0.7	
Joe_Pool_S040	0.5											0.3				0.5	
Joe_Pool_S010	0.5											0.3				0.5	
Joe_Pool_S050	0.5											0.3				0.5	
Mountain_Ck_S010	0.5											0.7				0.7	
Mountain_Ck_S020	0.5											0.7				0.7	
Mountain_Ck_S030	0.7											0.7				0.7	
West_Fork_S340	0.8											0.8				0.8	
Elm_Fork_S020	0.9							0.8				0.8				0.8	
Elm_Fork_S010	0.9							0.8				0.8				0.8	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Brushy_Elm_Ck_S010	0.9							0.8				0.8				0.8	
Brushy_Elm_Ck_S020	0.9							0.8				0.8				0.8	
Elm_Fork_S030	0.9							0.8				0.8				0.8	
Elm_Fork_S040	0.9							0.8				0.8				0.8	
Elm_Fork_S050	0.2							0.2				0.2				0.2	
Elm_Fork_S070	0.2							0.2				0.2				0.2	
Elm_Fork_S060	0.2							0.2				0.2				0.2	
Spring_Ck_S010	0.2							0.2				0.2				0.2	
Spring_Ck_S020	0.2							0.2				0.2				0.2	
Ray_Roberts_S010	0.2							0.2				0.2				0.2	
Timber_Ck_S010	0.8							0.5				0.2				0.5	
Timber_Ck_S030	0.2							0.2				0.2				0.2	
Timber_Ck_S020	0.2							0.2				0.2				0.2	
Ray_Roberts_S030	0.2							0.2				0.2				0.2	
Range_Ck_S010	0.4							0.3				0.2				0.4	
Range_Ck_S020	0.2							0.2				0.2				0.2	
Lake_Kiowa_S020	0.2							0.2				0.2				0.2	
Lake_Kiowa_S010	0.2							0.2				0.2				0.2	
Ray_Roberts_S020	0.2							0.2				0.2				0.2	
Range_Ck_S030	0.2							0.2				0.2				0.2	
Buck_Ck_S010	0.2							0.2				0.2				0.2	
Ray_Roberts_S050	0.2							0.2				0.2				0.2	
Ray_Roberts_S040	0.7							0.2				0.7				0.2	
Ray_Roberts_S060	0.2							0.2				0.2				0.2	
Timber_Ck_S040	0.2							0.2				0.2				0.2	
Elm_Fork_S080	0.8							0.8				0.7				0.8	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Clear_Ck_S010	0.9							0.7				0.8				0.9	
Clear_Ck_S020	0.9							0.7				0.8				0.9	
Clear_Ck_S030	0.9							0.7				0.8				0.9	
Clear_Ck_S040	0.9							0.7				0.8				0.9	
Clear_Ck_S050	0.9							0.7				0.8				0.9	
Clear_Ck_S070	0.9							0.7				0.8				0.9	
Clear_Ck_S060	0.9							0.7				0.8				0.9	
Clear_Ck_S080	0.9							0.7				0.8				0.9	
Clear_Ck_S090	0.9							0.7				0.8				0.9	
Clear_Ck_S110	0.8							0.8				0.7				0.8	
Clear_Ck_S100	0.8							0.8				0.7				0.8	
Clear_Ck_S120	0.8							0.8				0.7				0.8	
Little_Elm_Ck_S010	0.9							0.8				0.8				0.9	
Little_Elm_Ck_S020	0.9							0.8				0.8				0.9	
Little_Elm_Ck_S030	0.7							0.8				0.7				0.8	
Pecan_Ck_S010	0.7							0.8				0.7				0.8	
Doe_Branch_S010	0.8							0.8				0.7				0.8	
Doe_Branch_S020	0.7							0.8				0.7				0.8	
Lewisville_S030	0.7							0.8				0.7				0.8	
Hickory_Ck_S020	0.8							0.8				0.7				0.8	
Hickory_Ck_S010	0.8							0.8				0.7				0.8	
Hickory_Ck_S030	0.8							0.8				0.7				0.8	
Hickory_Ck_S040	0.8							0.8				0.7				0.8	
Hickory_Ck_S050	0.8							0.8				0.7				0.8	
Lewisville_S010	0.7							0.8				0.7				0.8	
Lewisville_S040	0.7							0.8				0.7				0.8	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Lewisville_S050	0.7							0.8				0.7				0.8	
Lewisville_S020	0.8							0.8				0.7				0.8	
Elm_Fork_S090	0.7											0.5				0.5	
Elm_Fork_S110	0.7											0.4				0.7	
Elm_Fork_S100	0.7											0.5				0.5	
Elm_Fork_S120	0.7											0.5				0.5	
Denton_Ck_S010	0.8							0.8				0.7				0.8	
Denton_Ck_S020	0.8							0.8				0.7				0.8	
Denton_Ck_S030	0.8							0.8				0.7				0.8	
Denton_Ck_S040	0.8							0.8				0.7				0.8	
Denton_Ck_S050	0.7							0.7				0.6				0.7	
Denton_Ck_S060	0.7							0.7				0.6				0.7	
Denton_Ck_S070	0.7							0.8				0.6				0.7	
Grapevine_S010	0.7							0.7				0.6				0.7	
Denton_Ck_S080	0.7											0.5				0.8	
Elm_Fork_S130	0.5											0.5				0.5	
Hackberry_Ck_S010	0.5											0.5				0.5	
Hackberry_Ck_S020	0.5											0.5				0.5	
Hackberry_Ck_S030	0.5											0.5				0.5	
Elm_Fork_S140	0.5											0.5				0.5	
Elm_Fork_S150	0.5											0.5				0.5	
Bachman_Branch_S010	0.8											0.8				0.8	
Bachman_Branch_S020	0.8											0.8				0.8	
Elm_Fork_S160	0.8											0.8				0.8	
Trinity_River_S010	0.8											0.8				0.8	
Trinity_River_S020	0.5											0.5				0.5	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
White_Rock_Ck_S010	0.8											0.6				0.7	
White_Rock_Ck_S020	0.8											0.6				0.7	
White_Rock_Ck_S030	0.8											0.6				0.7	
White_Rock_Ck_S040	0.8											0.5				0.5	
Trinity_River_S030	0.8											0.5				0.5	
Fivemile_Ck_S010												1.0				1.0	
Trinity_River_S040												0.6				0.6	
Trinity_River_S050												0.6				0.6	
Tenmile_Ck_S010												0.6				0.6	
Tenmile_Ck_S020												0.6				0.6	
Trinity_River_S060												0.6				0.6	
Indian_Ck_S010								0.8					0.8			0.9	0.7
Indian_Ck_S030								0.7					0.7			0.7	
Indian_Ck_S020								0.7					0.7			0.9	
Indian_Ck_S040								0.7					0.7			0.9	
Sister_Grove_S010								0.9					0.9			0.7	
Sister_Grove_S020								0.7					0.7			0.9	
East_Fork_S020								0.9					0.9			0.9	
East_Fork_S010								0.9					0.9			0.9	
East_Fork_S030								0.9					0.9			0.9	
East_Fork_S040								0.7					0.7			0.9	
Wilson_Ck_S010								0.7					0.7			0.9	
Lavon_S010								0.7					0.7			0.9	
Lavon_S020								0.7					0.7			0.9	
Rowlett_Ck_S010								0.9					0.8			0.7	
Ray_Hubbard_S010								0.8					0.7			0.8	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Ray_Hubbard_S020								0.8					0.7			0.8	
East_Fork_S050								0.8					0.8			0.8	
East_Fork_S070					0.6			0.6				0.6					
East_Fork_S060					0.5			0.5				0.5					
East_Fork_S080					0.5			0.5				0.5					
East_Fork_S090					0.5			0.5				0.5					
East_Fork_S110					0.5			0.5				0.5					
East_Fork_S100					0.5			0.5				0.5					
Trinity_River_S070												0.6				0.6	
East_Fork_S120												0.6				0.6	
Kings_Ck_S020													0.8			0.8	0.8
Kings_Ck_S010													0.8			0.8	0.8
Kings_Ck_S030								0.9					0.8			0.8	0.8
Cedar_Ck_S040								0.9					0.8			0.8	0.8
Cedar_Ck_S010								0.9					0.9				0.7
New_Terrell_City_Lake_S010								0.9					0.9			0.9	
Cedar_Ck_S020								0.9					0.8			0.8	0.8
Cedar_Ck_S030								0.9					0.8			0.8	0.8
Trinity_River_S080													0.8				
Trinity_River_S090								0.9					0.9			0.9	
Chambers_Ck_S010										0.7	0.7		0.7		0.6		
Chambers_Ck_S020										0.7	0.7		0.7		0.6		
Chambers_Ck_S040										0.7	0.7		0.7		0.6		
Chambers_Ck_S030										0.7	0.7		0.7		0.6		
Waxahachie_Ck_S010										0.9	0.9		0.9		0.9		
Waxahachie_Ck_S020										1.0	0.9		1.0		1.0		

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Waxahachie_Ck_S030										0.8	0.6		0.6		0.6		
Mustang_Ck_S010										0.8	0.6		0.6		0.6		
Bardwell_S010										0.8	0.6		0.6		0.6		
Chambers_Ck_S050										0.7	0.7		0.7		0.6		
Chambers_Ck_S060										0.7	0.7		0.7		0.6		
Chambers_Ck_S070										0.7	0.7		0.7		0.6		
Chambers_Ck_S080											0.7		0.9		0.5		
Post_Oak_Ck_S010											0.7		0.9		0.8		
Lake_Halbert_S010										0.9	0.9		0.9		0.6		
Navarro_Mills_S020										0.6	0.6		0.9		0.9		
Navarro_Mills_S030										0.6	0.6		0.9		0.9		
Navarro_Mills_S010										0.6	0.8		0.1		0.7		
Navarro_Mills_S040										0.6	0.6		0.9		0.9		
Richland_Ck_S010											0.9		0.9		0.8		
Richland_Ck_S020											0.9		0.9		0.8		
Richland-Chambers_S010											0.9		0.9		0.8		
Richland-Chambers_S020											0.9		0.9		0.8		
Tehuacana_Ck_S020								0.9					0.9			0.9	
Tehuacana_Ck_S010					0.8				0.1				0.6				0.6
Trinity_River_S100								0.9					0.9			0.9	
Fairfield_Lake_S010								0.9					0.9			0.9	
Trinity_River_S110								0.9					0.9			0.9	
Big_Brown_Ck_S010								0.9					0.9			0.9	
Trinity_River_S120								0.9					0.9			0.9	
Trinity_River_S130								0.8					0.8			0.8	
Upper_Keechi_Ck_S030								0.8					0.8			0.8	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Upper_Keechi_Ck_S010									0.6				0.5				0.5
Upper_Keechi_Ck_S020								0.8					0.8			0.8	
Upper_Keechi_Ck_S040								0.8					0.8			0.8	
Trinity_River_S140								0.8					0.8			0.8	
Little_Elkhart_S010								0.8					0.8			0.8	
Houston_County_Lake_S010					0.7								0.8			0.8	
Trinity_River_S150								0.8					0.8			0.8	
Trinity_River_S160					0.6			0.6					0.6				0.6
Trinity_River_S170					0.6			0.6					0.6				0.6
Trinity_River_S180					0.6			0.6					0.6				0.6
Bedias_Ck_S010													0.8				0.9
Bedias_Ck_S020					0.6			0.6					0.6				0.6
Trinity_River_S190					0.6			0.6					0.6				0.6
Livingston_S010					0.6			0.6					0.6				0.6
Livingston_S030					0.6			0.6					0.6				0.6
Livingston_S020					0.6			0.6					0.6				0.6
Trinity_River_S200								0.6					0.6			0.6	
Long_King_Ck_S010		0.8			0.8	0.8											
Long_King_Ck_S020								0.6					0.6			0.6	
Trinity_River_S210								0.6					0.6			0.6	
Menard_Ck_S010		0.8				0.8							0.8				
Trinity_River_S220								0.6					0.6			0.6	
Trinity_River_S230								0.8					0.8			0.8	
Trinity_River_S240								0.8					0.8			0.8	
Trinity_River_S250								0.8					0.8			0.8	

Table 18: Calibrated Baseflow Ratio to Peak

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_S020				0.02			0.01						0.02	0.04		0.01	
West_Fork_S010				0.02			0.01						0.02	0.04		0.01	
West_Fork_S030				0.02			0.01						0.02	0.04		0.01	
West_Fork_S040				0.02			0.01						0.02	0.04		0.01	
West_Fork_S050				0.02			0.01						0.02	0.04		0.01	
West_Fork_S060				0.02			0.01						0.01	0.04		0.01	
West_Fork_S070				0.02			0.02						0.02	0.04		0.01	
West_Fork_S080				0.02			0.02						0.02	0.04		0.01	
West_Fork_S090				0.02			0.02						0.02	0.04		0.01	
West_Fork_S100				0.02			0.02						0.02	0.04		0.01	
West_Fork_S120				0.02			0.02						0.01	0.04		0.01	
West_Fork_S110				0.02			0.02						0.02	0.04		0.01	
Big_Cleveland_S010				0.02			0.02						0.02	0.04		0.01	
Big_Cleveland_S020				0.02			0.02						0.02	0.04		0.01	
West_Fork_S130				0.02			0.02						0.02	0.04		0.01	
Lost_Ck_S010				0.02			0.04						0.03	0.05		0.10	
Lost_Ck_S020				0.03			0.01						0.02	0.08		0.05	
West_Fork_S140				0.03			0.01						0.01	0.08		0.05	
West_Fork_S150				0.03			0.01						0.02	0.08		0.05	
West_Fork_S160				0.03			0.01						0.02	0.08		0.05	
Beans_Ck_S010				0.03			0.01						0.02	0.08		0.05	
Beans_Ck_S020				0.03			0.01						0.02	0.08		0.05	
Big_Ck_S010				0.03			0.01						0.01	0.08		0.05	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Big_Ck_S030				0.03			0.01						0.02	0.08		0.05	
Big_Ck_S020				0.03			0.01						0.02	0.08		0.05	
Bridgeport_S030				0.03			0.01						0.02	0.08		0.05	
Bridgeport_S010				0.03			0.01						0.02	0.08		0.05	
Bridgeport_S040				0.03			0.01						0.02	0.08		0.05	
Bridgeport_S020				0.03			0.01						0.02	0.08		0.05	
West_Fork_S170				0.01			0.02						0.02	0.01		0.02	
Dry_Ck_S010				0.01			0.02						0.01	0.01		0.01	
West_Fork_S180				0.01			0.02						0.02	0.01		0.02	
Amon_G_Carter_S030				0.04			0.05						0.04	0.05		0.08	
Amon_G_Carter_S010				0.04			0.05						0.04	0.05		0.08	
Amon_G_Carter_S020				0.04			0.05						0.04	0.05		0.08	
Big_Sandy_Ck_S010				0.04			0.02						0.04	0.02		0.02	
Big_Sandy_Ck_S020				0.04			0.01						0.04	0.02		0.02	
Brushy_Ck_S010				0.04			0.02						0.04	0.04		0.02	
Brushy_Ck_S020				0.04			0.01						0.04	0.04		0.02	
Brushy_Ck_S030				0.04			0.01						0.04	0.10		0.02	
Big_Sandy_Ck_S030				0.04			0.01						0.04	0.02		0.02	
Big_Sandy_Ck_S040				0.04			0.01						0.04	0.02		0.02	
Big_Sandy_Ck_S050				0.01			0.02						0.02	0.01		0.02	
West_Fork_S190				0.01			0.02						0.02	0.01		0.02	
West_Fork_S200				0.01			0.02						0.02	0.01		0.02	
Garrett_Ck_S020				0.01			0.02						0.02	0.01		0.02	
Garrett_Ck_S010				0.01			0.02						0.01	0.01		0.01	
Garrett_Ck_S030				0.01			0.02						0.01	0.01		0.01	
Salt_Ck_S010				0.01			0.02						0.02	0.01		0.02	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Salt_Ck_S020				0.01			0.02						0.02	0.01		0.02	
West_Fork_S210				0.01			0.02						0.02	0.01		0.02	
West_Fork_S220				0.04			0.01						0.01	0.01		0.04	
Eagle_Mountain_S010				0.04			0.01						0.01	0.01		0.04	
Eagle_Mountain_S020				0.04			0.01						0.01	0.01		0.04	
Walnut_Ck_S020				0.02			0.02						0.02	0.01		0.02	
Walnut_Ck_S010				0.02			0.02						0.02	0.01		0.02	
Walnut_Ck_S030				0.04			0.01						0.01	0.01		0.04	
Eagle_Mountain_S040				0.04			0.01						0.01	0.01		0.04	
Eagle_Mountain_S030				0.04			0.01						0.01	0.01		0.04	
Silver_Ck_S020				0.05			0.01						0.01	0.02		0.02	
Silver_Ck_S010				0.05			0.01						0.01	0.02		0.02	
Lake_Worth_S010				0.05			0.01						0.01	0.02		0.02	
Lake_Worth_S020				0.05			0.01						0.01	0.02		0.02	
West_Fork_S230				0.05			0.05						0.05	0.05		0.10	
Lk_Weatherford_S010				0.05			0.05						0.05	0.01		0.05	
Lk_Weatherford_S020				0.05			0.05						0.05	0.02		0.05	
Clear_Fork_S010				0.09			0.02						0.09	0.09		0.09	
Clear_Fork_S020				0.09			0.02						0.09	0.09		0.09	
Bear_Ck_S010				0.09			0.02						0.09	0.09		0.09	
Bear_Ck_S020				0.09			0.02						0.09	0.09		0.09	
Benbrook_S010				0.09			0.02						0.09	0.09		0.09	
Benbrook_S020				0.09			0.02						0.09	0.09		0.09	
Benbrook_S030				0.09			0.02						0.09	0.09		0.09	
Clear_Fork_S030				0.04			0.02						0.02	0.05		0.05	
Marys_Ck_S010			0.02	0.02			0.02						0.10	0.02		0.03	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Clear_Fork_S040				0.04			0.02						0.02	0.05		0.05	
Clear_Fork_S050				0.05			0.05						0.05	0.05		0.10	
West_Fork_S240				0.05			0.01						0.05	0.05		0.05	
Marine_Ck_S020				0.05			0.01						0.05	0.05		0.05	
Marine_Ck_S010				0.05			0.01						0.05	0.05		0.05	
West_Fork_S250				0.05			0.01						0.05	0.05		0.05	
West_Fork_S260				0.05			0.01						0.05	0.05		0.05	
West_Fork_S270				0.01			0.05						0.01	0.01		0.05	
Big_Fossil_Ck_S010				0.01			0.05						0.01	0.01		0.05	
LittleFossil_Ck_S010				0.01			0.05						0.01	0.01		0.05	
West_Fork_S280				0.01			0.05						0.01	0.01		0.05	
Village_Ck_S010				0.07			0.04						0.05	0.05		0.05	
Village_Ck_S020				0.01			0.01						0.02	0.02		0.03	
Lake_Arlington_S010				0.01			0.01						0.02	0.02		0.03	
Village_Ck_S030				0.01			0.05						0.01	0.01		0.05	
West_Fork_S290				0.01			0.05						0.01	0.01		0.05	
West_Fork_S300				0.01			0.05						0.01	0.01		0.05	
West_Fork_S310				0.01			0.05						0.01	0.01		0.05	
West_Fork_S320	0.02											0.02				0.02	
Big_Bear_Ck_S010	0.01											0.02				0.01	
Big_Bear_Ck_S020	0.01											0.02				0.01	
West_Fork_S330	0.02											0.02				0.02	
Joe_Pool_S020	0.03											0.01				0.03	
Joe_Pool_S030	0.02											0.01				0.02	
Joe_Pool_S040	0.03											0.01				0.03	
Joe_Pool_S010	0.02											0.01				0.02	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Joe_Pool_S050	0.03											0.01				0.03	
Mountain_Ck_S010	0.02											0.01				0.02	
Mountain_Ck_S020	0.02											0.01				0.02	
Mountain_Ck_S030	0.02											0.02				0.02	
West_Fork_S340	0.02											0.02				0.02	
Elm_Fork_S020	0.06							0.04				0.16				0.09	
Elm_Fork_S010	0.06							0.04				0.16				0.09	
Brushy_Elm_Ck_S010	0.06							0.04				0.16				0.09	
Brushy_Elm_Ck_S020	0.06							0.04				0.16				0.09	
Elm_Fork_S030	0.06							0.04				0.16				0.09	
Elm_Fork_S040	0.06							0.04				0.16				0.09	
Elm_Fork_S050	0.03							0.02				0.01				0.03	
Elm_Fork_S070	0.03							0.02				0.01				0.03	
Elm_Fork_S060	0.03							0.02				0.01				0.03	
Spring_Ck_S010	0.03							0.02				0.01				0.03	
Spring_Ck_S020	0.03							0.02				0.01				0.03	
Ray_Roberts_S010	0.03							0.02				0.01				0.03	
Timber_Ck_S010	0.03							0.02				0.01				0.03	
Timber_Ck_S030	0.03							0.02				0.01				0.03	
Timber_Ck_S020	0.03							0.02				0.01				0.03	
Ray_Roberts_S030	0.03							0.02				0.01				0.03	
Range_Ck_S010	0.03							0.02				0.01				0.05	
Range_Ck_S020	0.03							0.02				0.01				0.03	
Lake_Kiowa_S020	0.03							0.02				0.01				0.03	
Lake_Kiowa_S010	0.03							0.02				0.01				0.03	
Ray_Roberts_S020	0.03							0.02				0.01				0.03	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Range_Ck_S030	0.03							0.02				0.01				0.03	
Buck_Ck_S010	0.03							0.02				0.01				0.03	
Ray_Roberts_S050	0.03							0.02				0.01				0.03	
Ray_Roberts_S040	0.05							0.03				0.05				0.03	
Ray_Roberts_S060	0.03							0.02				0.01				0.03	
Timber_Ck_S040	0.03							0.03				0.01				0.03	
Elm_Fork_S080	0.03							0.03				0.01				0.09	
Clear_Ck_S010	0.12							0.06				0.06				0.11	
Clear_Ck_S020	0.12							0.06				0.06				0.11	
Clear_Ck_S030	0.12							0.06				0.06				0.11	
Clear_Ck_S040	0.12							0.06				0.06				0.11	
Clear_Ck_S050	0.12							0.06				0.06				0.11	
Clear_Ck_S070	0.12							0.06				0.06				0.11	
Clear_Ck_S060	0.12							0.06				0.06				0.11	
Clear_Ck_S080	0.12							0.06				0.06				0.11	
Clear_Ck_S090	0.12							0.06				0.06				0.11	
Clear_Ck_S110	0.03							0.03				0.01				0.09	
Clear_Ck_S100	0.03							0.03				0.01				0.09	
Clear_Ck_S120	0.03							0.03				0.01				0.09	
Little_Elm_Ck_S010	0.10							0.08				0.07				0.13	
Little_Elm_Ck_S020	0.10							0.08				0.07				0.13	
Little_Elm_Ck_S030	0.03							0.02				0.01				0.09	
Pecan_Ck_S010	0.03							0.02				0.01				0.09	
Doe_Branch_S010	0.03							0.03				0.01				0.02	
Doe_Branch_S020	0.03							0.02				0.01				0.02	
Lewisville_S030	0.03							0.03				0.01				0.09	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Hickory_Ck_S020	0.03							0.02				0.02				0.04	
Hickory_Ck_S010	0.03							0.02				0.02				0.04	
Hickory_Ck_S030	0.03							0.02				0.02				0.04	
Hickory_Ck_S040	0.03							0.02				0.02				0.04	
Hickory_Ck_S050	0.03							0.02				0.01				0.09	
Lewisville_S010	0.03							0.02				0.01				0.09	
Lewisville_S040	0.03							0.02				0.01				0.09	
Lewisville_S050	0.03							0.02				0.01				0.09	
Lewisville_S020	0.03							0.02				0.01				0.09	
Elm_Fork_S090	0.05											0.05				0.02	
Elm_Fork_S110	0.05											0.02				0.03	
Elm_Fork_S100	0.05											0.02				0.02	
Elm_Fork_S120	0.05											0.02				0.02	
Denton_Ck_S010	0.15							0.03				0.09				0.10	
Denton_Ck_S020	0.15							0.03				0.09				0.10	
Denton_Ck_S030	0.15							0.03				0.09				0.10	
Denton_Ck_S040	0.15							0.03				0.09				0.10	
Denton_Ck_S050	0.01							0.01				0.01				0.02	
Denton_Ck_S060	0.01							0.01				0.01				0.02	
Denton_Ck_S070	0.01							0.01				0.01				0.02	
Grapevine_S010	0.01							0.01				0.01				0.02	
Denton_Ck_S080	0.05											0.02				0.02	
Elm_Fork_S130	0.02											0.02				0.02	
Hackberry_Ck_S010	0.02											0.02				0.02	
Hackberry_Ck_S020	0.02											0.02				0.02	
Hackberry_Ck_S030	0.02											0.02				0.02	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Elm_Fork_S140	0.02											0.02				0.02	
Elm_Fork_S150	0.02											0.02				0.02	
Bachman_Branch_S010	0.02											0.02				0.02	
Bachman_Branch_S020	0.02											0.02				0.02	
Elm_Fork_S160	0.02											0.02				0.02	
Trinity_River_S010	0.02											0.02				0.02	
Trinity_River_S020	0.02											0.02				0.02	
White_Rock_Ck_S010	0.03											0.02				0.02	
White_Rock_Ck_S020	0.03											0.02				0.02	
White_Rock_Ck_S030	0.03											0.02				0.02	
White_Rock_Ck_S040	0.03											0.02				0.02	
Trinity_River_S030	0.03											0.02				0.02	
Fivemile_Ck_S010												0.04				0.05	
Trinity_River_S040												0.04				0.05	
Trinity_River_S050												0.04				0.05	
Tenmile_Ck_S010												0.04				0.05	
Tenmile_Ck_S020												0.04				0.05	
Trinity_River_S060												0.04				0.05	
Indian_Ck_S010								0.10					0.10			0.20	0.20
Indian_Ck_S030								0.01					0.05			0.20	
Indian_Ck_S020								0.01					0.05			0.10	
Indian_Ck_S040								0.01					0.05			0.10	
Sister_Grove_S010								0.08					0.15			0.45	
Sister_Grove_S020								0.01					0.05			0.10	
East_Fork_S020								0.10					0.50			0.05	
East_Fork_S010								0.10					0.50			0.05	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
East_Fork_S030								0.10					0.10			0.05	
East_Fork_S040								0.01					0.07			0.10	
Wilson_Ck_S010								0.01					0.07			0.10	
Lavon_S010								0.01					0.08			0.10	
Lavon_S020								0.01					0.07			0.10	
Rowlett_Ck_S010								0.05					0.07			0.04	
Ray_Hubbard_S010								0.05					0.05			0.10	
Ray_Hubbard_S020								0.05					0.05			0.10	
East_Fork_S050								0.05					0.10			0.10	
East_Fork_S070					0.20			0.30				0.30					
East_Fork_S060					0.20			0.30				0.30					
East_Fork_S080					0.20			0.30				0.30					
East_Fork_S090					0.20			0.30				0.30					
East_Fork_S110					0.20			0.30				0.30					
East_Fork_S100					0.20			0.30				0.30					
Trinity_River_S070												0.04				0.05	
East_Fork_S120												0.04				0.05	
Kings_Ck_S020													0.05			0.10	0.05
Kings_Ck_S010													0.05			0.10	0.05
Kings_Ck_S030								0.10					0.04			0.35	0.09
Cedar_Ck_S040								0.10					0.04			0.35	0.09
Cedar_Ck_S010								0.01					0.05				0.23
New_Terrell_City_Lake_S010								0.10					0.10			0.10	
Cedar_Ck_S020								0.10					0.04			0.35	0.09
Cedar_Ck_S030								0.10					0.04			0.35	0.09
Trinity_River_S080													0.05				

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Trinity_River_S090								0.16					0.05			0.05	
Chambers_Ck_S010										0.00	0.10		0.12		0.10		
Chambers_Ck_S020										0.00	0.10		0.12		0.10		
Chambers_Ck_S040										0.00	0.08		0.12		0.10		
Chambers_Ck_S030										0.00	0.08		0.12		0.10		
Waxahachie_Ck_S010										0.00	0.18		0.20		0.32		
Waxahachie_Ck_S020										0.00	0.15		0.20		0.30		
Waxahachie_Ck_S030										0.00	0.01		0.03		0.10		
Mustang_Ck_S010										0.00	0.01		0.03		0.10		
Bardwell_S010										0.00	0.01		0.03		0.10		
Chambers_Ck_S050										0.00	0.08		0.12		0.10		
Chambers_Ck_S060										0.00	0.08		0.12		0.10		
Chambers_Ck_S070										0.00	0.08		0.12		0.10		
Chambers_Ck_S080											0.20		0.05		0.20		
Post_Oak_Ck_S010											0.20		0.05		0.20		
Lake_Halbert_S010										0.00	0.01		0.01		0.10		
Navarro_Mills_S020										0.00	0.10		0.05		0.05		
Navarro_Mills_S030										0.00	0.10		0.05		0.05		
Navarro_Mills_S010										0.00	0.26		0.35		0.11		
Navarro_Mills_S040										0.00	0.10		0.05		0.05		
Richland_Ck_S010											0.20		0.05		0.10		
Richland_Ck_S020											0.20		0.05		0.10		
Richland-Chambers_S010											0.20		0.05		0.10		
Richland-Chambers_S020											0.20		0.05		0.10		
Tehuacana_Ck_S020								0.16					0.05			0.05	
Tehuacana_Ck_S010					0.02				0.50				0.02				0.01

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Trinity_River_S100								0.16					0.05			0.05	
Fairfield_Lake_S010								0.16					0.05			0.05	
Trinity_River_S110								0.16					0.05			0.05	
Big_Brown_Ck_S010								0.16					0.05			0.05	
Trinity_River_S120								0.16					0.05			0.05	
Trinity_River_S130								0.00					0.05			0.00	
Upper_Keechi_Ck_S030								0.00					0.05			0.00	
Upper_Keechi_Ck_S010									0.20				0.70				0.20
Upper_Keechi_Ck_S020								0.00					0.05			0.00	
Upper_Keechi_Ck_S040								0.00					0.05			0.00	
Trinity_River_S140								0.00					0.05			0.00	
Little_Elkhart_S010								0.00					0.05			0.00	
Houston_County_Lake_S010					0.05								0.05			0.05	
Trinity_River_S150								0.00					0.05			0.00	
Trinity_River_S160					0.05			0.05					0.05				0.05
Trinity_River_S170					0.05			0.05					0.05				0.05
Trinity_River_S180					0.05			0.05					0.05				0.05
Bedias_Ck_S010													0.05				0.02
Bedias_Ck_S020					0.05			0.05					0.05				0.05
Trinity_River_S190					0.05			0.05					0.05				0.05
Livingston_S010					0.05			0.05					0.05				0.05
Livingston_S030					0.05			0.05					0.05				0.05
Livingston_S020					0.05			0.05					0.05				0.05
Trinity_River_S200								0.01					0.02			0.01	
Long_King_Ck_S010		0.01			0.05	0.05											
Long_King_Ck_S020								0.01					0.02			0.01	

Subbasin Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Trinity_River_S210								0.01					0.02			0.01	
Menard_Ck_S010		0.10				0.05							0.10				
Trinity_River_S220								0.01					0.02			0.01	
Trinity_River_S230								0.06					0.10			0.05	
Trinity_River_S240								0.06					0.10			0.05	
Trinity_River_S250								0.06					0.10			0.05	

Table 19: Calibrated Routing Reach Modified Puls Subreaches

Reach Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_R010				4			4						4	4		4	
West_Fork_R020				1			1						1	1		1	
West_Fork_R030				2			1						1	2		2	
West_Fork_R040				1			1						1	1		1	
West_Fork_R050				2			2						2	2		2	
West_Fork_R060				2			2						2	2		2	
West_Fork_R070				2			4						3	3		4	
Big_Cleveland_R010				2			3						2	2		2	
West_Fork_R080				2			2						1	1		3	
Lost_Ck_R010				5			5						5	5		5	
Beans_Ck_R010				1			1						1	1		1	
Big_Ck_R010				3			3						3	3		3	
Big_Ck_R020				1			1						1	1		1	
West_Fork_R120				5			5						5	5		5	

Reach Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_R130				2			2						2	2		2	
Big_Sandy_Ck_R020				4			4						4	4		4	
Big_Sandy_Ck_R030				1			10						8	10		10	
Brushy_Ck_R010				1			8						6	6		8	
Brushy_Ck_R020				1			1						1	1		1	
Big_Sandy_Ck_R040				1			4						4	4		4	
Big_Sandy_Ck_R050				2			4						4	4		4	
Big_Sandy_Ck_R060				1			1						2	2		2	
West_Fork_R140				2			1						2	2		2	
West_Fork_R150				1			1						1	1		1	
Garrett_Ck_R010				2			1						1	1		1	
Garrett_Ck_R020				2			1						1	1		1	
Salt_Ck_R010				5			3						3	3		3	
Salt_Ck_R020				2			1						2	2		1	
Salt_Ck_R030				1			1						1	1		1	
West_Fork_R160				2			1						2	2		2	
Walnut_Ck_R020				3			3						3	1		2	
Silver_Ck_R010				3			6						6	10		10	
West_Fork_R200				1			2						1	2		2	
West_Fork_R201				1			1						1	1		1	
Clear_Fork_R030				1			1						1	1		1	
Clear_Fork_R040				6			6						6	10		10	
Clear_Fork_R050				1			1						1	1		1	
West_Fork_R210				1			3						1	1		3	
Marine_Ck_R010				1			5						1	1		1	
West_Fork_R220				1			5						1	1		4	

Reach Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_R230				1			3						1	1		1	
West_Fork_R231				1			3						1	1		1	
West_Fork_R240				1			1						1	1		1	
West_Fork_R250				2			1						1	1		1	
Village_Ck_R020				1			2						1	1		1	
West_Fork_R260				1			1						1	1		1	
West_Fork_R261				1			1						1	1		1	
West_Fork_R262				1			1						1	1		1	
West_Fork_R264				1			1						1	1		1	
West_Fork_R270				1			1						1	1		1	
West_Fork_R280	1											1				1	
Big_Bear_Ck_R010	2											2				1	
West_Fork_R290	1											1				1	
Mountain_Ck_R020	6											6				6	
Mountain_Ck_R030	2											2				1	
West_Fork_R300	1											1				1	
Elm_Fork_R060	8							8				8				8	
Clear_Ck_R050	1							1								1	
Clear_Ck_R060	3							3								3	
Elm_Fork_R065	1							1								1	
Little_Elm_Ck_R030	1							1								1	
Doe_Branch_R010	1							1								1	
Hickory_Ck_R030	1							1								1	
Elm_Fork_R070	6											4				6	
Elm_Fork_R080	4											1				2	
Denton_Ck_R010	14							14				14				14	

Reach Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Denton_Ck_R030	8							4				8				1	
Denton_Ck_R040	2							1				2				2	
Denton_Ck_R050	3							2				3				3	
Denton_Ck_R055	2							1				2				2	
Denton_Ck_R060	6											8				8	
Elm_Fork_R090	4											2				8	
Elm_Fork_R100	4											2				8	
Elm_Fork_R120	5											5				1	
Bachman_Branch_R010	1											1				1	
Elm_Fork_R130	3											2				1	
Trinity_River_R010	1											3				1	
Trinity_River_R020	1											1				1	
Trinity_River_R030	2											1				2	
White_Rock_Ck_R020	4											2				5	
Trinity_River_R040	1											1				1	
Trinity_River_R050								1				1				1	
Trinity_River_R060								1				1				1	
Trinity_River_R070								1				1				1	
East_Fork_R040								6					6			6	
East_Fork_R050								1				1				1	
East_Fork_R060								1				1				1	
East_Fork_R070								1				1				1	
East_Fork_R080								1				1				1	
Trinity_River_R090								1				1				1	
Trinity_River_R100								40					40			10	
Trinity_River_R110								1					2			1	

Reach Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
Trinity_River_R120								9					2			5	
Chambers_Ck_R009										5	5		5		5		
Chambers_Ck_R010										20	20		20		20		
Chambers_Ck_R020										7	7		7		7		
Chambers_Ck_R030										8	8		8		8		
Chambers_Ck_R040										12	12		12		12		
Richland_Ck_R020										14	7		7		14		
Trinity_River_R130								8					1			1	
Tehuacana_Ck_R009					1			1					1			1	
Trinity_River_R140								6					1			1	
Trinity_River_R150								6					1			1	
Trinity_River_R160								12					3			7	
Trinity_River_R170								1					1			1	
Trinity_River_R180								1					1			1	
Trinity_River_R190								1					1			1	
Trinity_River_R200					1			1					1			1	
Trinity_River_R210					1			1					1			1	
Trinity_River_R220					1			1					1			1	
Trinity_River_R230								1					1			1	
Trinity_River_R240								1					1			1	
Trinity_River_R250								1					1			1	
Trinity_River_R260								4					10			1	
Trinity_River_R270								4					10			1	
Trinity_River_R280								4					10			1	

Table 20: Calibrated Routing Reach Modified Puls Storage Adjustments from Initial Estimates

Reach Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
West_Fork_R262				0.3-1.0			1.0						0.3-1.0	1.0		1.0	
Trinity_River_R060								0.8-1.0				0.8-1.2				0.8-1.2	
Trinity_River_R070								0.8-1.0				0.8-1.2				0.8-1.2	
East_Fork_R080								1.0				1.0-1.2				1.0-1.2	
Trinity_River_R090								0.8-1.0				0.8-1.2				0.8-1.2	
Trinity_River_R100								0.8-1.0					0.8-1.0			0.8-1.0	
Trinity_River_R160								0.8-1					0.8-1			0.8-1	
Trinity_River_R170								0.8-1.1					0.8-1.1			0.8-1.1	
Trinity_River_R200					0.8-1.25			0.8-1.25					0.8-1.25			0.8-1.25	
Trinity_River_R210					0.8-1.25			0.8-1.25					0.8-1.25			0.8-1.25	
Trinity_River_R220					0.8-1.25			0.8-1.25					0.8-1.25			0.8-1.25	

Table 21: Calibrated Routing Reach Muskingum Parameters

Muskingum Parameter	Reach Name	Dec-91	Apr-99	Jun-00	Jun-04	Nov-04	Oct-06	Mar-07	Jun-07	Jul-07	Sep-09	Oct-09	Sep-10	May-15	Jun-15	Oct-15	Nov-15	Dec-15
K (hrs)	West_Fork_R090				1.0			1.0						1.0	1.0		1.0	
K (hrs)	West_Fork_R100				3.0			3.0						3.0	3.0		3.0	
K (hrs)	West_Fork_R110				3.0			3.0						3.0	3.0		3.0	
K (hrs)	West_Fork_R170				3.0			7.0						5.0	5.0		7.0	
K (hrs)	West_Fork_R180				2.0			6.0						4.0	4.0		6.0	
K (hrs)	Walnut_Ck_R010				1.0			1.8						1.0	1.0		1.0	
K (hrs)	West_Fork_R190				2.0			9.0						9.0	9.0		9.0	

Muskingum Parameter	Reach Name	Dec- 91	Apr- 99	Jun- 00	Jun- 04	Nov- 04	Oct- 06	Mar- 07	Jun- 07	Jul- 07	Sep- 09	Oct- 09	Sep- 10	May- 15	Jun- 15	Oct- 15	Nov- 15	Dec- 15
K (hrs)	Bear_Ck_R010				1.0			1.0						1.0	1.0		1.0	
K (hrs)	Marys_Ck_R010				1.0			1.0						1.0	1.0		1.0	
K (hrs)	Village_Ck_R010				4.0			2.0						6.0	6.0		6.0	
K (hrs)	JPL_Walnut_Ck_R010	1.0											1.0				1.0	
K (hrs)	Mountain_Ck_R010	5.0											5.0				5.0	
K (hrs)	Elm_Fork_R010	3.9							1.0				3.9				3.9	
K (hrs)	Brushy_Elm_Ck_R010	3.9							3.9				3.9				3.9	
K (hrs)	Elm_Fork_R020	1.1							1.0				1.1				1.1	
K (hrs)	Elm_Fork_R030	2.0							1.0				2.0				2.0	
K (hrs)	Elm_Fork_R040	1.6							3.0				1.6				6.0	
K (hrs)	Elm_Fork_R050	3.7							4.0				3.7				8.0	
K (hrs)	Spring_Ck_R010	2.0							5.0				2.0				5.0	
K (hrs)	Timber_Ck_R010	1.1							1.1				1.1				3.0	
K (hrs)	Timber_Ck_R020								2.0									
K (hrs)	Range_Ck_R010	5.5							5.5				5.5				7.0	
K (hrs)	Range_Ck_R020								2.0									
K (hrs)	Lake_Kiowa_R010	1.3							1.3				1.3				4.0	
K (hrs)	Clear_Ck_R010	1.0							1.0				1.0				1.0	
K (hrs)	Clear_Ck_R020	3.0							3.0				3.0				6.0	
K (hrs)	Clear_Ck_R030	1.2							1.0				1.2				1.0	
K (hrs)	Clear_Ck_R040	4.0							3.0				7.7				7.0	
K (hrs)	Little_Elm_Ck_R010	6.0							7.0				6.0				6.0	
K (hrs)	Little_Elm_Ck_R035	2.0							2.0								4.0	
K (hrs)	Hickory_Ck_R010	4.0							2.0				4.0				4.0	
K (hrs)	Hickory_Ck_R020	3.0							2.0				3.0				3.0	
K (hrs)	Hickory_Ck_R035	8.0							4.0								8.0	

Muskingum Parameter	Reach Name	Dec- 91	Apr- 99	Jun- 00	Jun- 04	Nov- 04	Oct- 06	Mar- 07	Jun- 07	Jul- 07	Sep- 09	Oct- 09	Sep- 10	May- 15	Jun- 15	Oct- 15	Nov- 15	Dec- 15
K (hrs)	Denton_Ck_R020	2.0							2.0				2.0				2.0	
K (hrs)	Hackberry_Ck_R010	1.0											1.0				1.0	
K (hrs)	Elm_Fork_R110	1.0											1.0				1.0	
K (hrs)	White_Rock_Ck_R010	3.0											6.0				3.0	
K (hrs)	Five_Mile_Ck_R010								0.5				0.5				0.5	
K (hrs)	Tenmile_Ck_R010								2.0				1.5				1.5	
K (hrs)	Indian_Ck_R010								5.1					5.1			5.1	
K (hrs)	Indian_Ck_R020								3.1					3.1			3.1	
K (hrs)	Sister_Grove_Ck_R010								7.1					7.1			7.1	
K (hrs)	East_Fork_R010								2.0					3.0			2.0	
K (hrs)	East_Fork_R020								5.8					5.8			5.8	
K (hrs)	East_Fork_R030								2.0					3.8			2.0	
K (hrs)	Lavon_RayHubbard_R010								1.0					4.0			4.0	
K (hrs)	Rowlett_Ck_R010								4.0					4.0			4.0	
K (hrs)	Trinity_River_R080								1.0				1.0				1.0	
K (hrs)	Kings_Ck_R010								1.0					1.0			1.0	
K (hrs)	Kings_Ck_R020								6.0					6.0			6.0	6.0
K (hrs)	Cedar_Ck_R010								12.0					12.0			12.0	
K (hrs)	Cedar_Ck_R020								8.0					8.0			8.0	8.0
K (hrs)	Cedar_Ck_R030								14.0					10.0			10.0	
K (hrs)	Waxahachie_Ck_R010										3.6	3.0		4.2		3.0		
K (hrs)	Waxahachie_Ck_R020										5.4	6.0		7.0		10.0		
K (hrs)	Waxahachie_Ck_R030										6.0	1.0		1.0		5.0		
K (hrs)	Post_Oak_Ck_R010										1.5	1.5		1.5		1.5		
K (hrs)	Richland_Ck_R010										10.5	10.5		10.5		7.0		
K (hrs)	Richland_Ck_R030										7.0	3.5		10.5		3.5		

Muskingum Parameter	Reach Name	Dec- 91	Apr- 99	Jun- 00	Jun- 04	Nov- 04	Oct- 06	Mar- 07	Jun- 07	Jul- 07	Sep- 09	Oct- 09	Sep- 10	May- 15	Jun- 15	Oct- 15	Nov- 15	Dec- 15
K (hrs)	Richland_Ck_R040								1.0					1.0			1.0	
K (hrs)	Tehuacana_Ck_R010								6.0					6.0			6.0	
K (hrs)	Big_Brown_Ck_R010								1.0					1.0			1.0	
K (hrs)	Upper_Keechi_Ck_R010								3.0					3.0			3.0	
K (hrs)	Upper_Keechi_Ck_R020								3.5					3.5			3.5	
K (hrs)	Big_Elkhart_R010								2.5					2.5			2.5	
K (hrs)	Bedias_Ck_R010					6.0			6.0					6.0				6.0
K (hrs)	Long_King_Ck_R010								4.0					4.0			4.0	
X	West_Fork_R090				0.25			0.25						0.25	0.25		0.25	
X	West_Fork_R100				0.40			0.40						0.40	0.25		0.25	
X	West_Fork_R110				0.40			0.40						0.40	0.25		0.25	
X	West_Fork_R170				0.25			0.10						0.25	0.25		0.25	
X	West_Fork_R180				0.25			0.10						0.25	0.25		0.25	
X	Walnut_Ck_R010				0.40			0.25						0.25	0.25		0.25	
X	West_Fork_R190				0.10			0.15						0.10	0.10		0.15	
X	Bear_Ck_R010				0.25			0.25						0.25	0.25		0.25	
X	Marys_Ck_R010				0.10			0.25						0.25	0.25		0.25	
X	Village_Ck_R010				0.40			0.40						0.40	0.40		0.40	
X	JPL_Walnut_Ck_R010	0.20											0.20				0.20	
X	Mountain_Ck_R010	0.20											0.20				0.20	
X	Elm_Fork_R010	0.30							0.30				0.30				0.30	
X	Brushy_Elm_Ck_R010	0.30							0.30				0.30				0.30	
X	Elm_Fork_R020	0.30							0.30				0.30				0.30	
X	Elm_Fork_R030	0.30							0.30				0.30				0.30	
X	Elm_Fork_R040	0.20							0.20				0.20				0.20	
X	Elm_Fork_R050	0.20							0.20				0.20				0.20	

Muskingum Parameter	Reach Name	Dec- 91	Apr- 99	Jun- 00	Jun- 04	Nov- 04	Oct- 06	Mar- 07	Jun- 07	Jul- 07	Sep- 09	Oct- 09	Sep- 10	May- 15	Jun- 15	Oct- 15	Nov- 15	Dec- 15
X	Spring_Ck_R010	0.20							0.20				0.20				0.20	
X	Timber_Ck_R010	0.20							0.20				0.20				0.20	
X	Timber_Ck_R020								0.20									
X	Range_Ck_R010	0.20							0.20				0.20				0.20	
X	Range_Ck_R020								0.20									
X	Lake_Kiowa_R010	0.20							0.20				0.20				0.20	
X	Clear_Ck_R010	0.30							0.30				0.30				0.30	
X	Clear_Ck_R020	0.30							0.30				0.30				0.30	
X	Clear_Ck_R030	0.30							0.30				0.30				0.30	
X	Clear_Ck_R040	0.30							0.30				0.30				0.30	
X	Little_Elm_Ck_R010	0.20							0.40				0.20				0.20	
X	Little_Elm_Ck_R035	0.10							0.10								0.10	
X	Hickory_Ck_R010	0.30							0.30				0.30				0.30	
X	Hickory_Ck_R020	0.30							0.30				0.30				0.30	
X	Hickory_Ck_R035	0.10							0.10								0.10	
X	Denton_Ck_R020	0.25							0.25				0.25				0.25	
X	Hackberry_Ck_R010	0.25											0.25				0.25	
X	Elm_Fork_R110	0.25											0.25				0.25	
X	White_Rock_Ck_R010	0.30											0.10				0.30	
X	Five_Mile_Ck_R010								0.30				0.30				0.30	
X	Tenmile_Ck_R010								0.30				0.30				0.30	
X	Indian_Ck_R010								0.25					0.25			0.25	
X	Indian_Ck_R020								0.20					0.20			0.20	
X	Sister_Grove_Ck_R010								0.20					0.20			0.20	
X	East_Fork_R010								0.10					0.10			0.20	
X	East_Fork_R020								0.20					0.20			0.20	

Muskingum Parameter	Reach Name	Dec- 91	Apr- 99	Jun- 00	Jun- 04	Nov- 04	Oct- 06	Mar- 07	Jun- 07	Jul- 07	Sep- 09	Oct- 09	Sep- 10	May- 15	Jun- 15	Oct- 15	Nov- 15	Dec- 15
X	East_Fork_R030								0.20					0.20			0.20	
X	Lavon_RayHubbard_R010								0.20					0.20			0.20	
X	Rowlett_Ck_R010								0.20					0.20			0.20	
X	Trinity_River_R080								0.25				0.25				0.25	
X	Kings_Ck_R010								0.40					0.10			0.40	
X	Kings_Ck_R020								0.40					0.30			0.40	0.40
X	Cedar_Ck_R010								0.30					0.30			0.30	
X	Cedar_Ck_R020								0.40					0.30			0.40	0.40
X	Cedar_Ck_R030								0.10					0.10			0.10	
X	Waxahachie_Ck_R010										0.30	0.30		0.30		0.30		
X	Waxahachie_Ck_R020										0.30	0.30		0.39		0.30		
X	Waxahachie_Ck_R030										0.10	0.40		0.30		0.30		
X	Post_Oak_Ck_R010										0.30	0.30		0.30		0.30		
X	Richland_Ck_R010										0.40	0.40		0.40		0.30		
X	Richland_Ck_R030										0.10	0.30		0.30		0.10		
X	Richland_Ck_R040								0.10					0.10			0.10	
X	Tehuacana_Ck_R010								0.10					0.10			0.10	
X	Big_Brown_Ck_R010								0.10					0.10			0.10	
X	Upper_Keechi_Ck_R010								0.10					0.25			0.10	
X	Upper_Keechi_Ck_R020								0.10					0.25			0.10	
X	Big_Elkhart_R010								0.10					0.25			0.10	
X	Bedias_Ck_R010					0.25			0.25					0.25				0.25
X	Long_King_Ck_R010								0.10					0.10			0.10	
Subreaches	West_Fork_R090				1			1						1	1		1	
Subreaches	West_Fork_R100				3			1						4	4		3	
Subreaches	West_Fork_R110				3			1						5	5		3	

Muskingum Parameter	Reach Name	Dec- 91	Apr- 99	Jun- 00	Jun- 04	Nov- 04	Oct- 06	Mar- 07	Jun- 07	Jul- 07	Sep- 09	Oct- 09	Sep- 10	May- 15	Jun- 15	Oct- 15	Nov- 15	Dec- 15
Subreaches	West_Fork_R170				2			1						2	4		4	
Subreaches	West_Fork_R180				2			1						1	3		3	
Subreaches	Walnut_Ck_R010				2			1						1	1		1	
Subreaches	West_Fork_R190				4			6						2	4		4	
Subreaches	Bear_Ck_R010				1			1						1	1		1	
Subreaches	Marys_Ck_R010				1			1						1	1		1	
Subreaches	Village_Ck_R010				4			4						4	4		4	
Subreaches	JPL_Walnut_Ck_R010	1											1				1	
Subreaches	Mountain_Ck_R010	3											2				3	
Subreaches	Elm_Fork_R010	4							1				4				4	
Subreaches	Brushy_Elm_Ck_R010	4							4				4				4	
Subreaches	Elm_Fork_R020	1							1				1				1	
Subreaches	Elm_Fork_R030	2							1				2				2	
Subreaches	Elm_Fork_R040	2							2				2				4	
Subreaches	Elm_Fork_R050	4							3				4				5	
Subreaches	Spring_Ck_R010	2							3				2				3	
Subreaches	Timber_Ck_R010	1							1				1				2	
Subreaches	Timber_Ck_R020								1									
Subreaches	Range_Ck_R010	6							4				6				5	
Subreaches	Range_Ck_R020								1									
Subreaches	Lake_Kiowa_R010	1							1				1				2	
Subreaches	Clear_Ck_R010	1							1				1				1	
Subreaches	Clear_Ck_R020	2							2				4				4	
Subreaches	Clear_Ck_R030	1							1				1				1	
Subreaches	Clear_Ck_R040	3							2				3				5	
Subreaches	Little_Elm_Ck_R010	5							10				5				5	

Muskingum Parameter	Reach Name	Dec- 91	Apr- 99	Jun- 00	Jun- 04	Nov- 04	Oct- 06	Mar- 07	Jun- 07	Jul- 07	Sep- 09	Oct- 09	Sep- 10	May- 15	Jun- 15	Oct- 15	Nov- 15	Dec- 15
Subreaches	Little_Elm_Ck_R035	1							1								2	
Subreaches	Hickory_Ck_R010	3							2				4				3	
Subreaches	Hickory_Ck_R020	2							1				2				2	
Subreaches	Hickory_Ck_R035	4							2								4	
Subreaches	Denton_Ck_R020	1							1				1				1	
Subreaches	Hackberry_Ck_R010	1											1				1	
Subreaches	Elm_Fork_R110	1											1				1	
Subreaches	White_Rock_Ck_R010	2											3				2	
Subreaches	Five_Mile_Ck_R010								2				1				1	
Subreaches	Tenmile_Ck_R010								3				1				1	
Subreaches	Indian_Ck_R010								3					3			3	
Subreaches	Indian_Ck_R020								2					2			2	
Subreaches	Sister_Grove_Ck_R010								4					4			4	
Subreaches	East_Fork_R010								1					1			1	
Subreaches	East_Fork_R020								3					3			3	
Subreaches	East_Fork_R030								2					2			2	
Subreaches	Lavon_RayHubbard_R010								8					4			8	
Subreaches	Rowlett_Ck_R010								3					3			3	
Subreaches	Trinity_River_R080								1				1				1	
Subreaches	Kings_Ck_R010								1					1			1	
Subreaches	Kings_Ck_R020								3					3			3	3
Subreaches	Cedar_Ck_R010								6					6			6	
Subreaches	Cedar_Ck_R020								4					4			4	4
Subreaches	Cedar_Ck_R030								4					1			1	
Subreaches	Waxahachie_Ck_R010										4	3		4		4		
Subreaches	Waxahachie_Ck_R020										6	6		7		10		

Muskingum Parameter	Reach Name	Dec- 91	Apr- 99	Jun- 00	Jun- 04	Nov- 04	Oct- 06	Mar- 07	Jun- 07	Jul- 07	Sep- 09	Oct- 09	Sep- 10	May- 15	Jun- 15	Oct- 15	Nov- 15	Dec- 15
Subreaches	Waxahachie_Ck_R030										6	1		1		5		
Subreaches	Post_Oak_Ck_R010										2	2		2		2		
Subreaches	Richland_Ck_R010										10	11		11		7		
Subreaches	Richland_Ck_R030										1	4		11		4		
Subreaches	Richland_Ck_R040								1					1			1	
Subreaches	Tehuacana_Ck_R010								3					3			3	
Subreaches	Big_Brown_Ck_R010								1					1			1	
Subreaches	Upper_Keechi_Ck_R010								1					1			1	
Subreaches	Upper_Keechi_Ck_R020								1					1			1	
Subreaches	Big_Elkhart_R010								1					1			1	
Subreaches	Bedias_Ck_R010					1			1					3				3
Subreaches	Long_King_Ck_R010								1					1			1	

Table 22: Calibrated Routing Reach Lag Time (minutes) Estimates

Reach Name	Dec- 91	Apr- 99	Jun- 00	Jun- 04	Nov- 04	Oct- 06	Mar- 07	Jun- 07	Jul- 07	Sep- 09	Oct- 09	Sep- 10	Oct- 13	May- 15	Jun- 15	Oct- 15	Nov- 15	Dec- 15
Clear_Fork_R041				60			0							0	30		60	
West_Fork_R251				0			0							0	60		60	
West_Fork_R263				0			0							0	60		60	
Denton_Ck_Lag	120							60				180					180	
Tehuacana_Ck_R008					430			430						430	430		430	430
Upper_Keechi_Ck_R001								600					300					600

1.4.3 Calibration Results

The final calibration results showed that the HEC-HMS model was able to accurately simulate the response of the watershed, as it reproduced the volume, timing, shape, and peak magnitudes of most observed floods very well. The resulting hydrograph comparisons can be seen in the following figures of this section. The figures show the HEC-HMS computed versus the USGS observed flow hydrographs at each gage location. Figures are only shown for the locations where the USGS stream gages were recording for that event and where the magnitude of the flow was significant enough to warrant calibration.

The Mary's Creek at Benbrook gage was a location that received additional investigation following the preliminary calibration results. The investigation included a unit hydrograph peaking study performed to improve the accuracy of flood frequency estimates in the watershed by improving the unit hydrograph parameter estimates within the hydrologic modeling. There were 3 primary reasons for this investigation. The first reason is that the calibration events available for HMS model calibration were very limited and much smaller in magnitude than those used to administer the National Flood Insurance Program (NFIP) program such as the 1% Annual Exceedance Probability (AEP) (100-yr) event. The calibration events had 24-hour runoff totals between 1-2 inches, while the 1% AEP 24-hour design runoff amount is 6+ inches for a 24-hour storm event based on the USACE Fort Worth District losses being used in this study. It is well documented in literature that more intense storm events have a more rapid and severe runoff response than smaller less intense events (Snyder; Minshall; USACE, 1991). This introduced some concern that the calibrated HMS parameters would not sufficiently represent physical watershed response to a much more intense storm event, such as the 1% AEP event. The second reason for the additional investigation is the significant level of new development planned for this area, increasing the importance of accurate flood frequency estimates. The final reason for the investigation was the 2015 release of HEC-RAS version 5.0, which includes the ability to apply excess-precipitation onto a 2-dimensional mesh and simulate the excess-runoff being routed through the system with the unsteady 2D equations in RAS.

The RAS 2D model utilized 2015 Light, Detection, and Ranging (LiDAR) data obtained from the City of Fort Worth. Large culverts were field measured and added into the model to improve the model's ability to route flow through significant constrictions within the watershed. The model was calibrated and validated, with there being a very small difference between the calibrated model and the uncalibrated model. The uncalibrated model resulted in a peak discharge 6% less than the calibrated model. Comparison of the hydrographs is located within Figure 4.3 of Appendix F - USACE 2-Dimensional HEC-RAS Analysis of Mary's Creek. The results of the study indicated significant peaking occurs to unit hydrograph parameters as storm intensity increases. For example, the 10% AEP (10-yr) lag time from the RAS 2D study was approximately 2.1 hours, while the 1% AEP (100-y) lag time from the RAS 2D study came out to 1.5 hours. The 10% AEP lag time of 2.1 hours matches that developed during HMS calibration of the smaller storm events. This trend is consistent with additional storm calibrations of smaller events, not performed during the original calibration effort within the watershed.

Excess precipitation from hypothetical 24-hour storms, with an alternating block distribution was applied to the RAS 2D mesh and was routed to the watershed outlet. Within HMS, the same storm was applied and the resulting flow hydrograph was calibrated to the RAS 2D hydrograph for that event (Figure 19). This resulted in HMS unit hydrograph parameters that approximate the routing through the RAS 2D mesh representing the watershed. This process was performed for the 50% AEP (2-yr) to 0.2% (500-yr) event. The resulting unit hydrograph parameters were then used to develop flood frequency estimates.

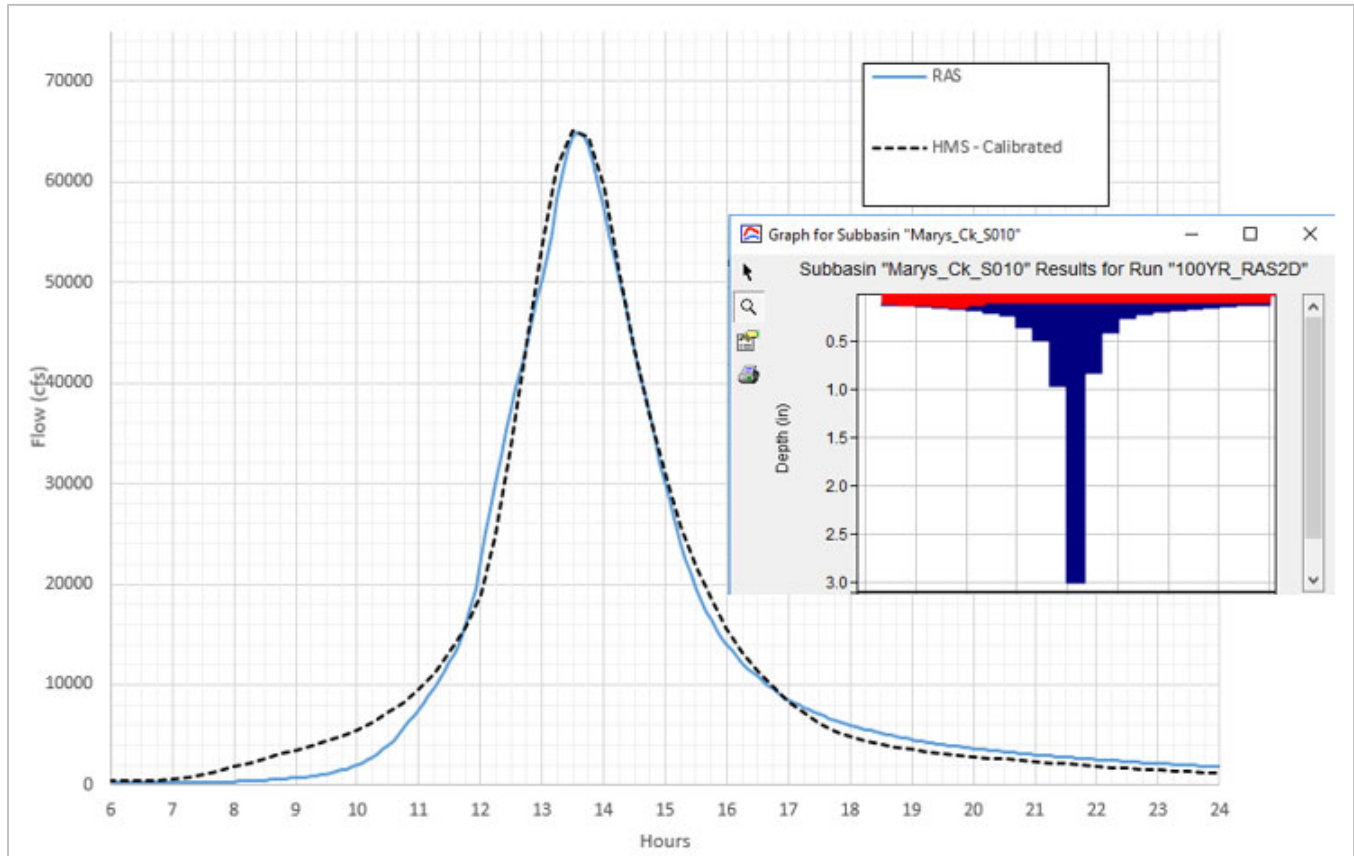


Figure 19. HMS Calibration to RAS 2D Results for Hypothetical Storm Events

The results of the study will be included with the HMS results for the Mary's Creek gage. In addition to unit hydrograph parameters specifically for the single subbasin above the Marys Creek gage, regression equations were developed for the watershed for use in future studies within the Mary's Creek watershed where additional subbasins will be added (Figure 20).

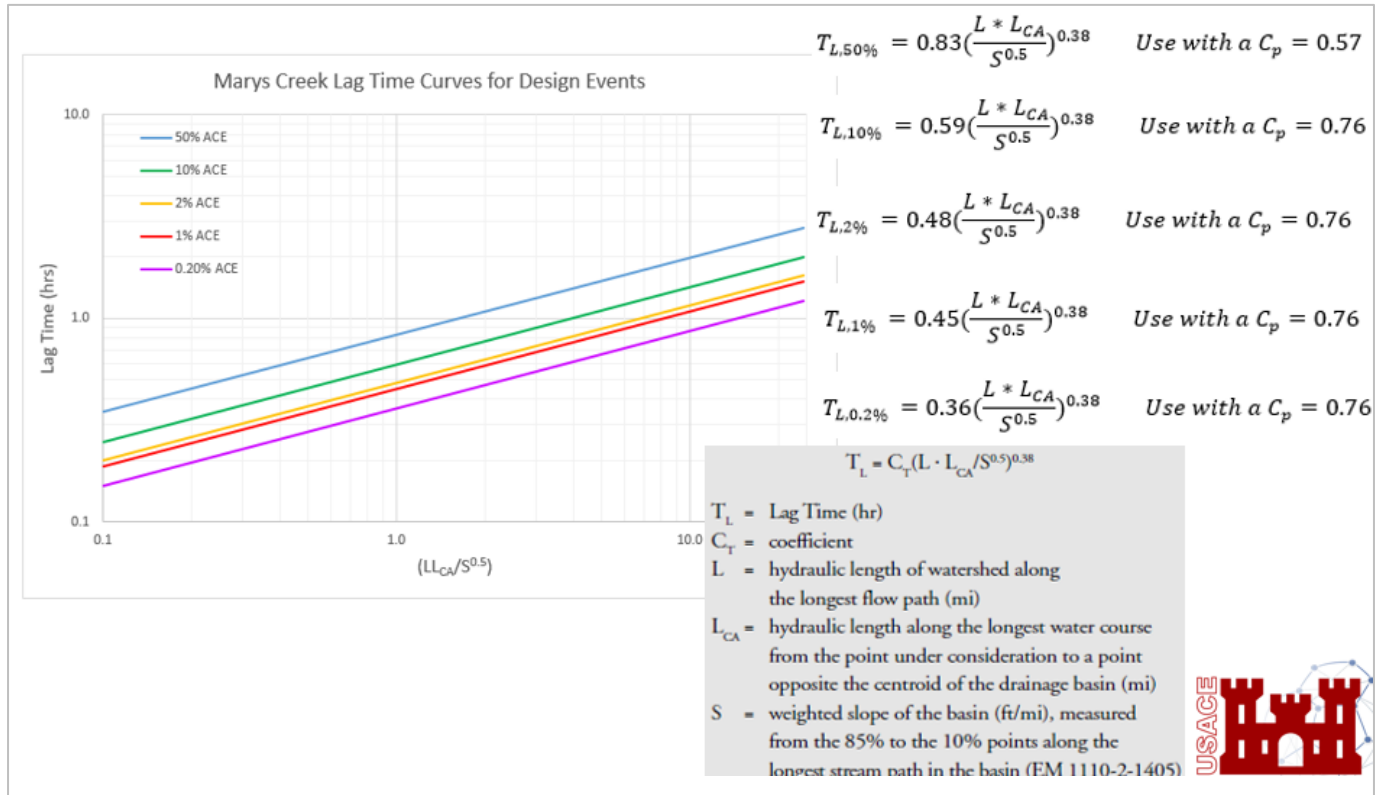


Figure 1. Lag Time Equations Approximating RAS 2D Routing through the Marys Creek Watershed

Oversight and review for this study was performed by members from the USACE Hydrologic Engineering Center (HEC) and USACE Dam Safety Modification Mandatory Center of Expertise (DSMMX). Additional information about the unit hydrograph peaking study performed within Mary's Creek can be found in Appendix F – 2-Dimensional HEC-RAS Analysis of Mary's Creek.

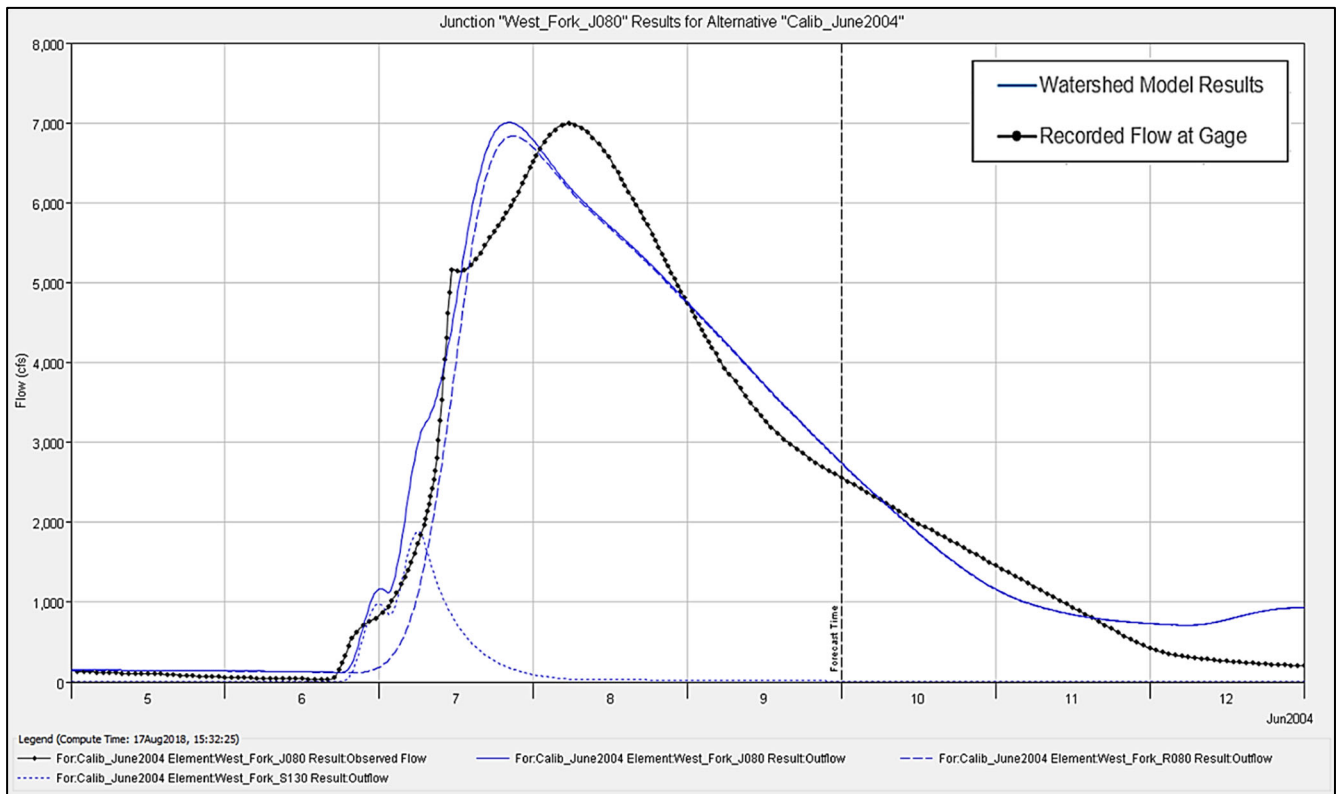


Figure 21a. June 8, 2004 Calibration Results for the West Fork at Jacksboro, TX Gage.

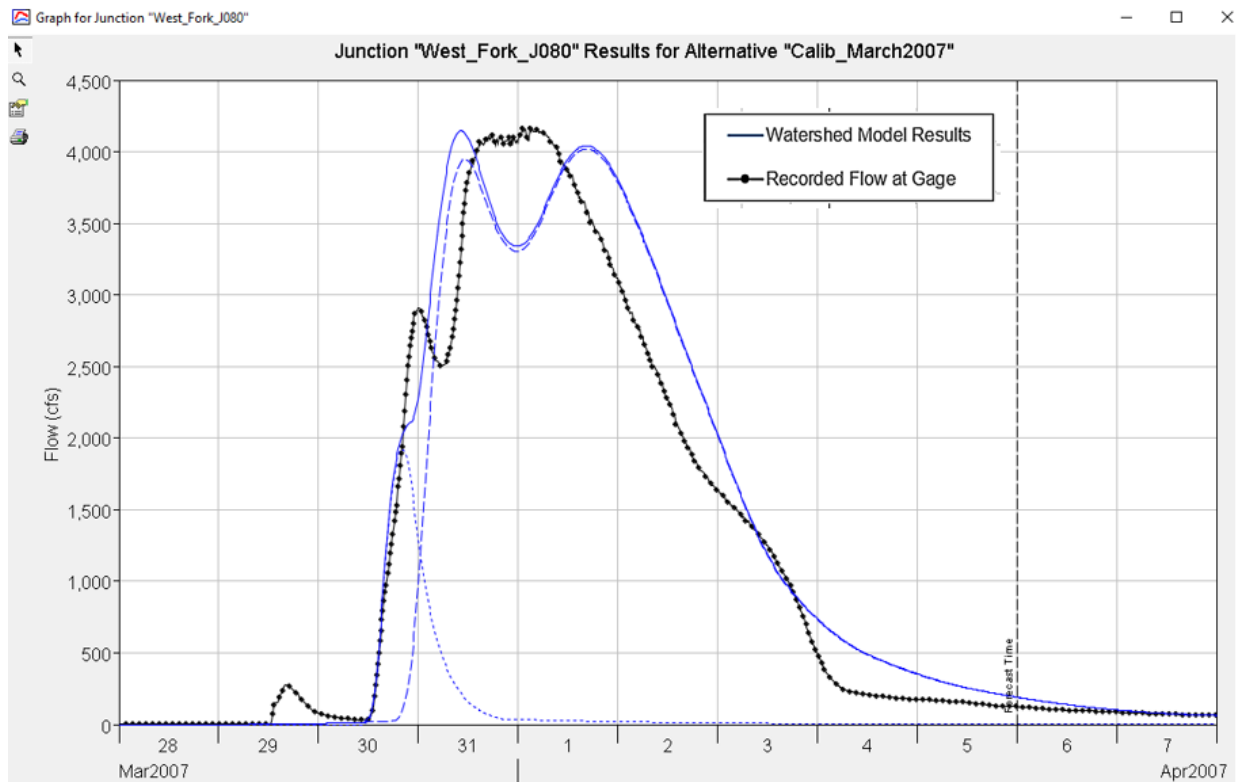


Figure 21b. March 28, 2007 Calibration Results for the West Fork at Jacksboro, TX Gage

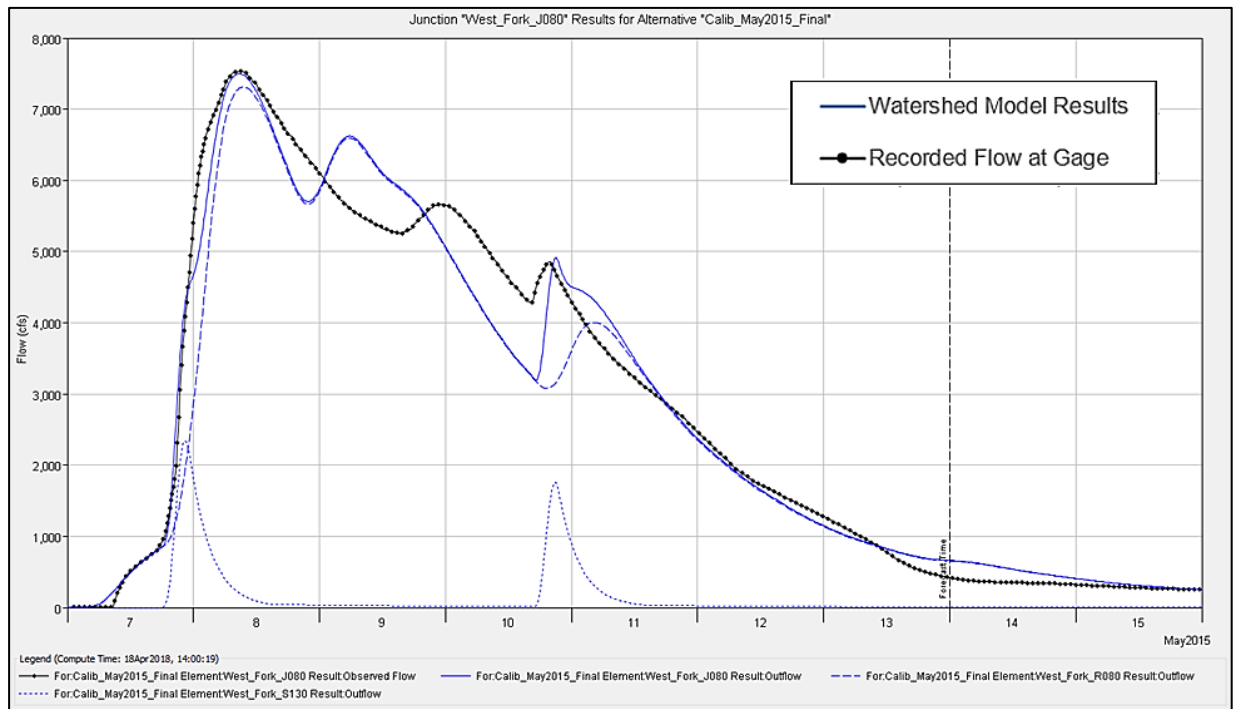


Figure 21c. May 8, 2015 Calibration Results for the West Fork Trinity River at Jacksboro, TX.

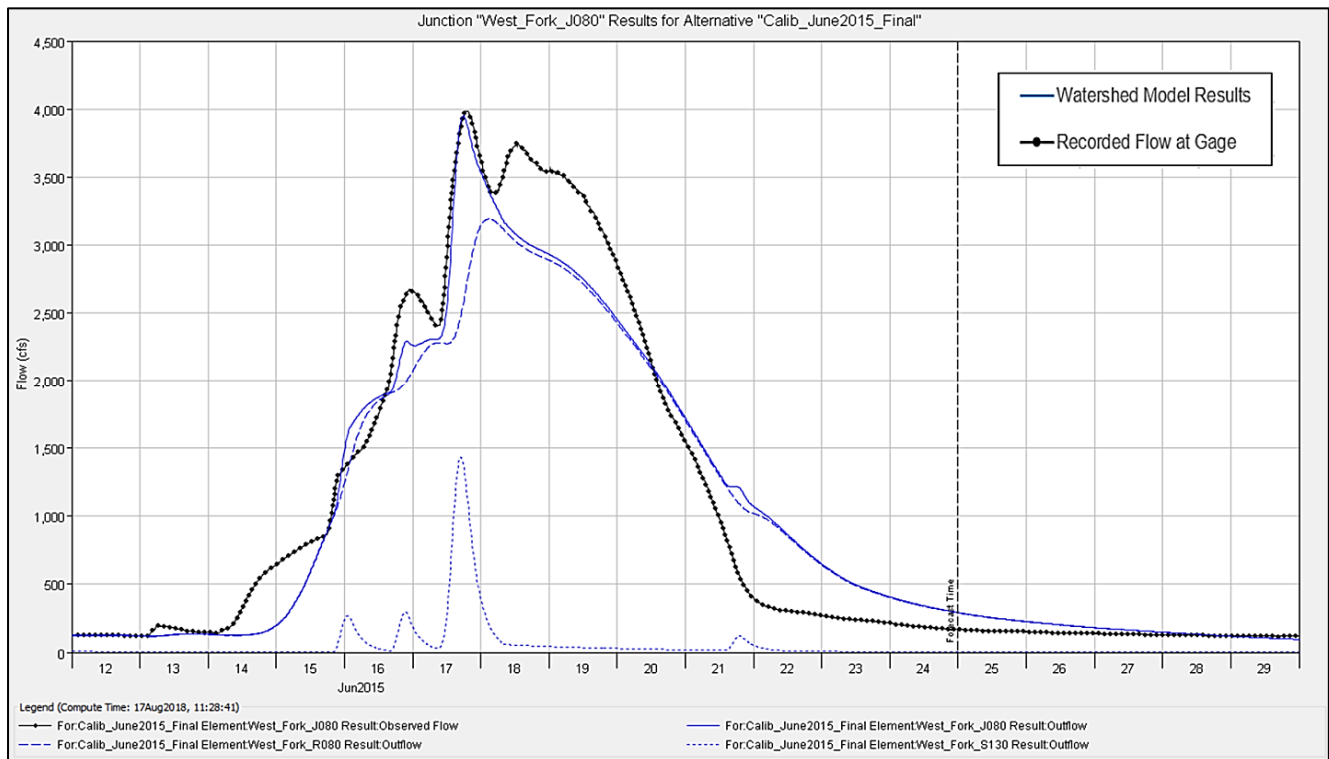


Figure 22a. June 18, 2015 Calibration Results for the West Fork near Jacksboro, TX Gage

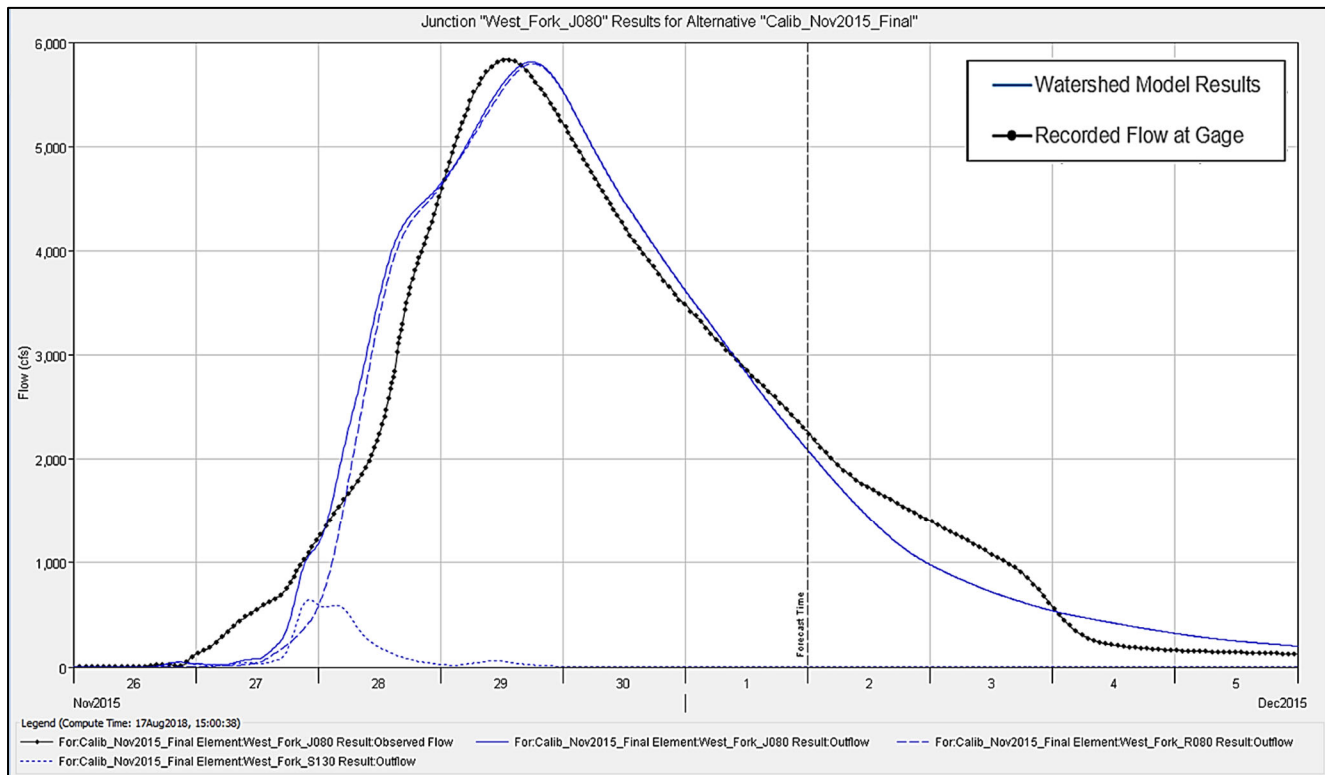


Figure 22b. November 29, 2015 Calibration Results for the West Fork near Jacksboro, TX Gage

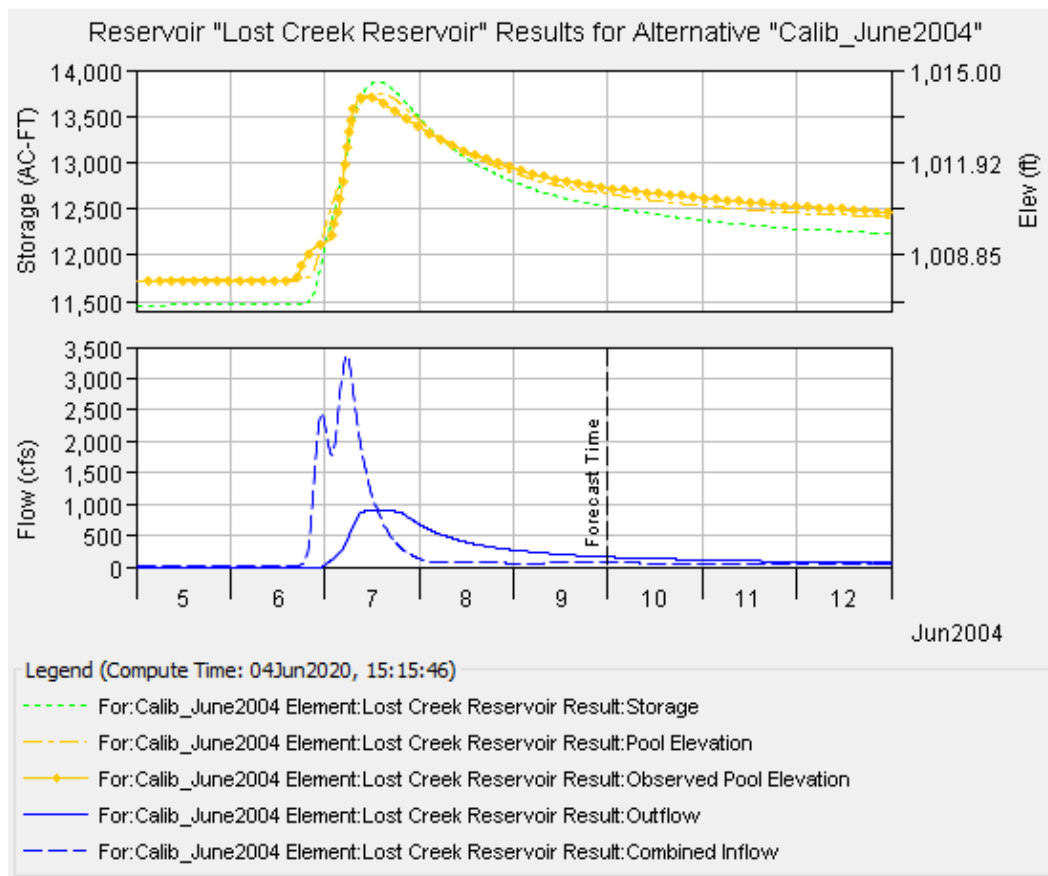


Figure 23a. June 2004 Calibration Results for Lost Creek Reservoir

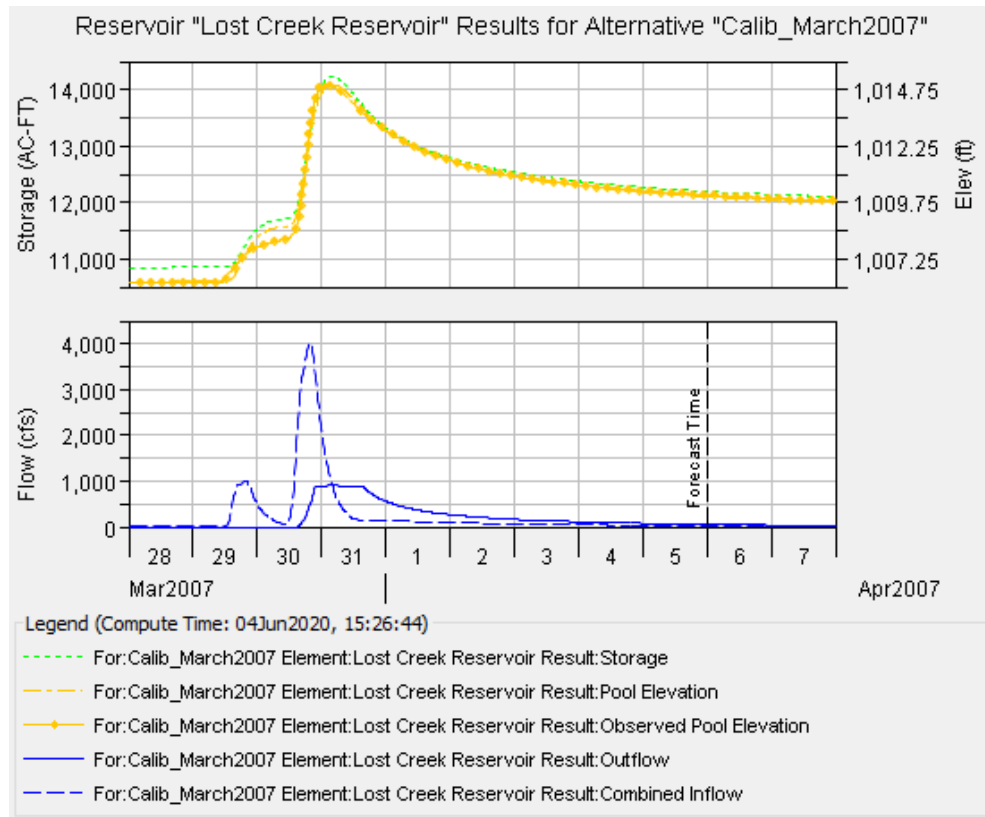


Figure 23b. March 2007 Calibration Results for Lost Creek Reservoir

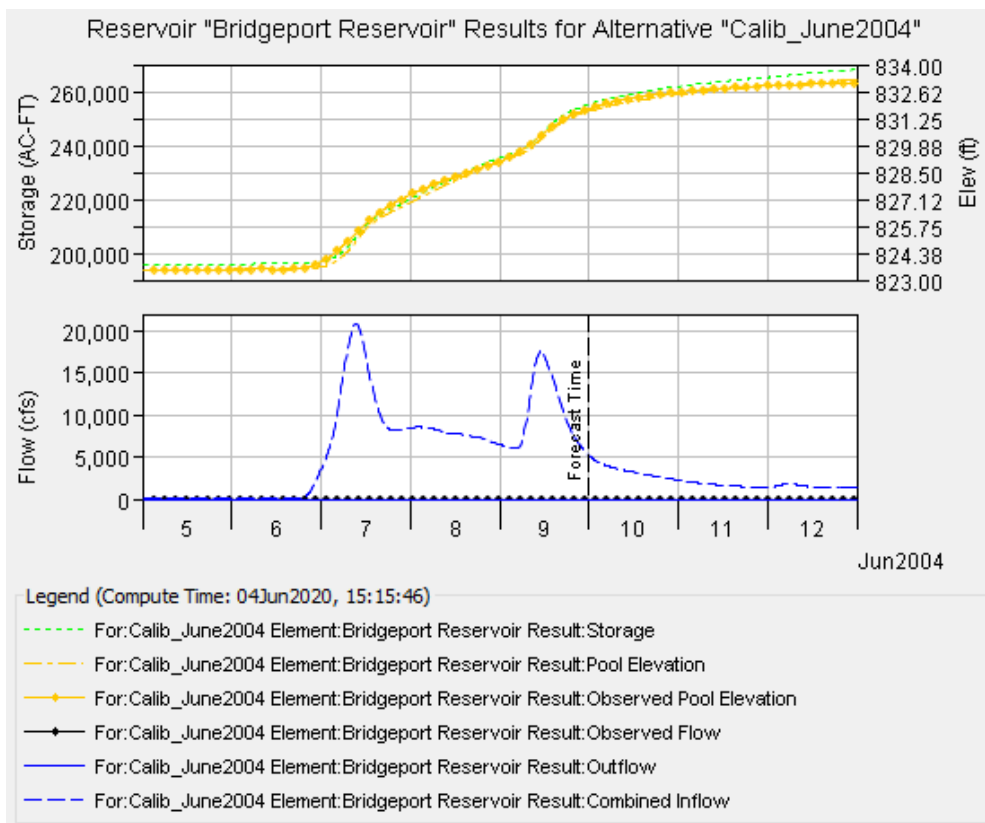


Figure 24a. June 2004 Calibration Results for Bridgeport Reservoir

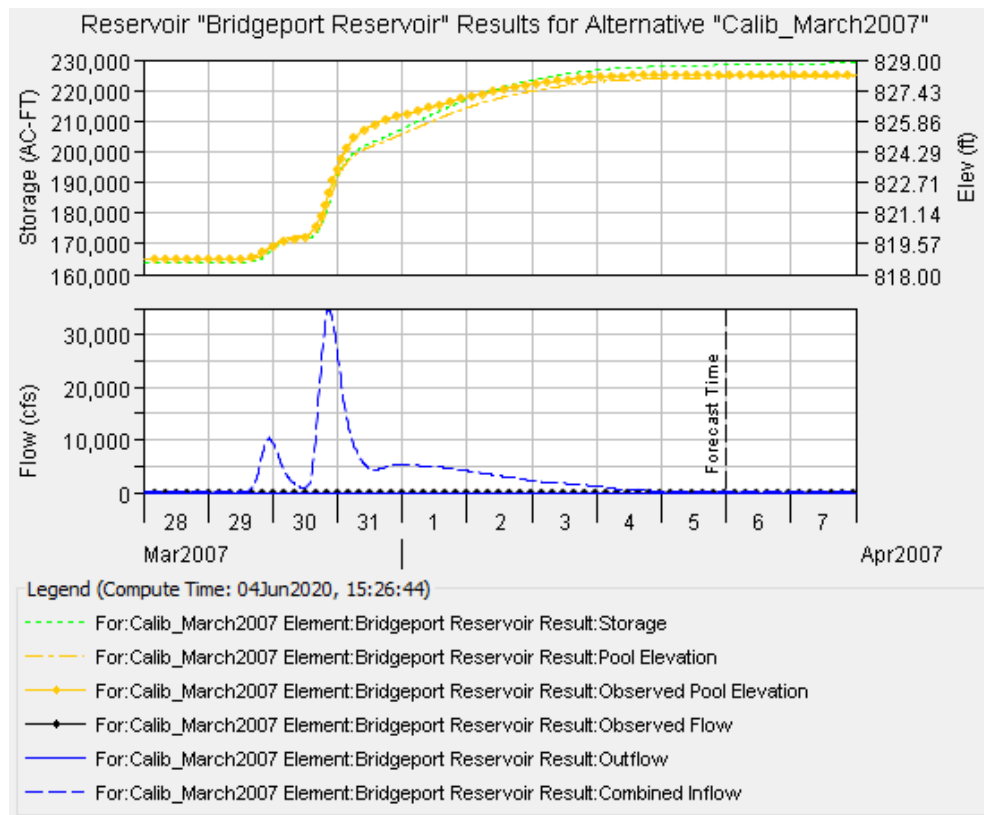


Figure 24b. March 2007 Calibration Results for Bridgeport Reservoir

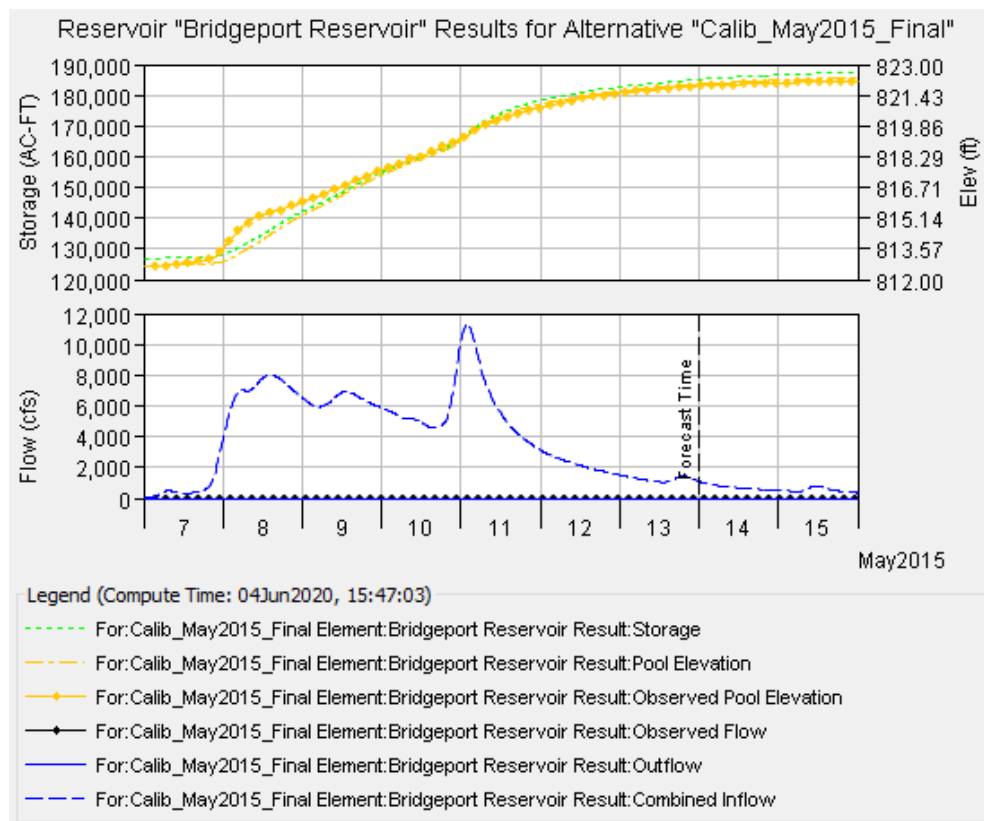


Figure 24c. May 2015 Calibration Results for Bridgeport Reservoir

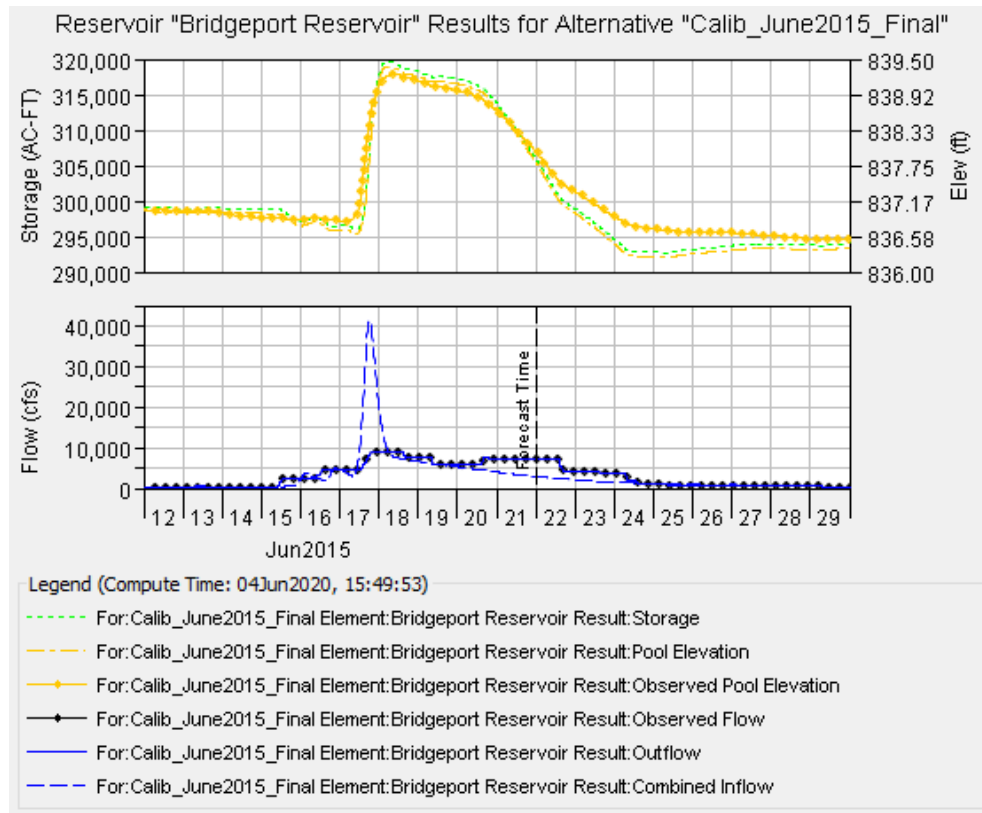


Figure 24d. June 2015 Calibration Results for Bridgeport Reservoir

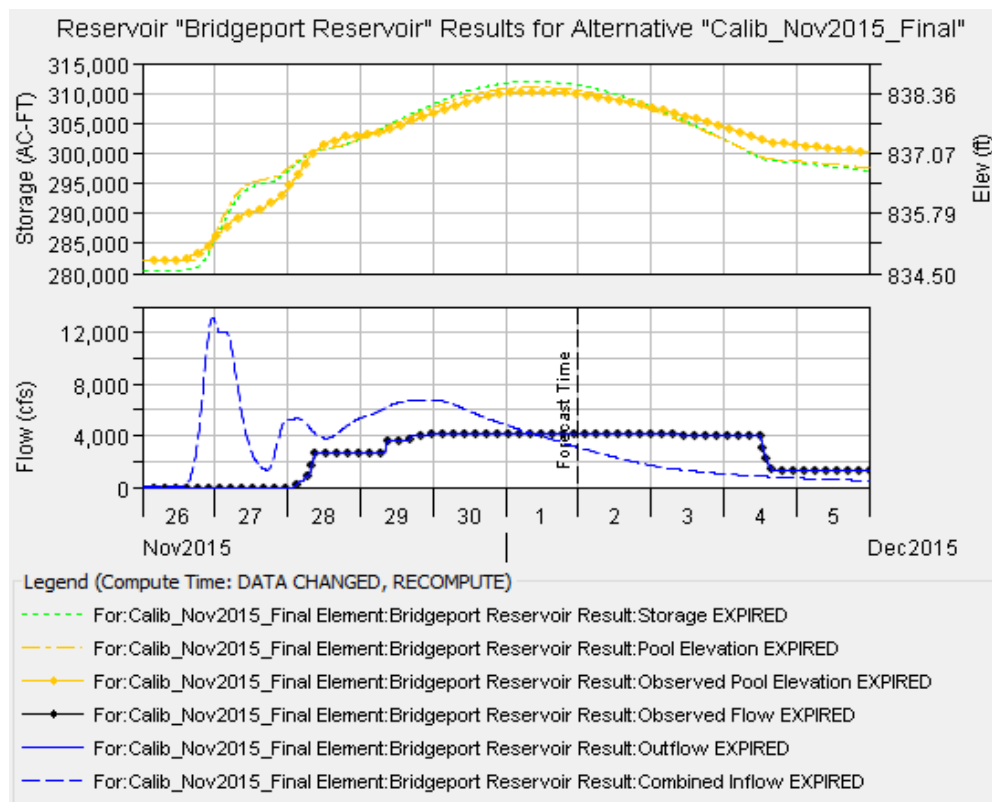


Figure 24e. November 2015 Calibration Results for Bridgeport Reservoir

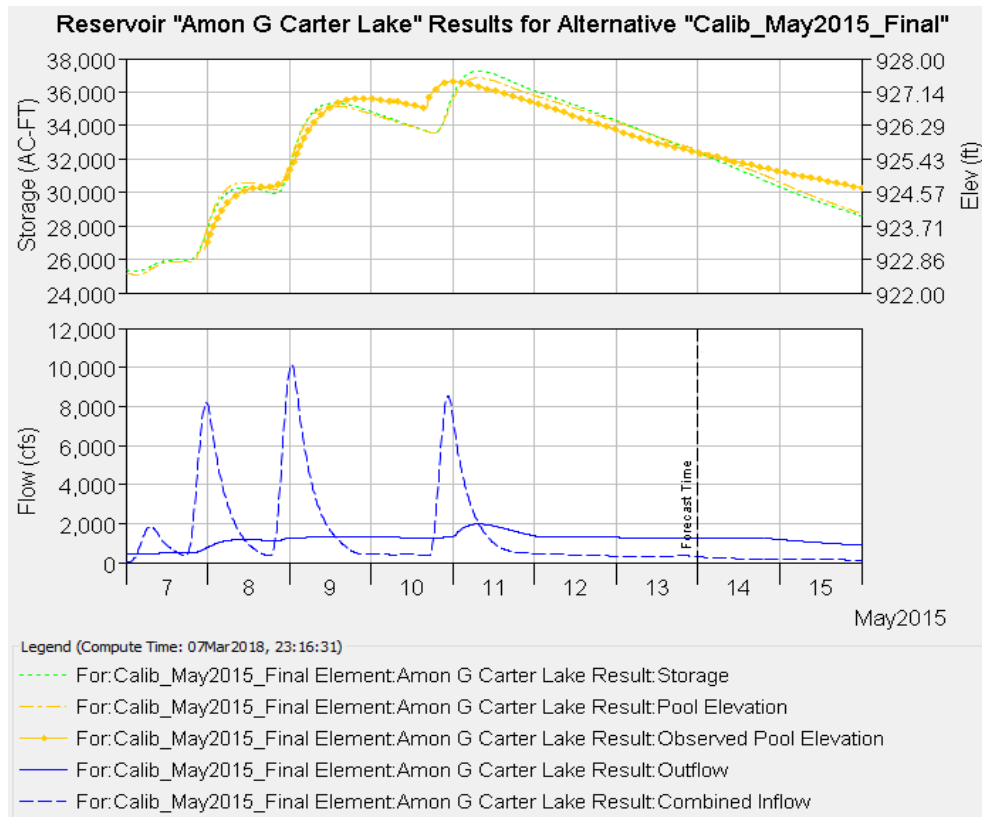


Figure 25a. March 2015 Calibration Results for Amon G Carter Reservoir

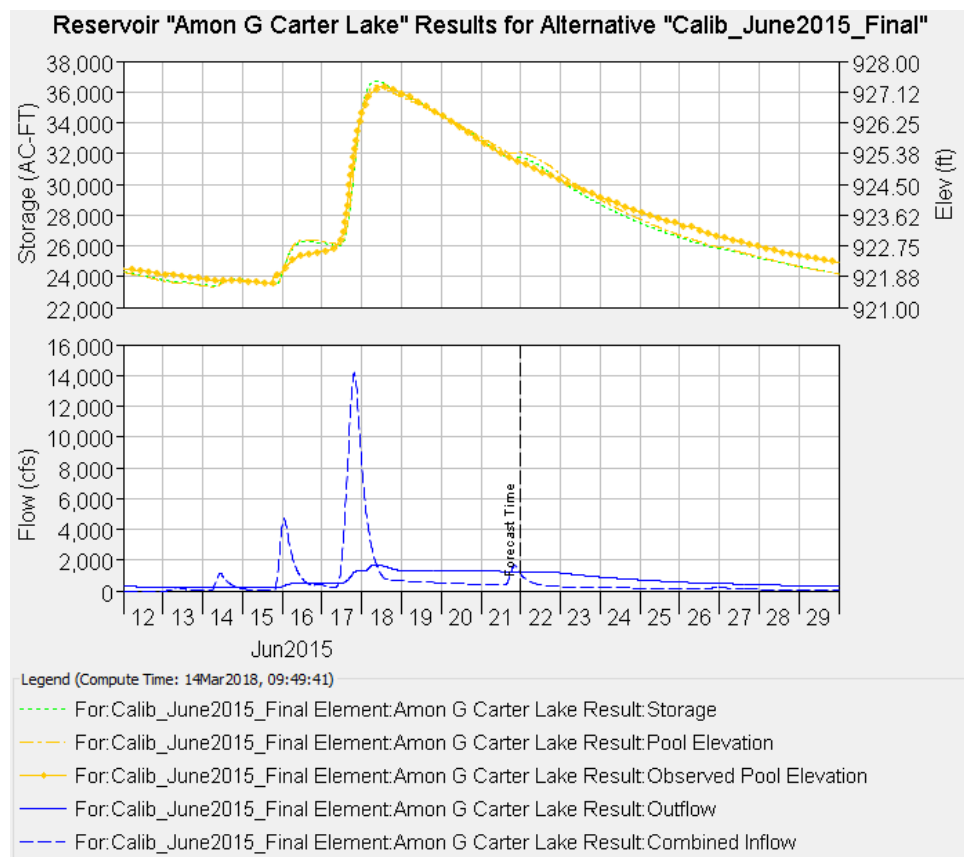


Figure 25b. June 2015 Calibration Results for Amon G Carter Reservoir

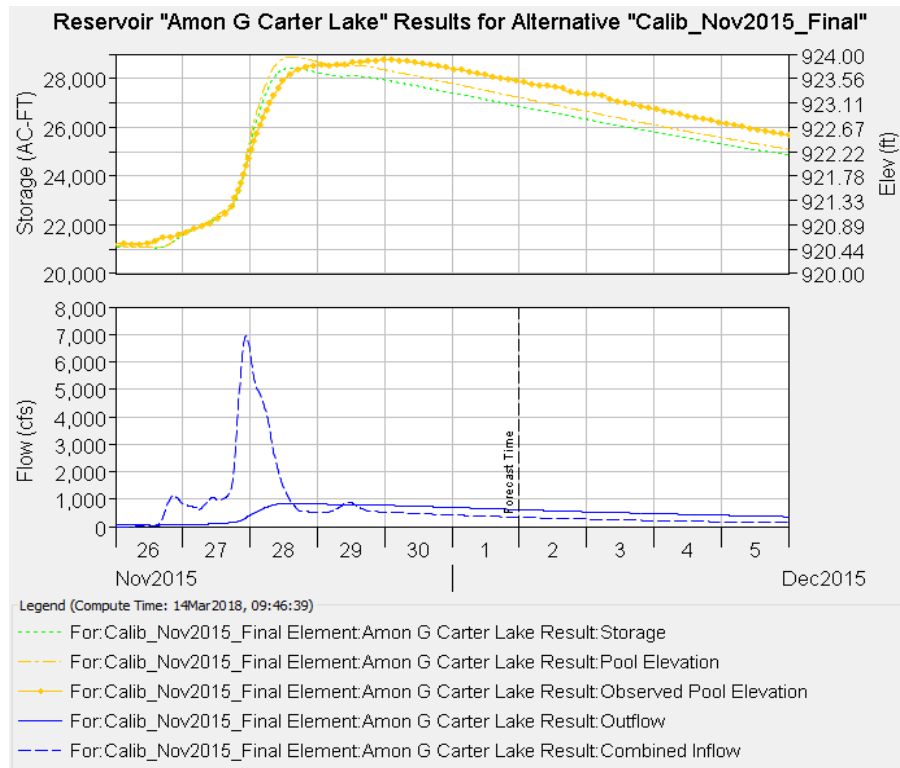


Figure 25c. November 2015 Calibration Results for Amon G Carter Reservoir

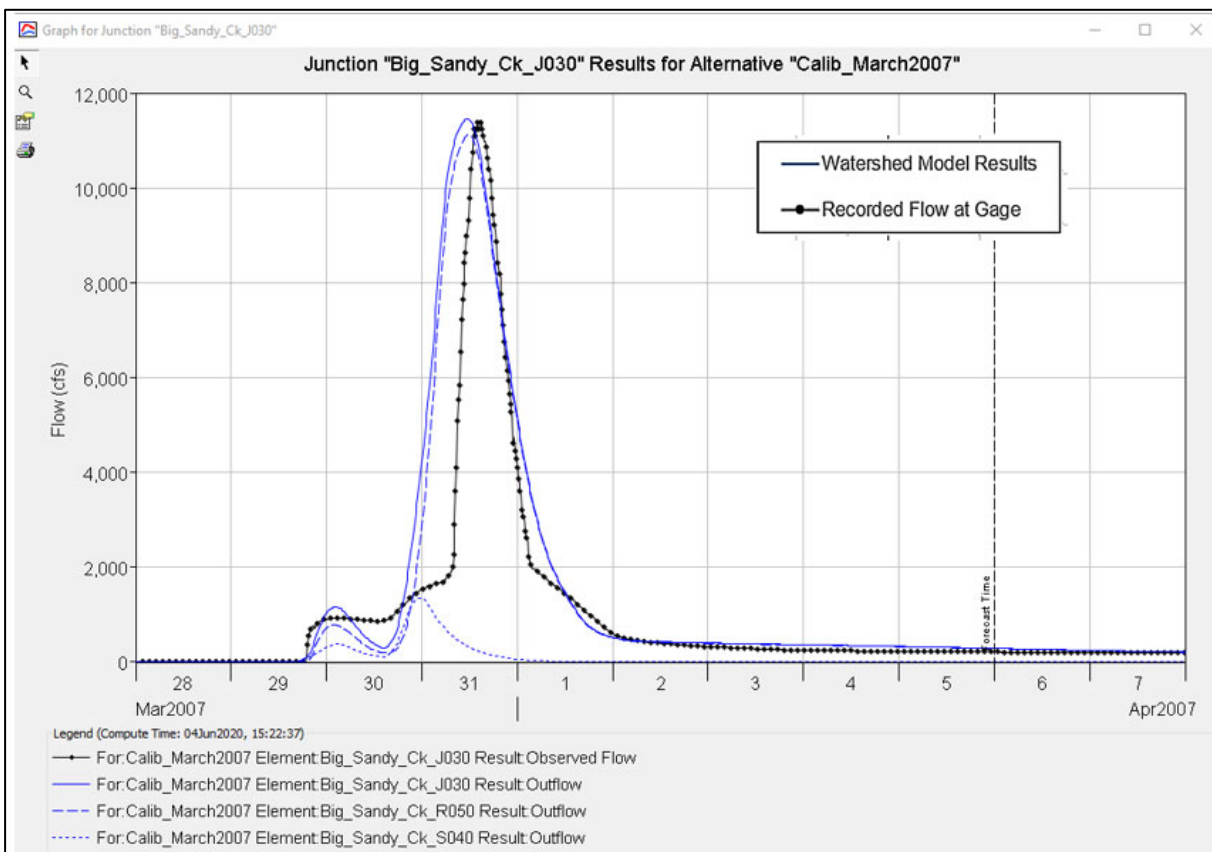


Figure 26a. March 28, 2007 Calibration Results for Sandy Creek nr Bridgeport, TX Gage

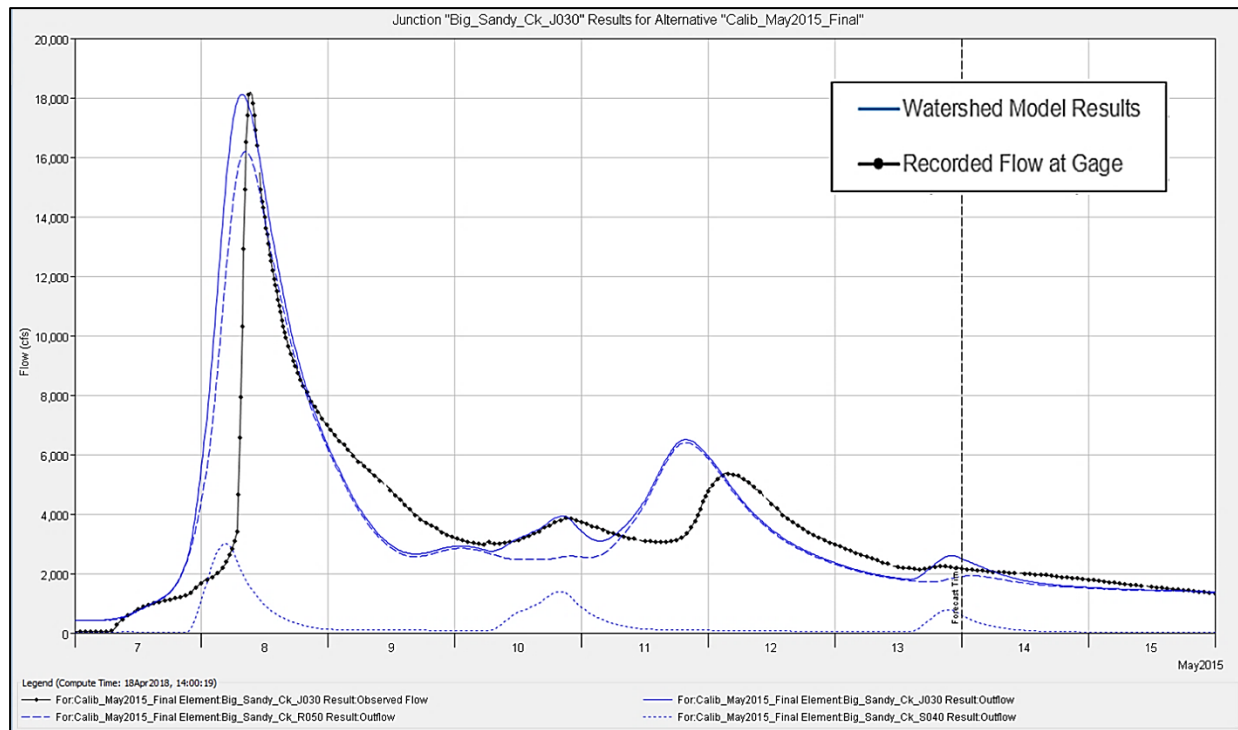


Figure 26b. May 8, 2015 Calibration Results for Sandy Creek nr Bridgeport, TX Gage

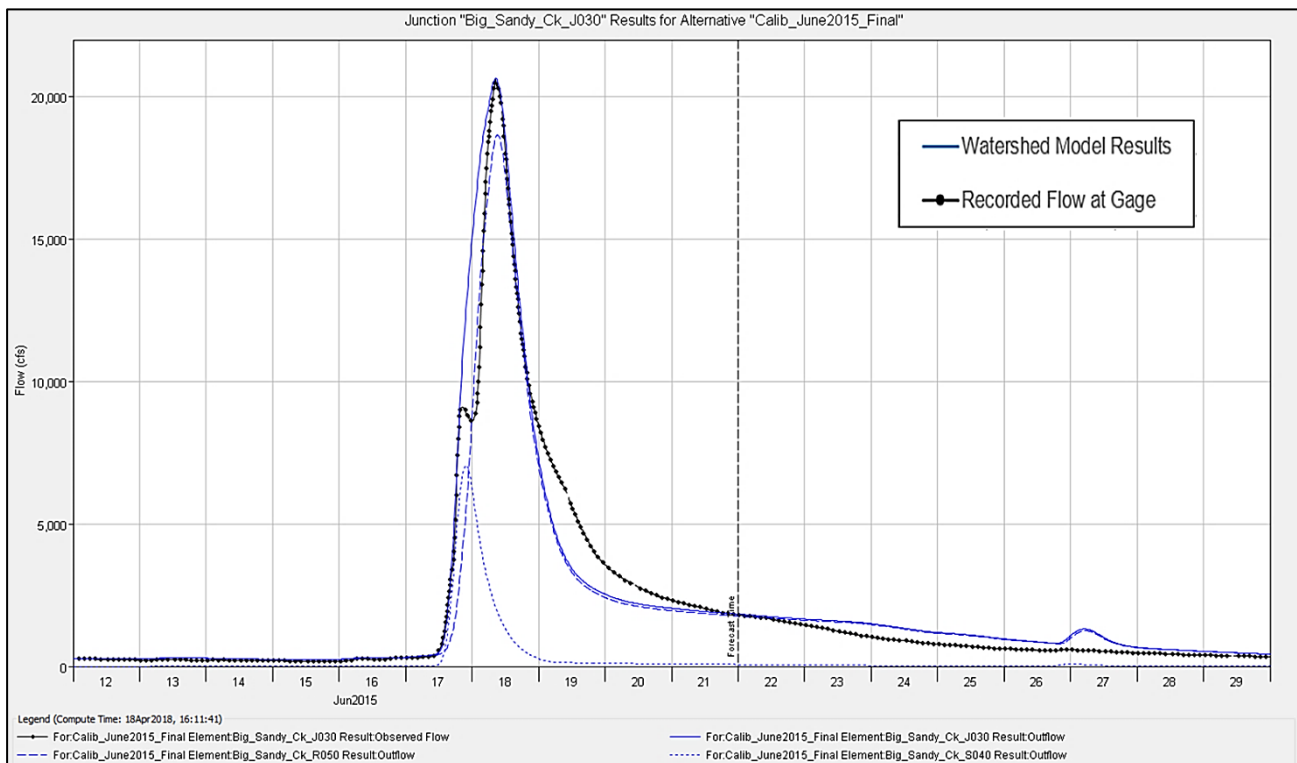


Figure 26c. June 18, 2015 Calibration Results for the Sandy Creek nr Bridgeport, TX Gage

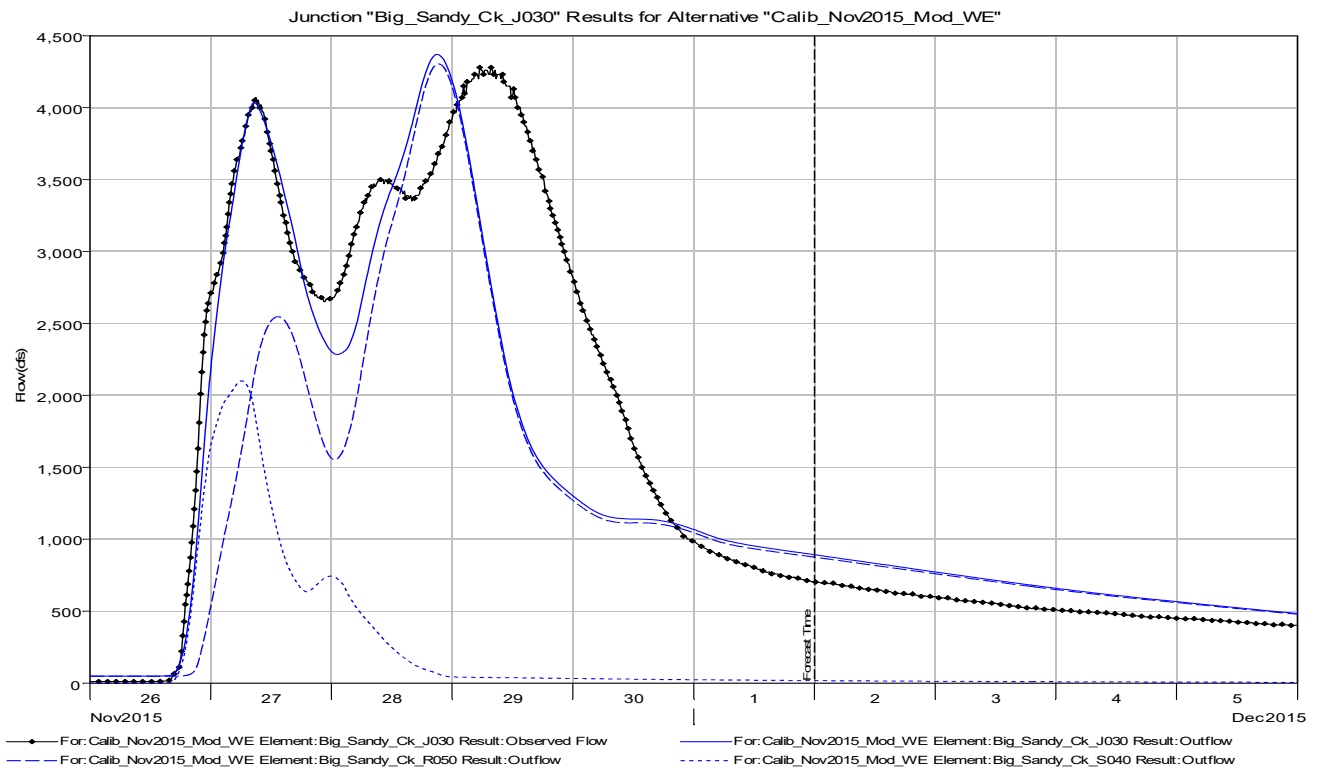


Figure 26d. November 29, 2015 Calibration Results for the Sandy Creek nr Bridgeport, TX Gage

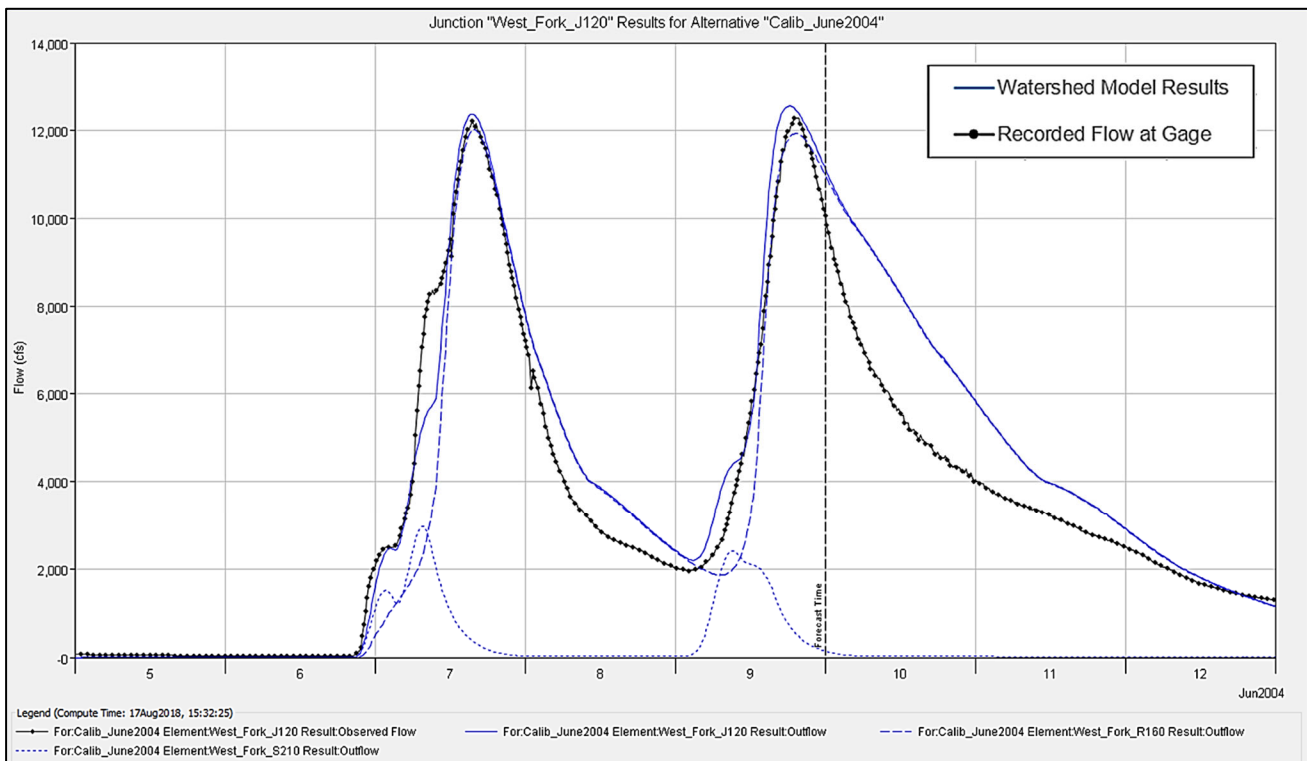


Figure 27a. June 8, 2004 Calibration Results for the West Fork near Boyd, TX Gage

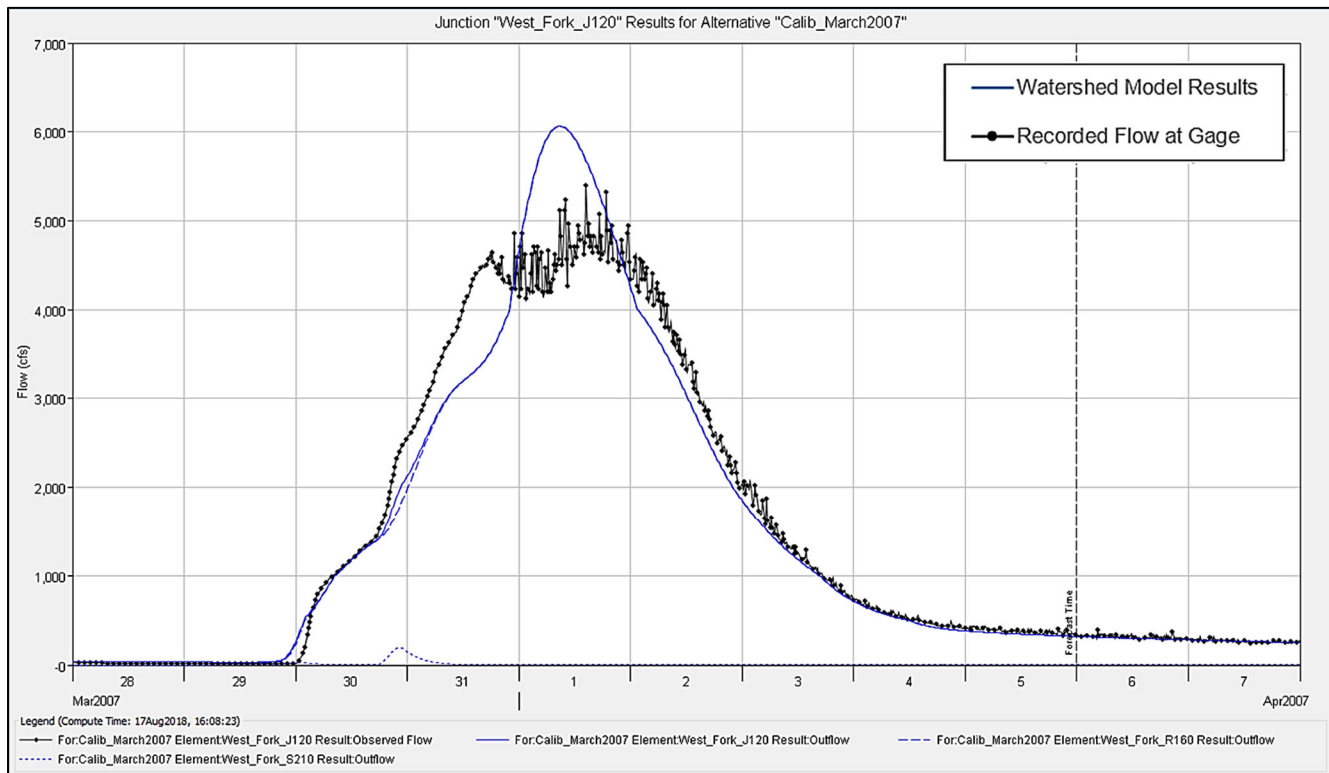


Figure 27b. March 28, 2007 Calibration Results for the West Fork near Boyd, TX Gage

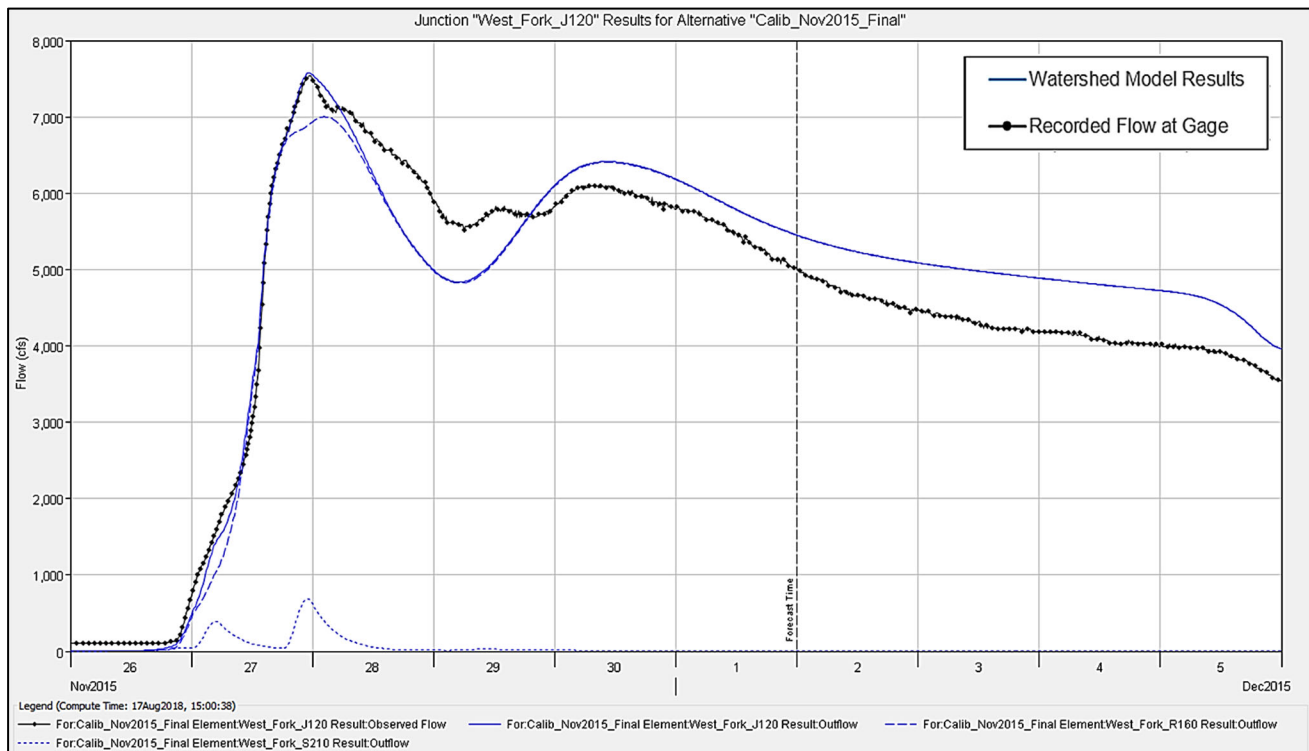


Figure 27c. November 29, 2015 Calibration Results for the West Fort near Boyd, TX Gage

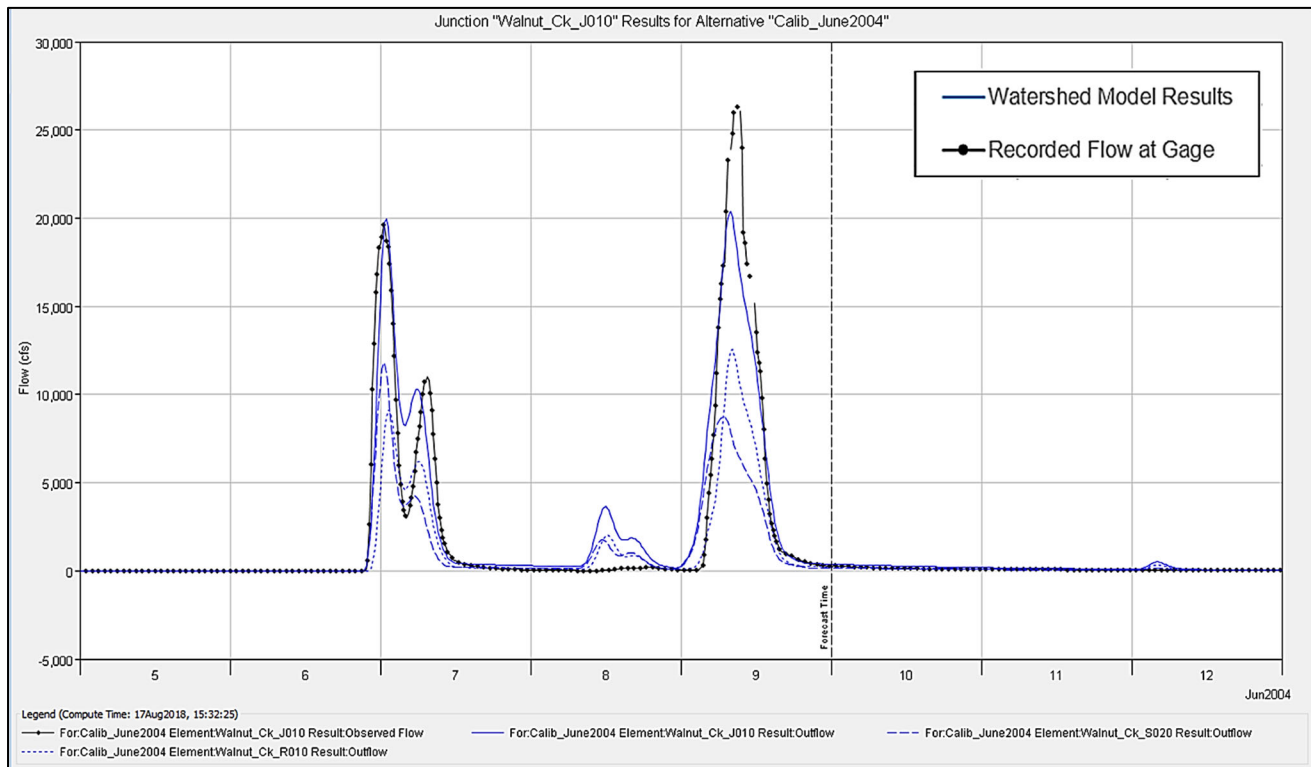


Figure 28a. June 8, 2004 Calibration Results for the Walnut Creek at Reno, TX Gage

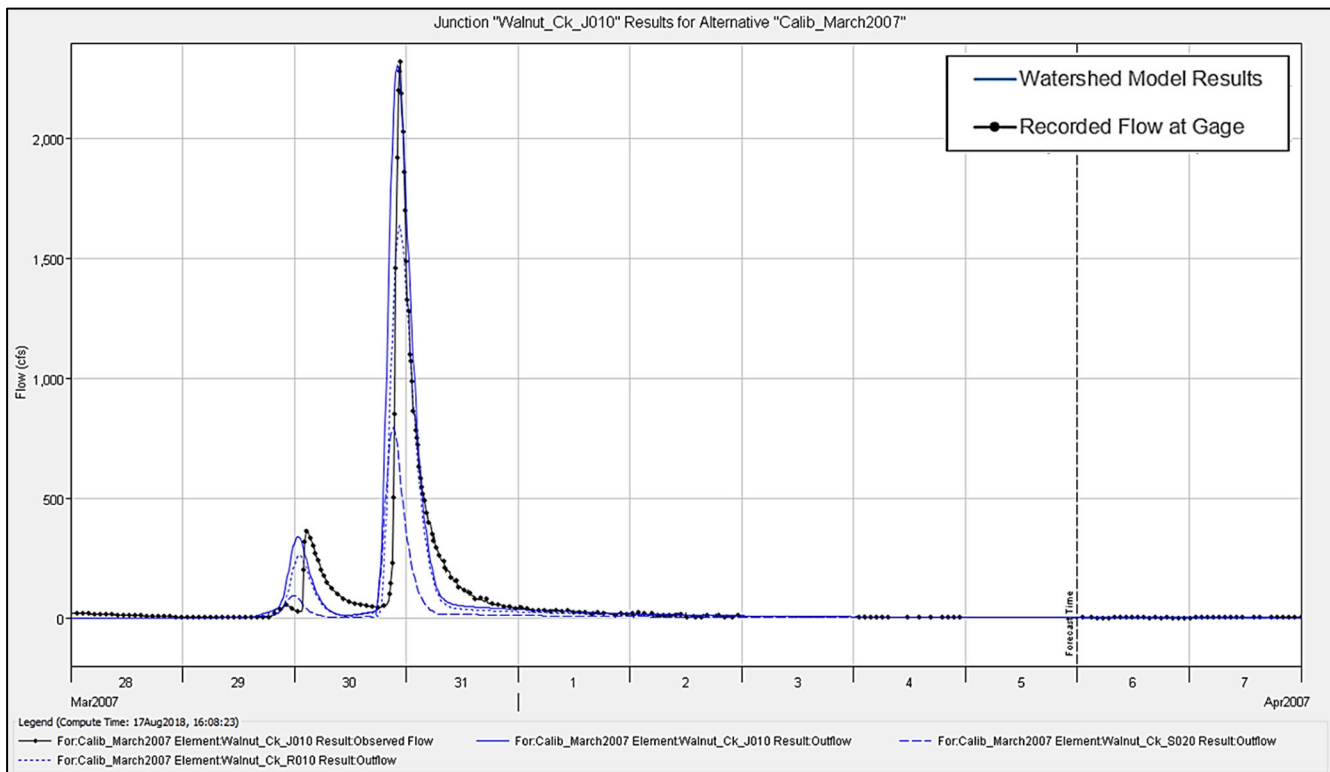


Figure 28b. March 28, 2007 Calibration Results for the Walnut Creek at Reno, TX Gage

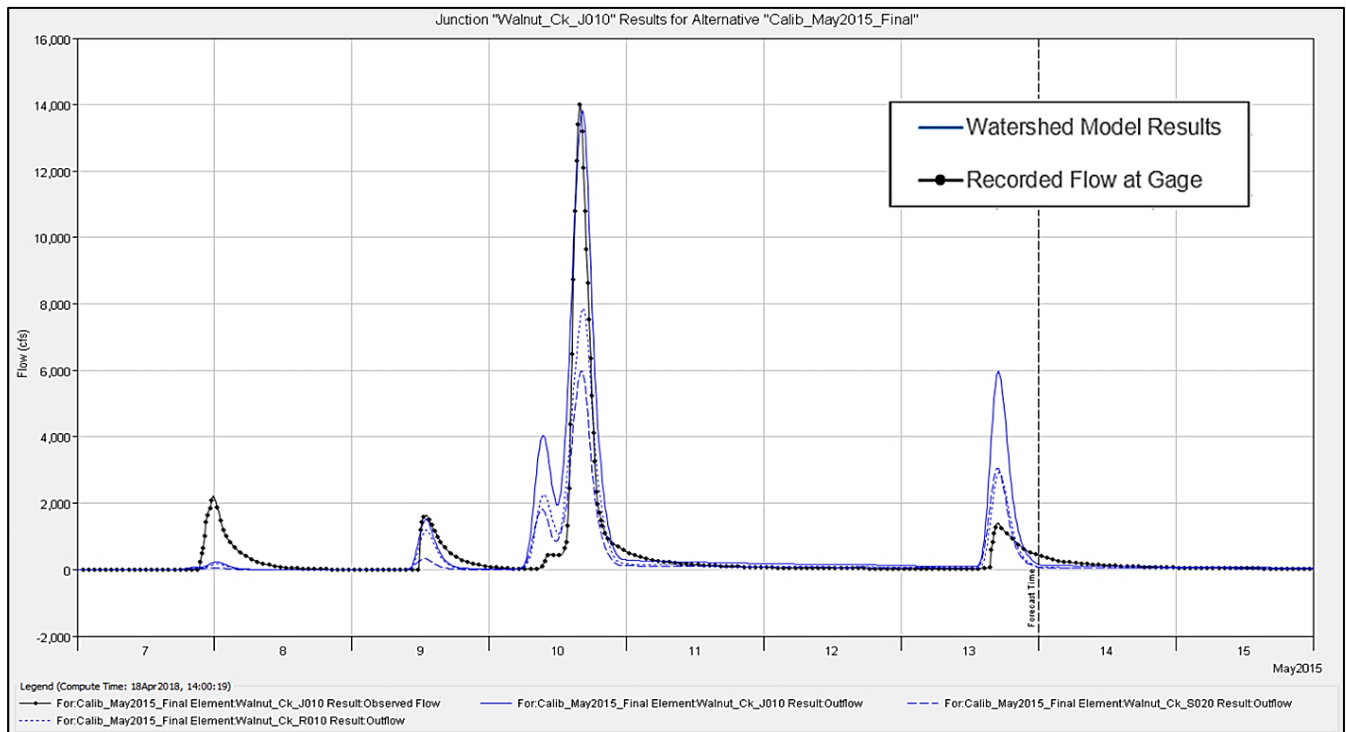


Figure 28c. May 8, 2015 Calibration Results for the Walnut Creek at Reno, TX.

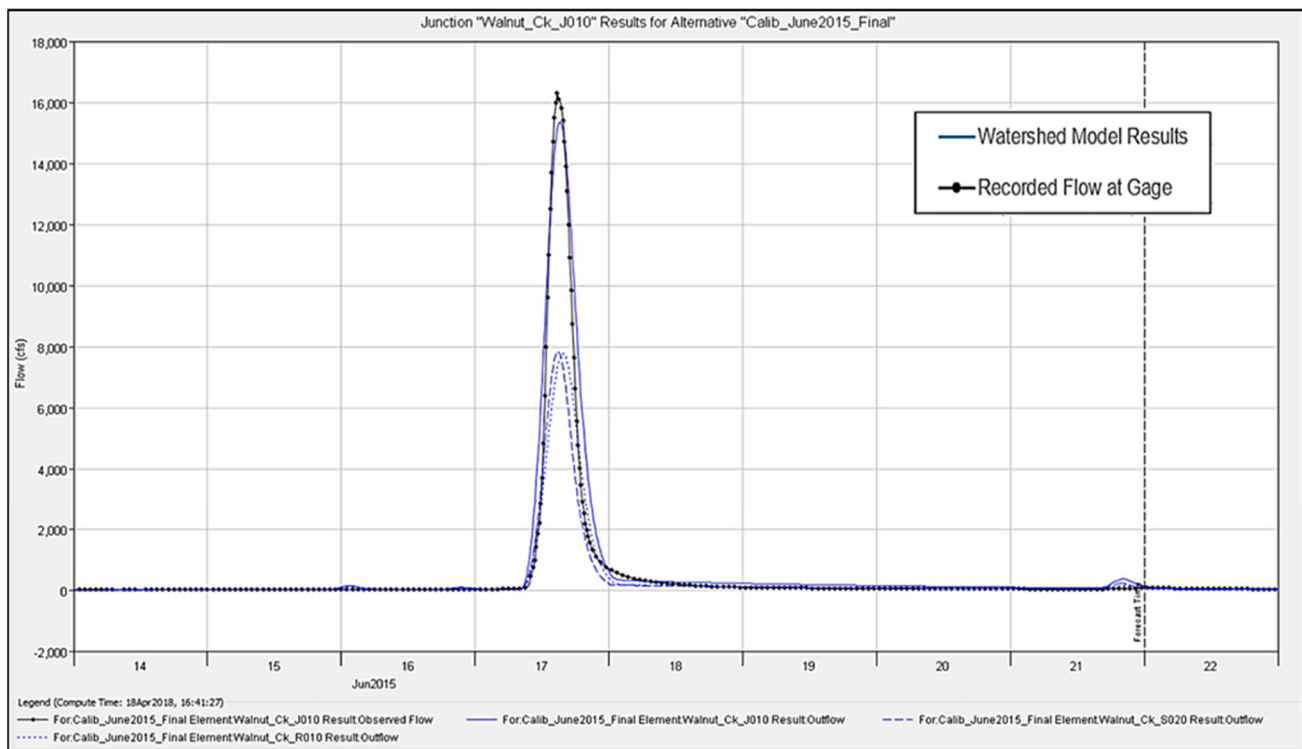


Figure 28d. June 18, 2015 Calibration Results for the Walnut Creek at Reno, TX.

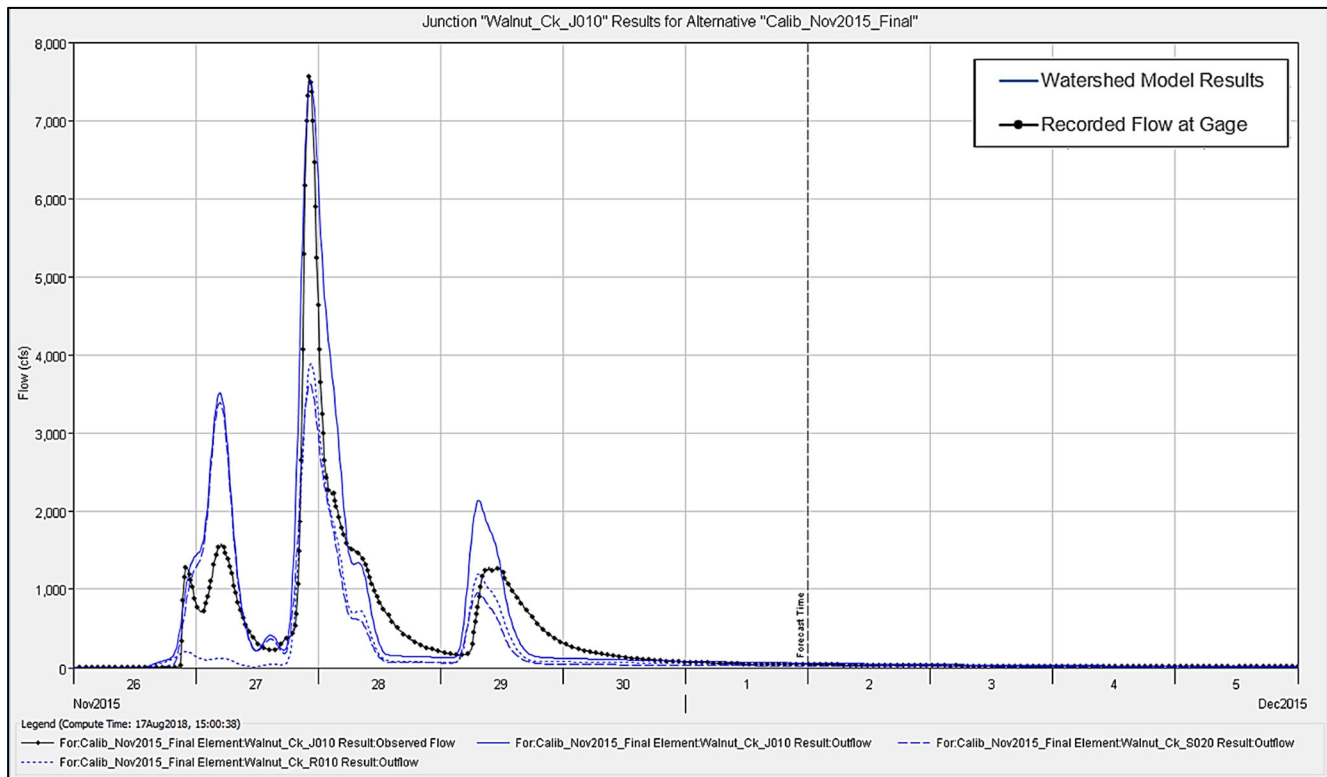


Figure 28e. November 29, 2015 Calibration Results for the Walnut Creek at Reno, TX.

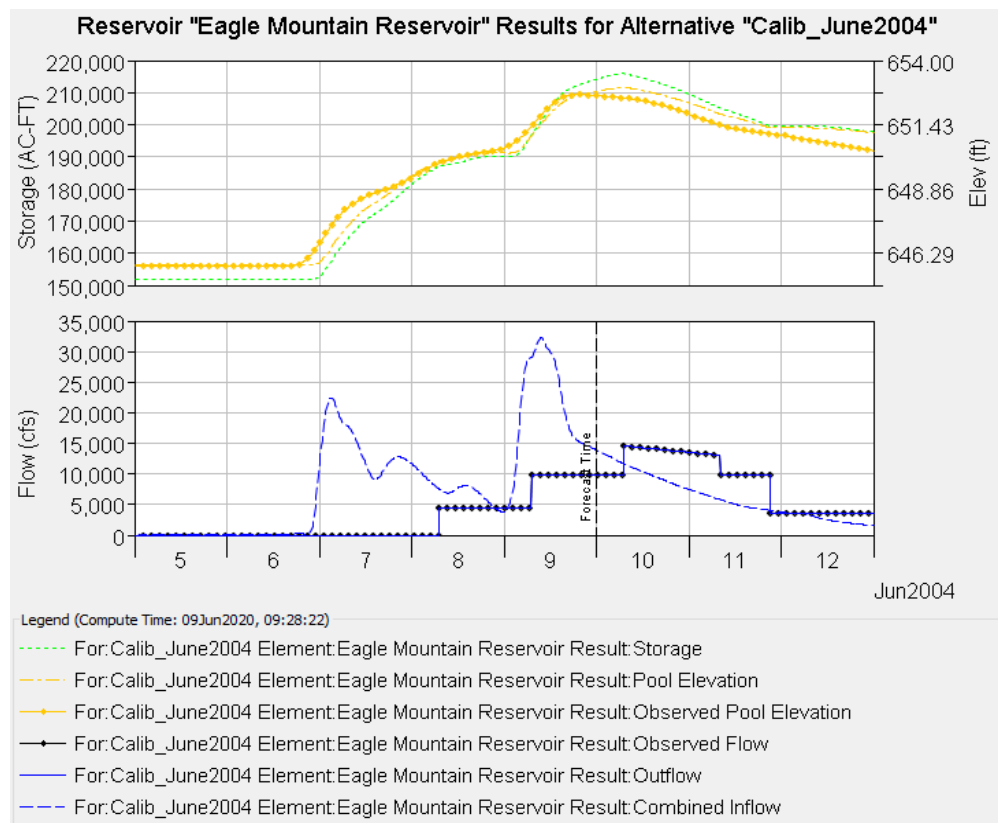


Figure 29a. June 2004 Calibration Results for Eagle Mountain Reservoir

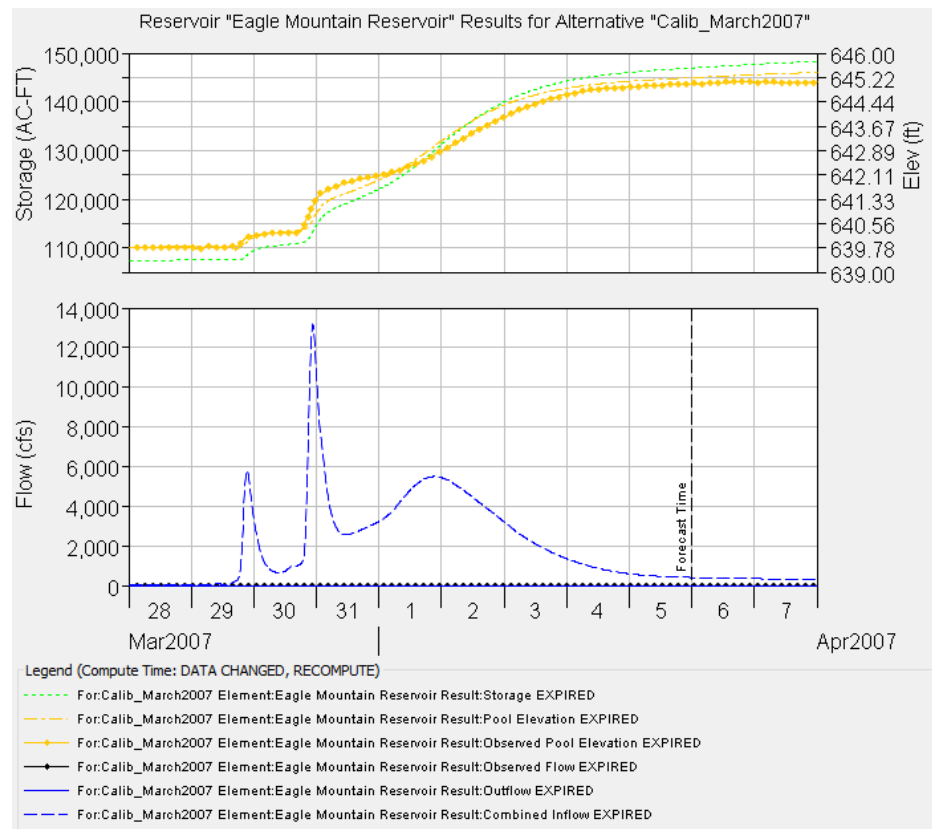


Figure 29b. March 2007 Calibration Results for Eagle Mountain Reservoir

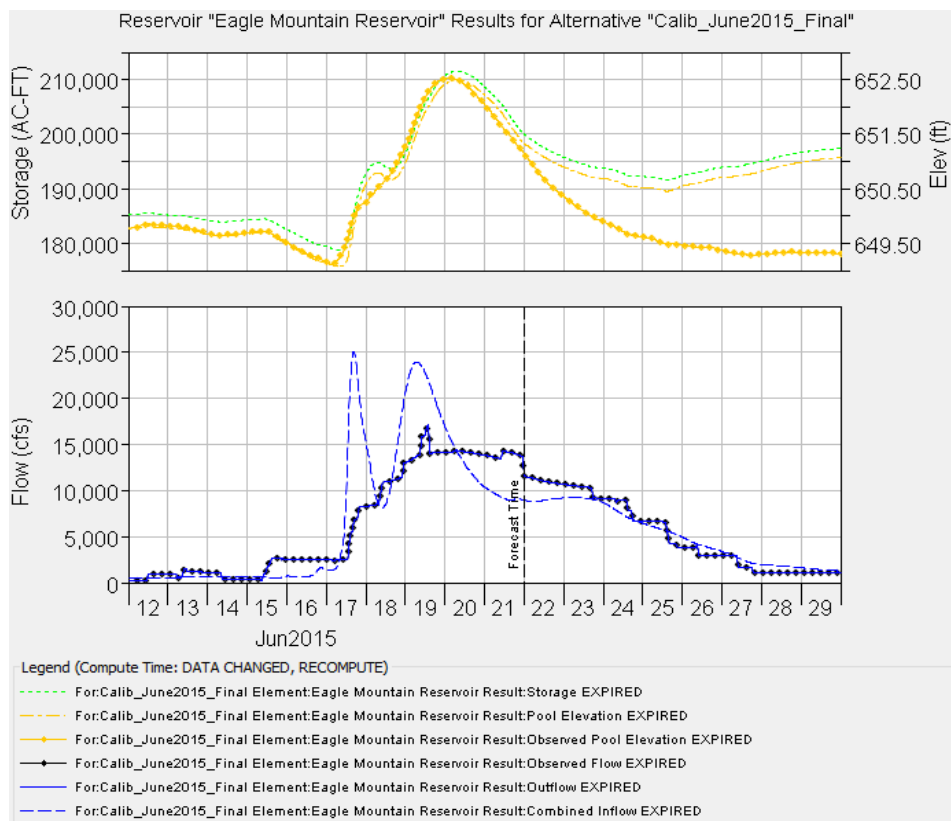


Figure 29c. June 2015 Calibration Results for Eagle Mountain Reservoir

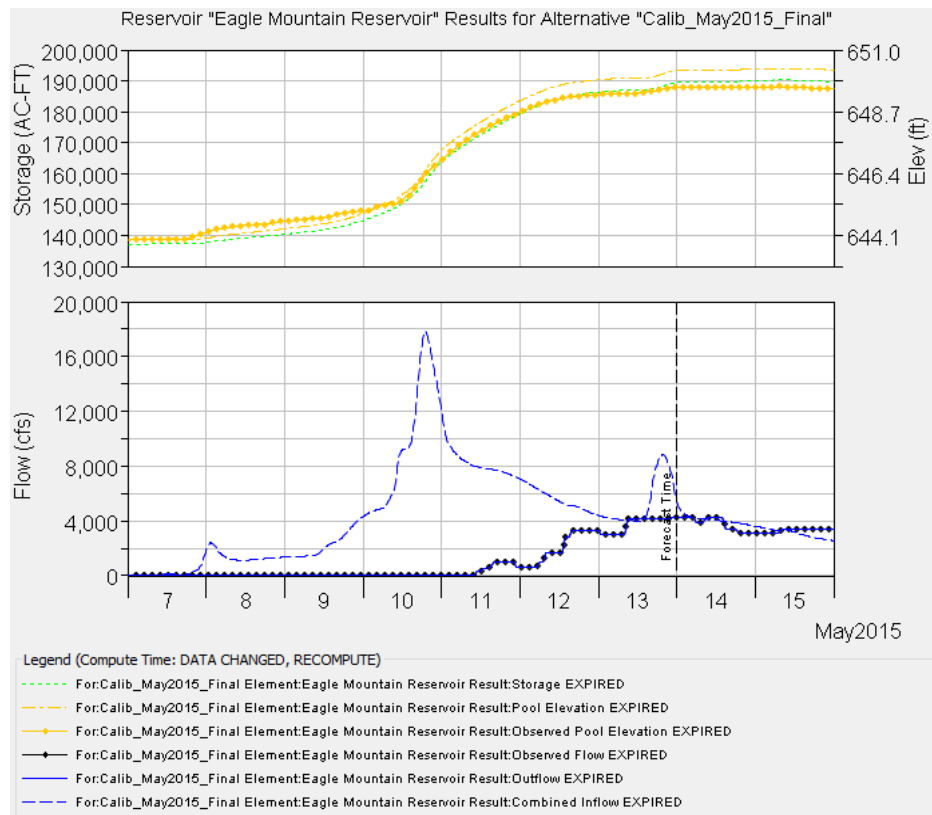


Figure 29d. May 2015 Calibration Results for Eagle Mountain Reservoir

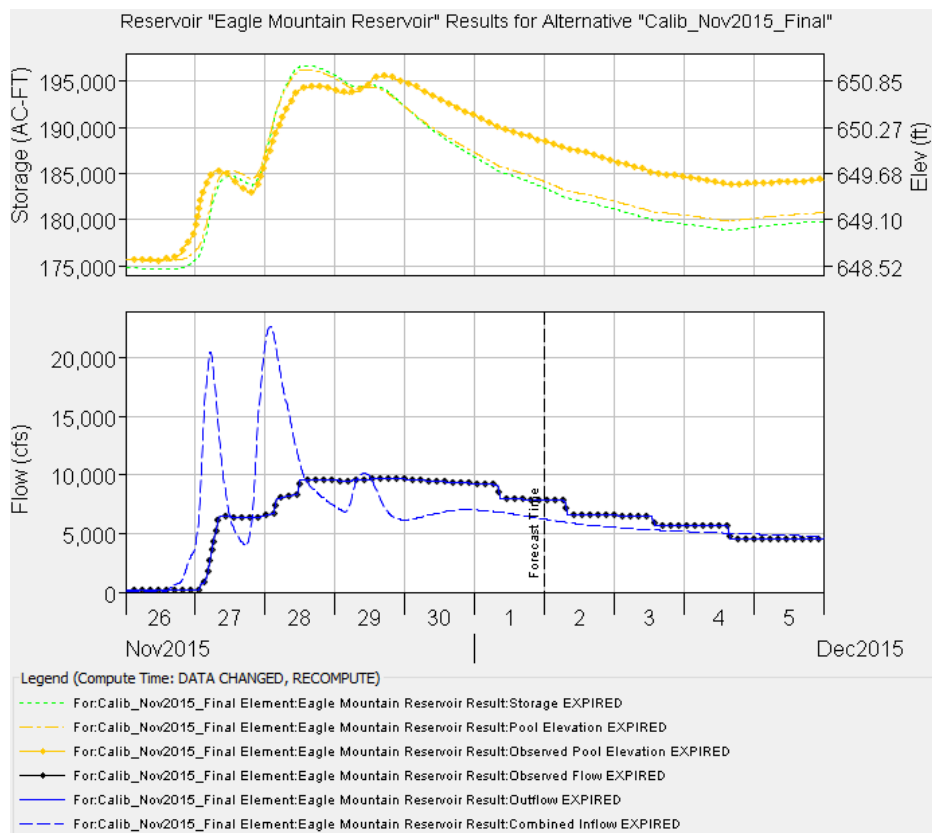


Figure 29e. November 2015 Calibration Results for Eagle Mountain Reservoir

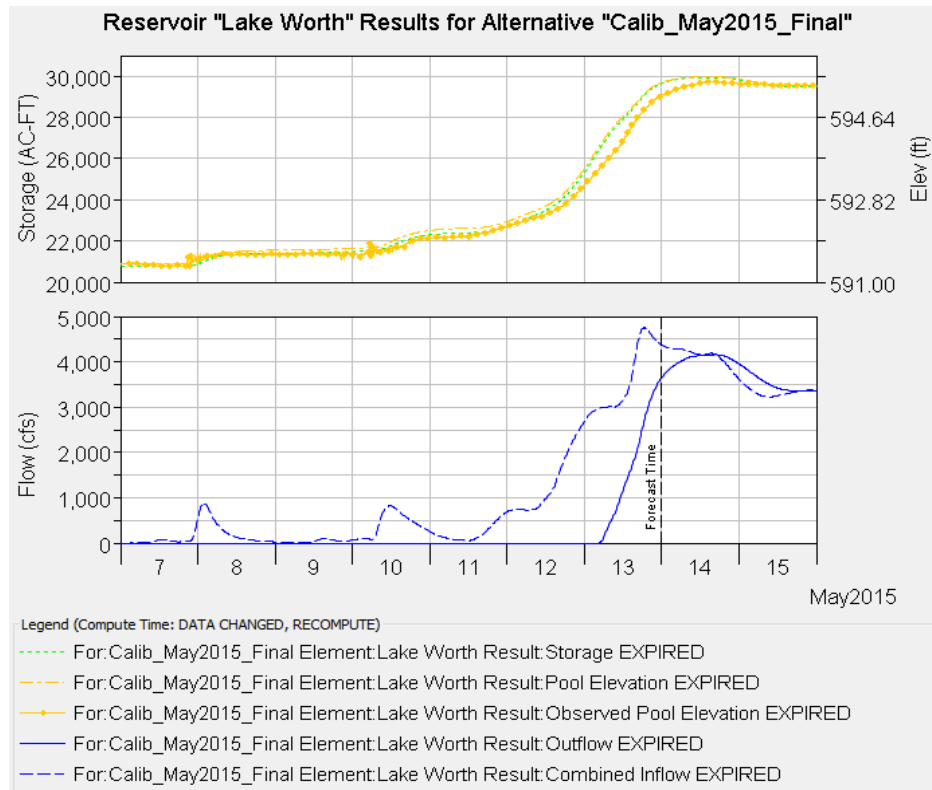


Figure 30a. May 2015 Calibration Results for Lake Worth

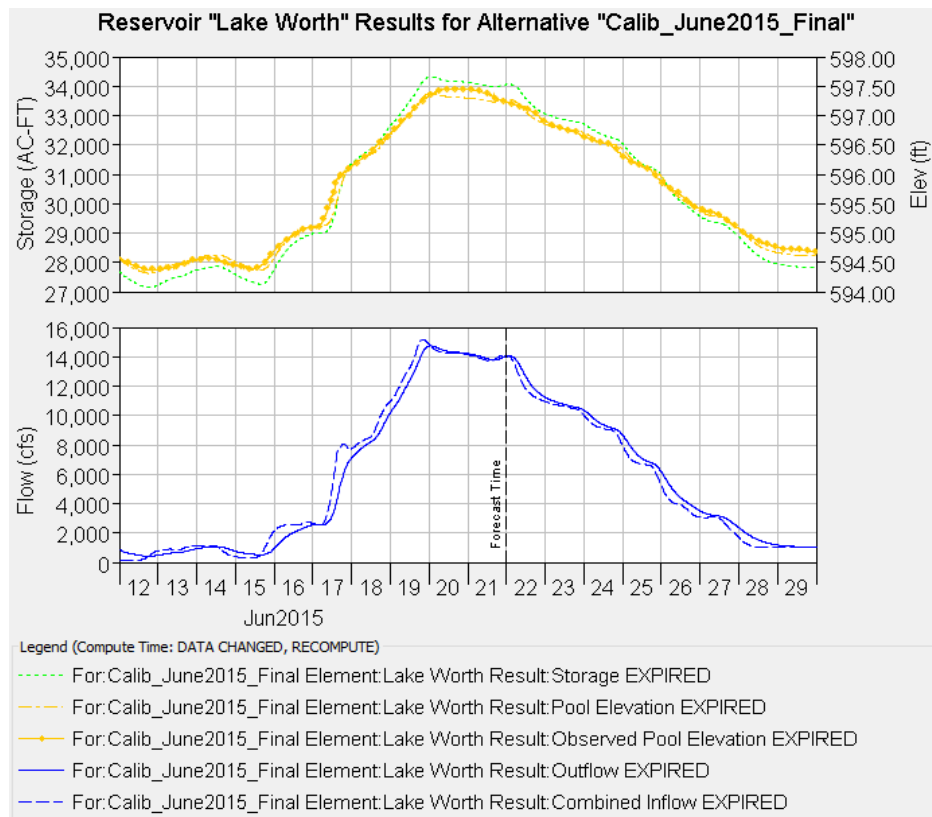


Figure 30b. June 2015 Calibration Results for Lake Worth

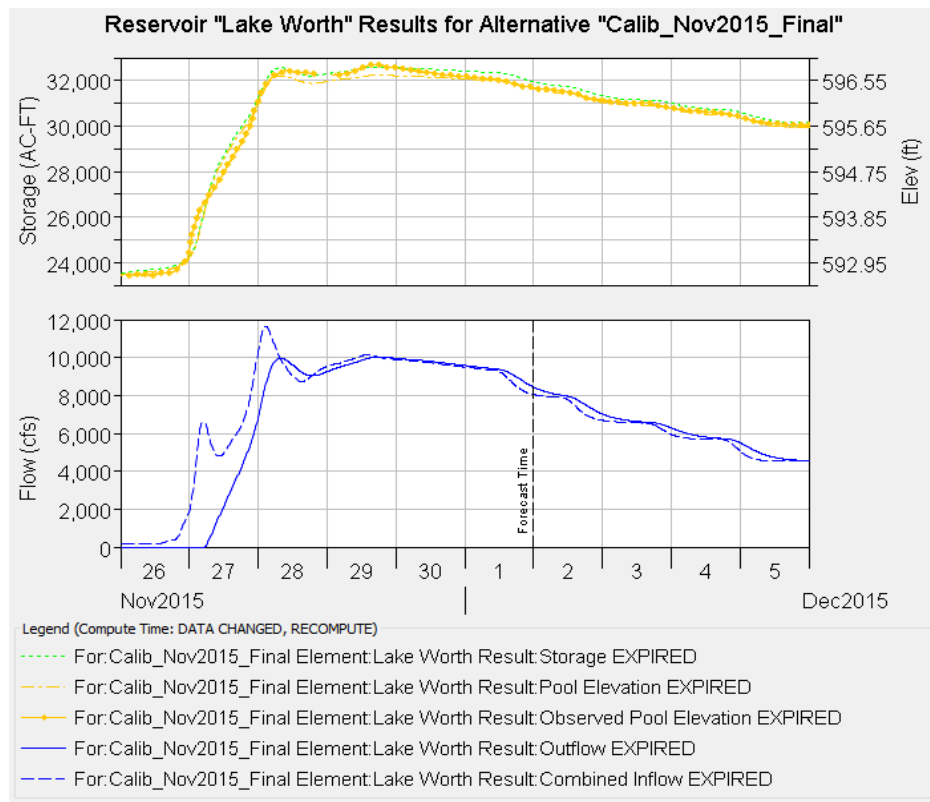


Figure 30c. November 2015 Calibration Results for Lake Worth

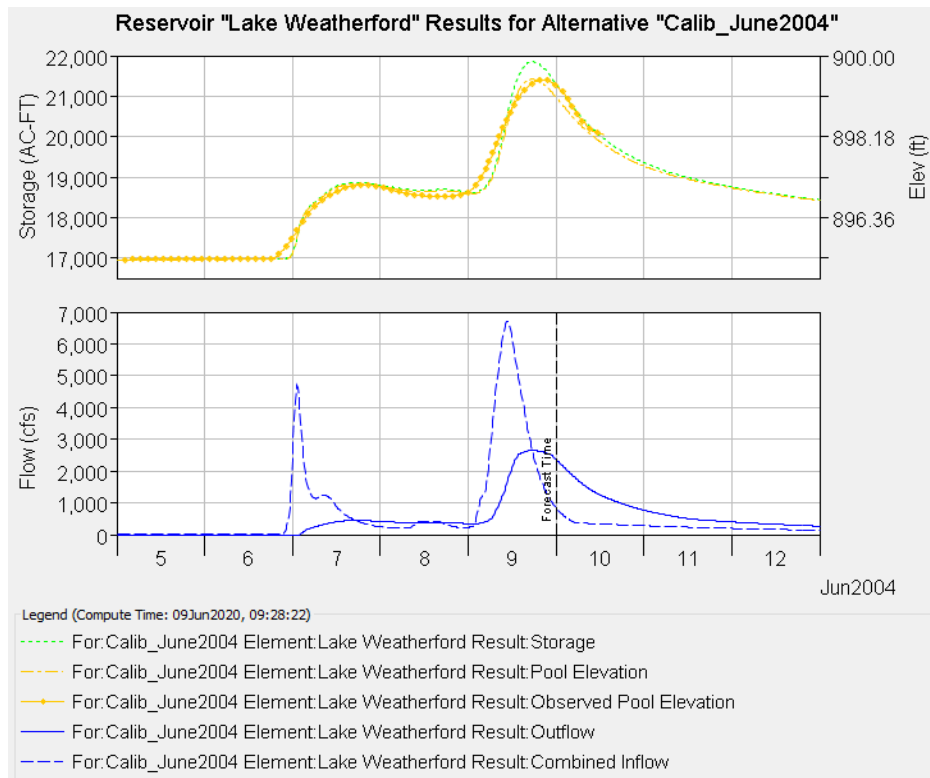


Figure 31a. June 2004 Calibration Results for Lake Weatherford

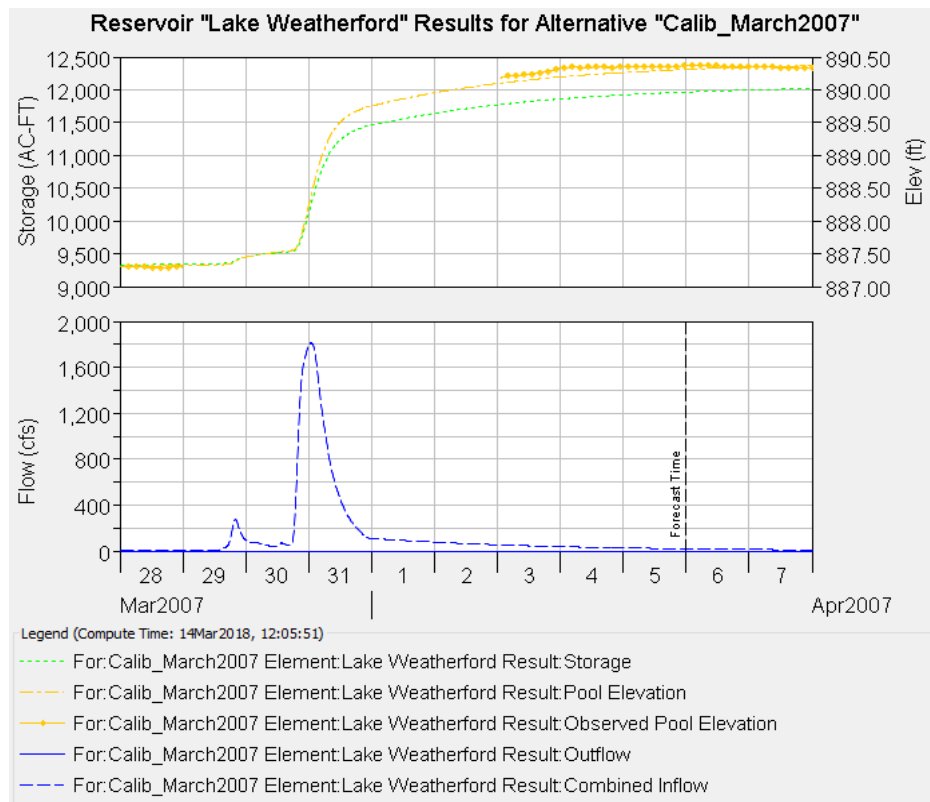


Figure 31b. March 2007 Calibration Results for Lake Weatherford

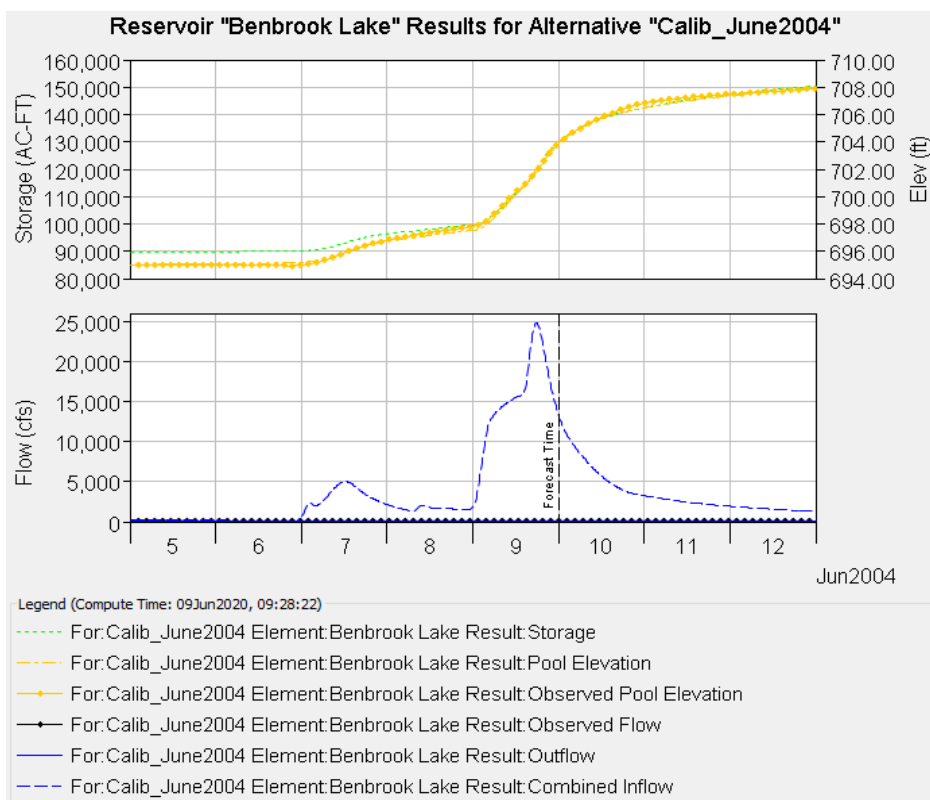


Figure 32a. June 2004 Calibration Results for Benbrook Reservoir

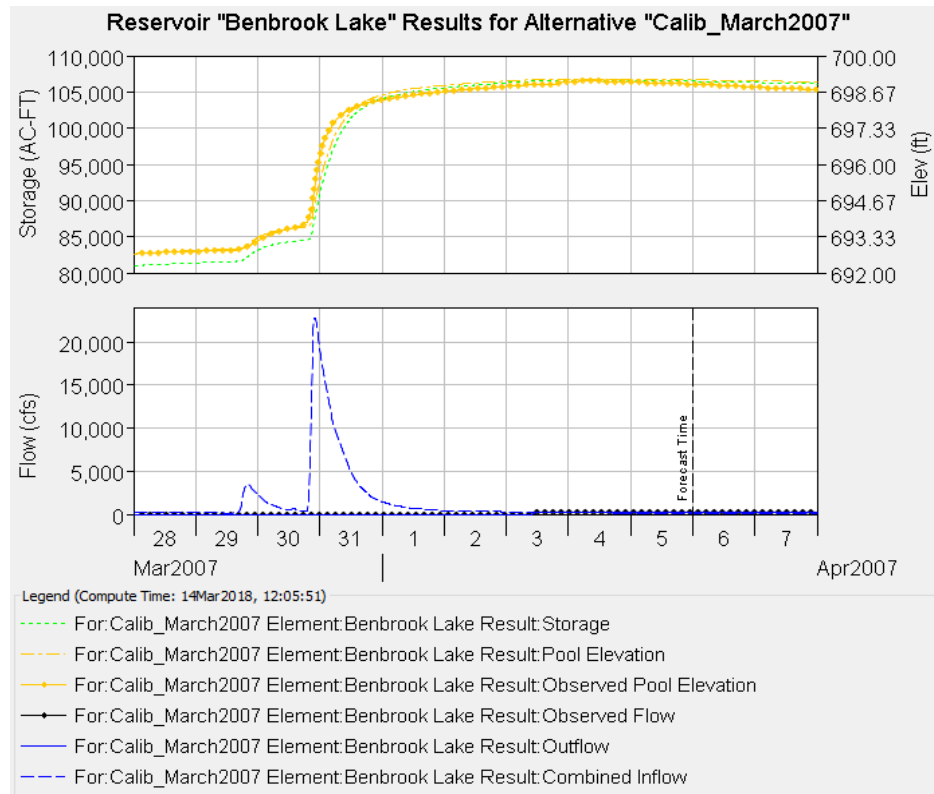


Figure 32b. March 2007 Calibration Results for Benbrook Reservoir

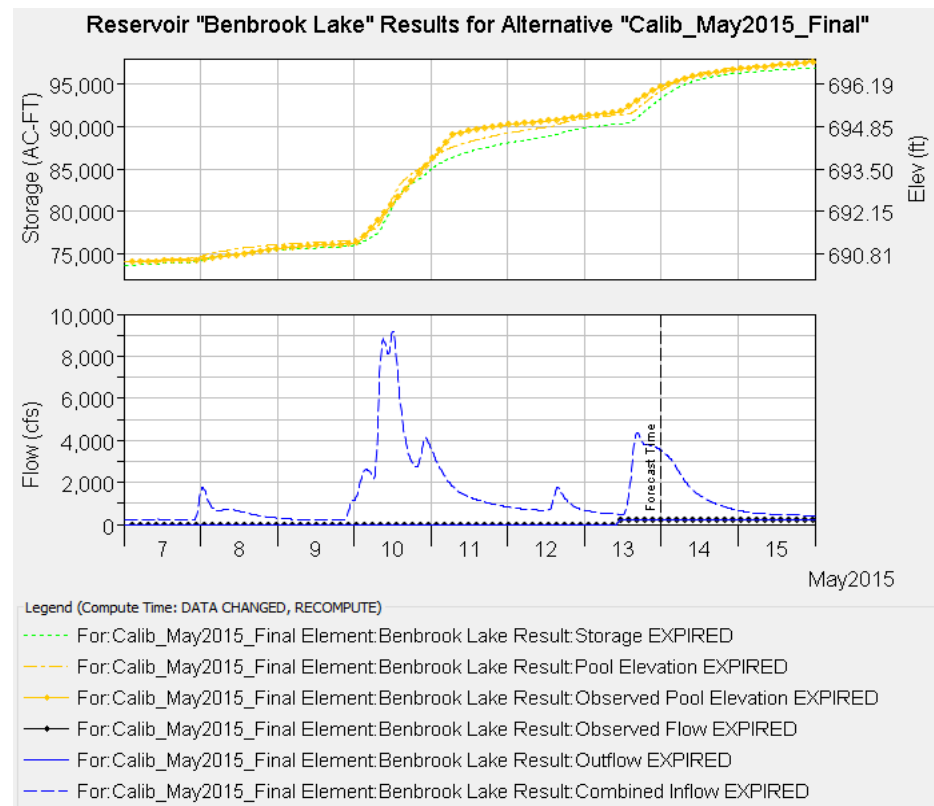


Figure 32c. May 2015 Calibration Results for Benbrook Reservoir

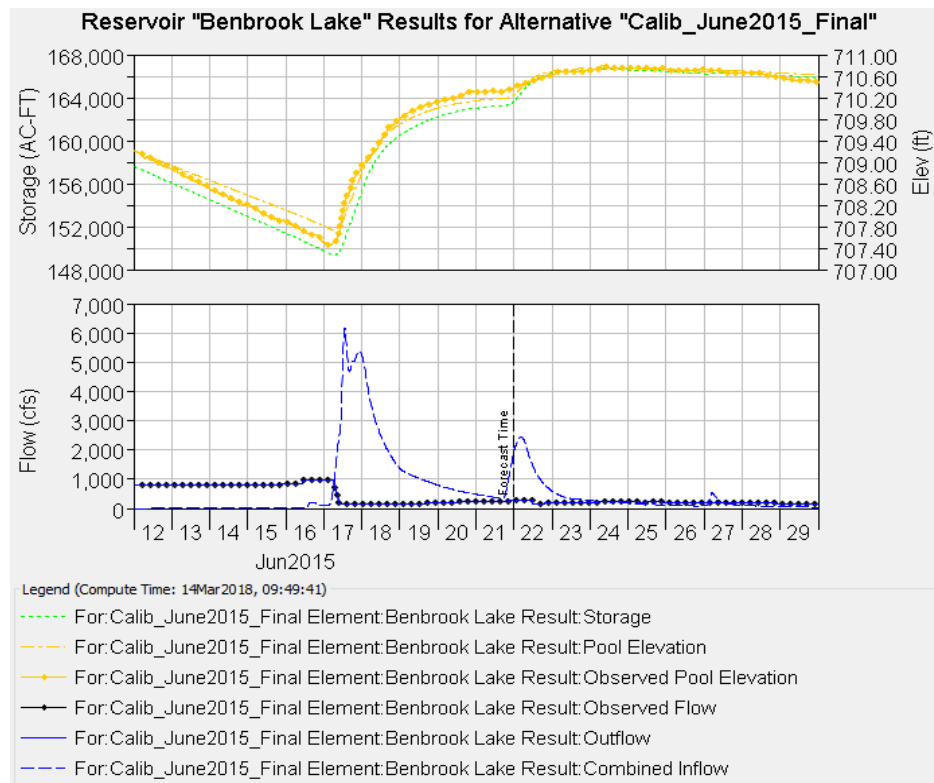


Figure 32d. June 2015 Calibration Results for Benbrook Reservoir

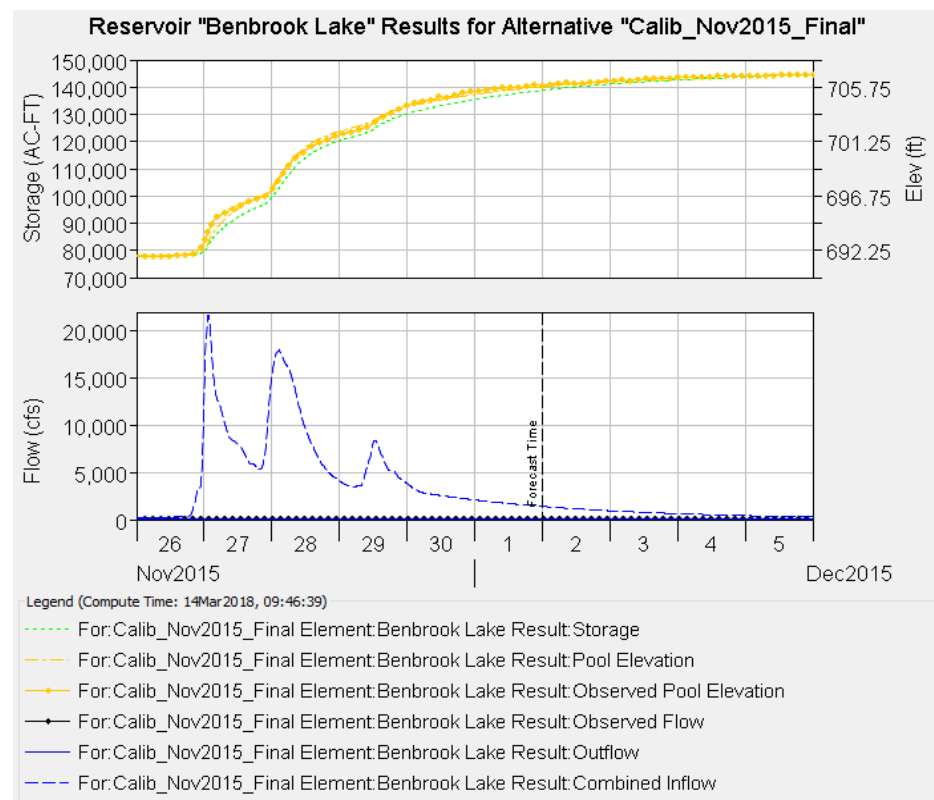


Figure 32e. November 2015 Calibration Results for Benbrook Reservoir

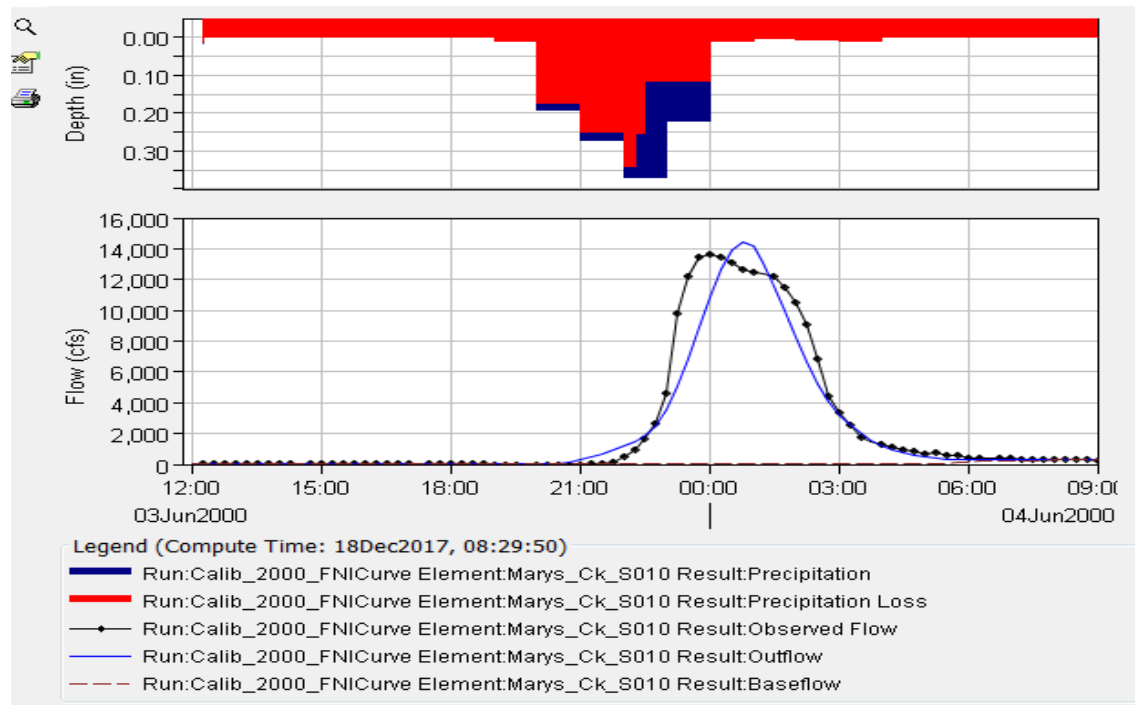


Figure 2. June 2000 Calibration Results for the Marys Creek at Benbrook, TX Gage

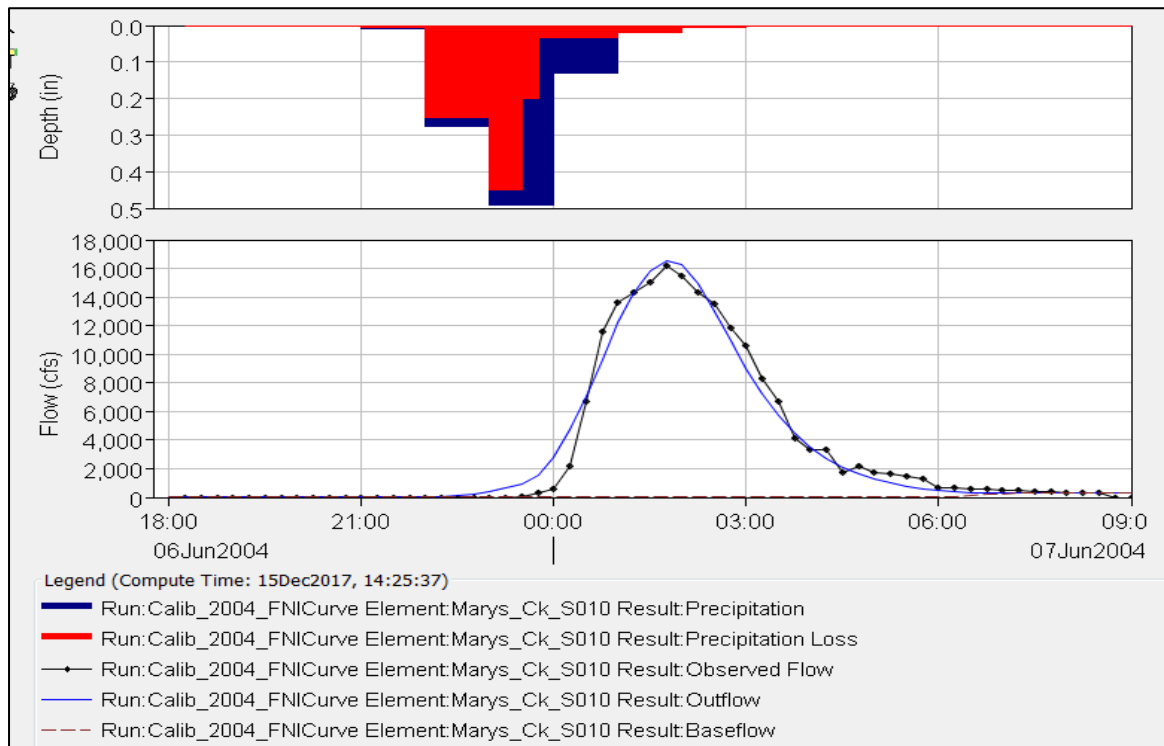


Figure 3. June 2004 Calibration Results for the Marys Creek at Benbrook, TX Gage

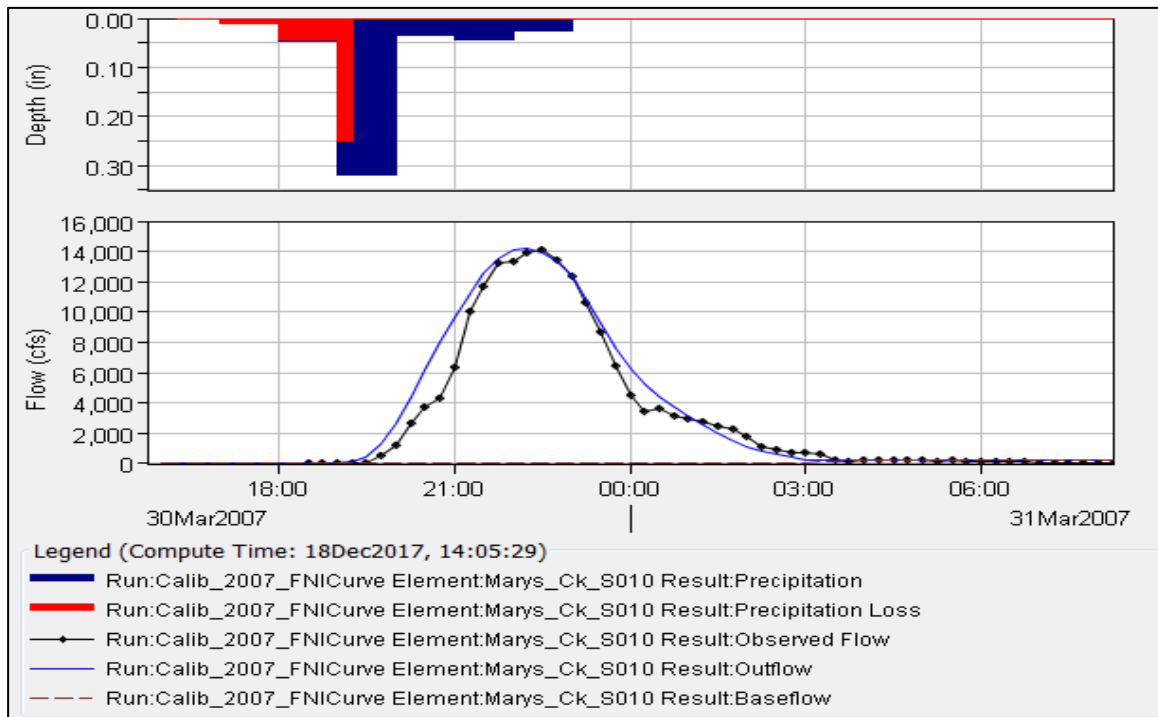


Figure 4. March 2007 Calibration Results for the Marys Creek at Benbrook, TX Gage

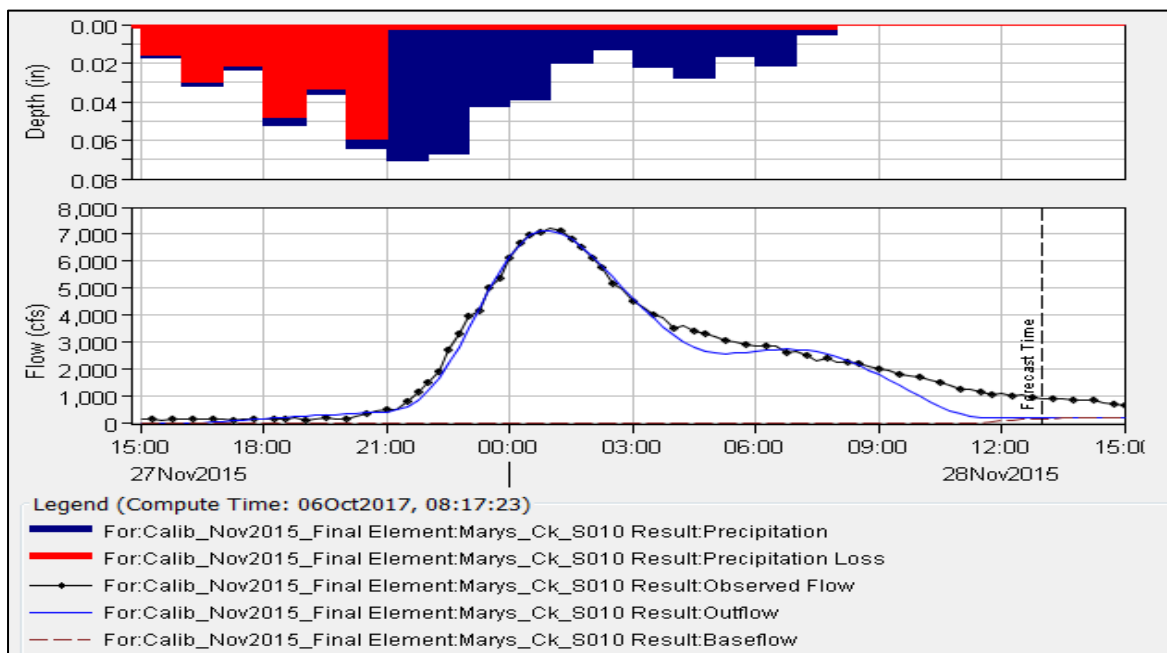


Figure 5. May 2015 Calibration Results for the Marys Creek at Benbrook, TX Gage

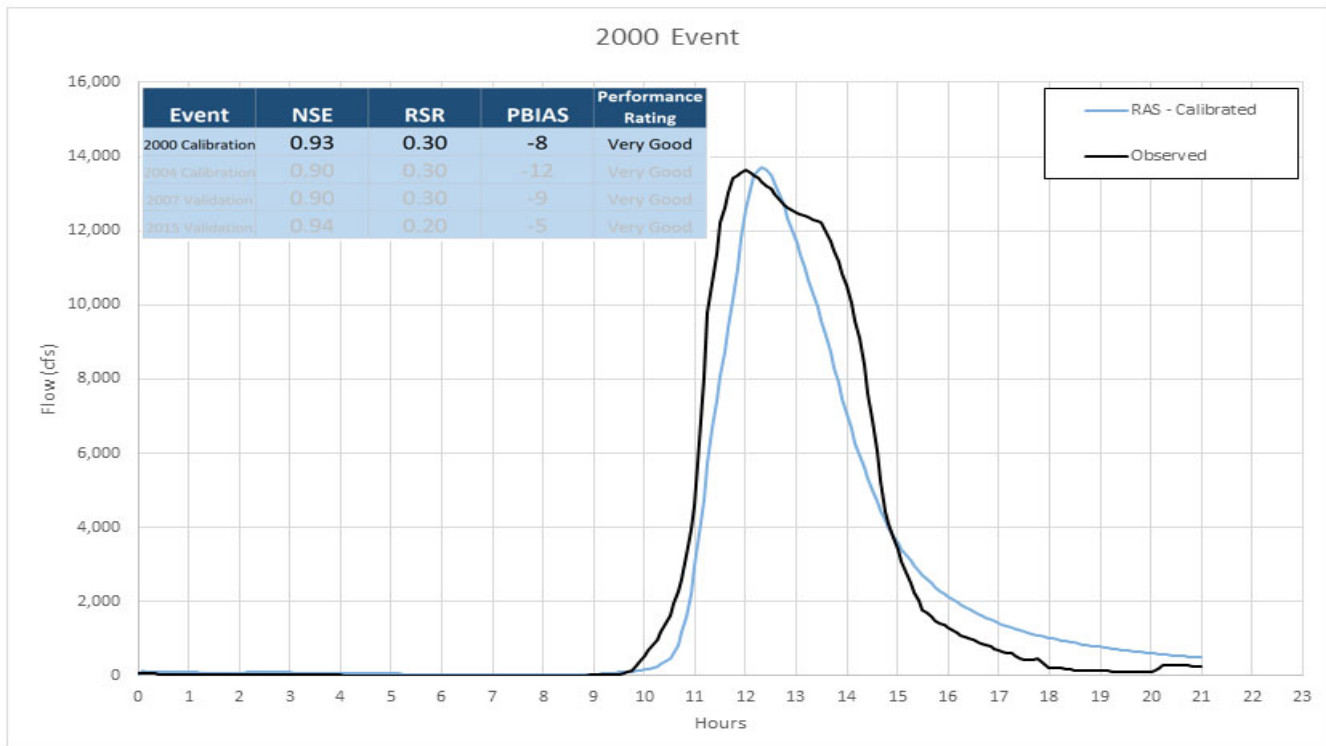


Figure 6. June 2000 RAS 2D Calibration Results for the Marys Creek at Benbrook, TX Gage

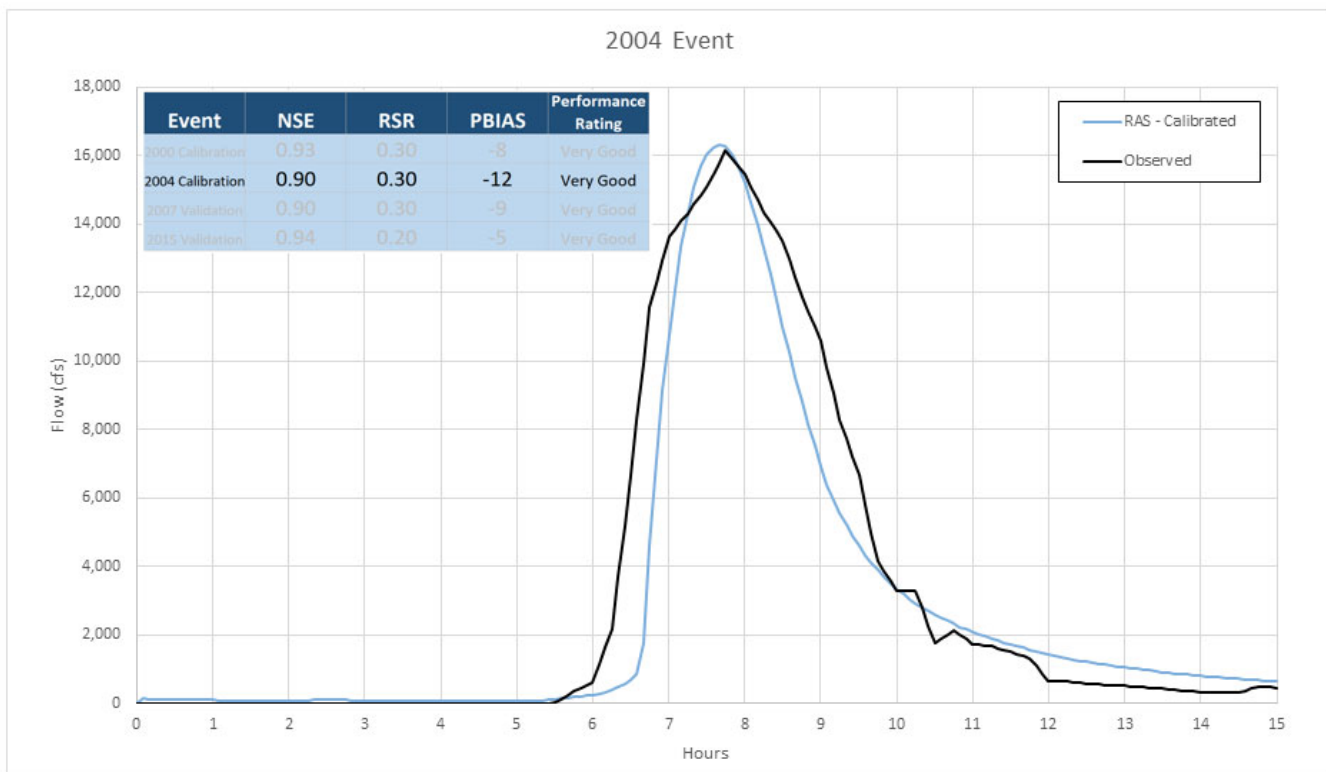


Figure 7. June 2000 RAS 2D Calibration Results for the Marys Creek at Benbrook, TX Gage

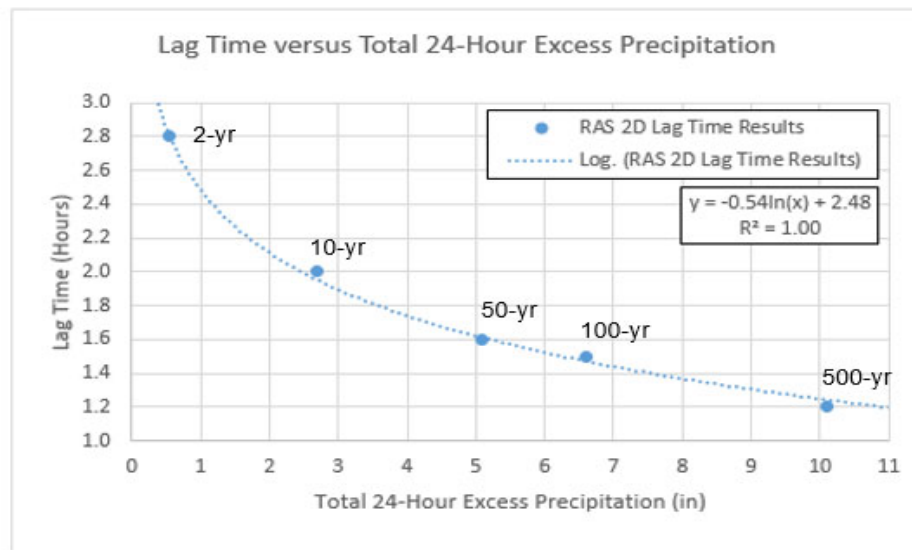


Figure 8. RAS 2D Snyder Lag Times for the Marys Creek at Benbrook, TX Gage

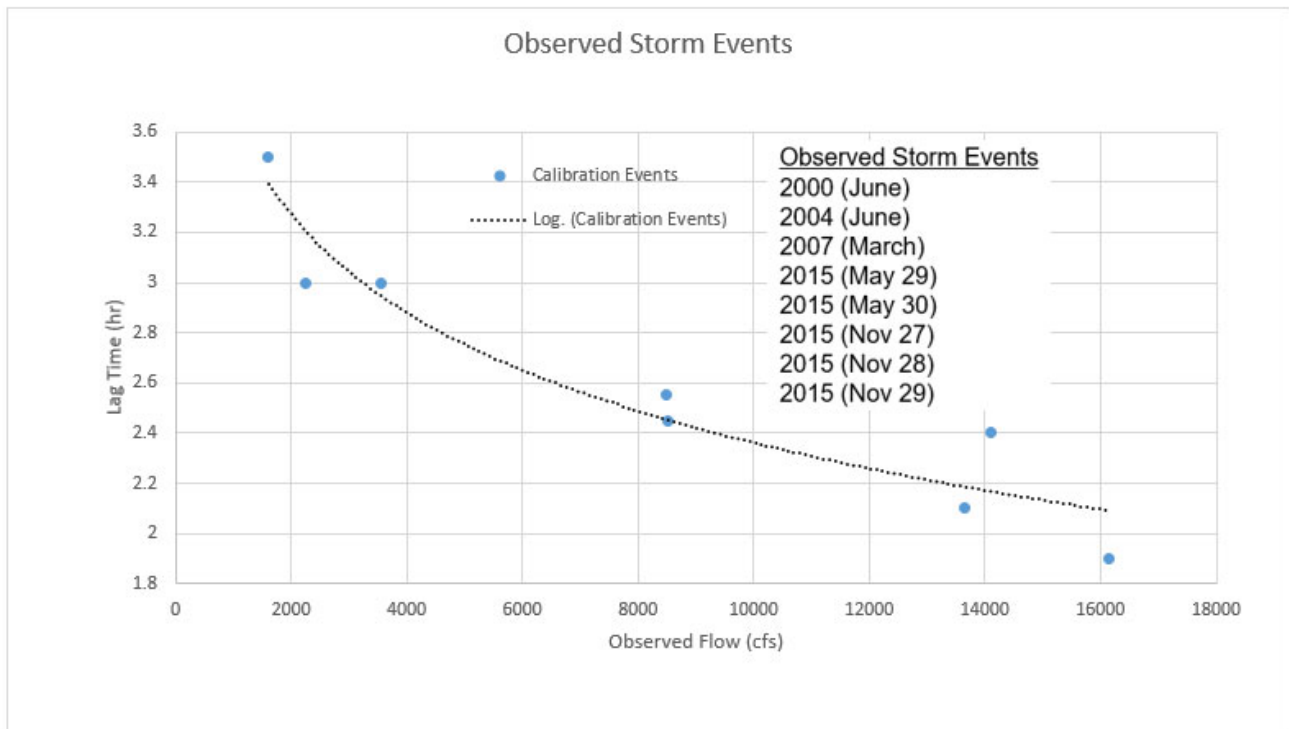


Figure 9. Calibrated Snyder Lag Times for the Marys Creek at Benbrook, TX Gage

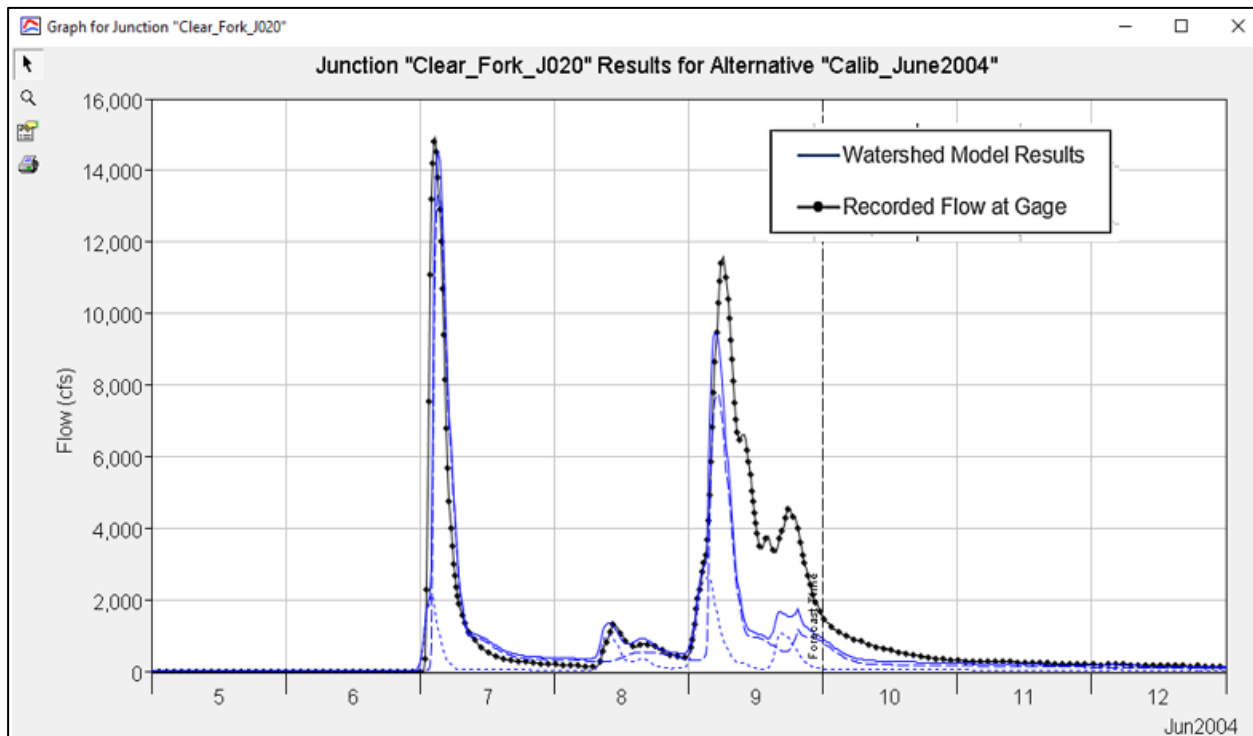


Figure 34a. June 2004 Calibration Results for the Clear Fork at Fort Worth, TX Gage

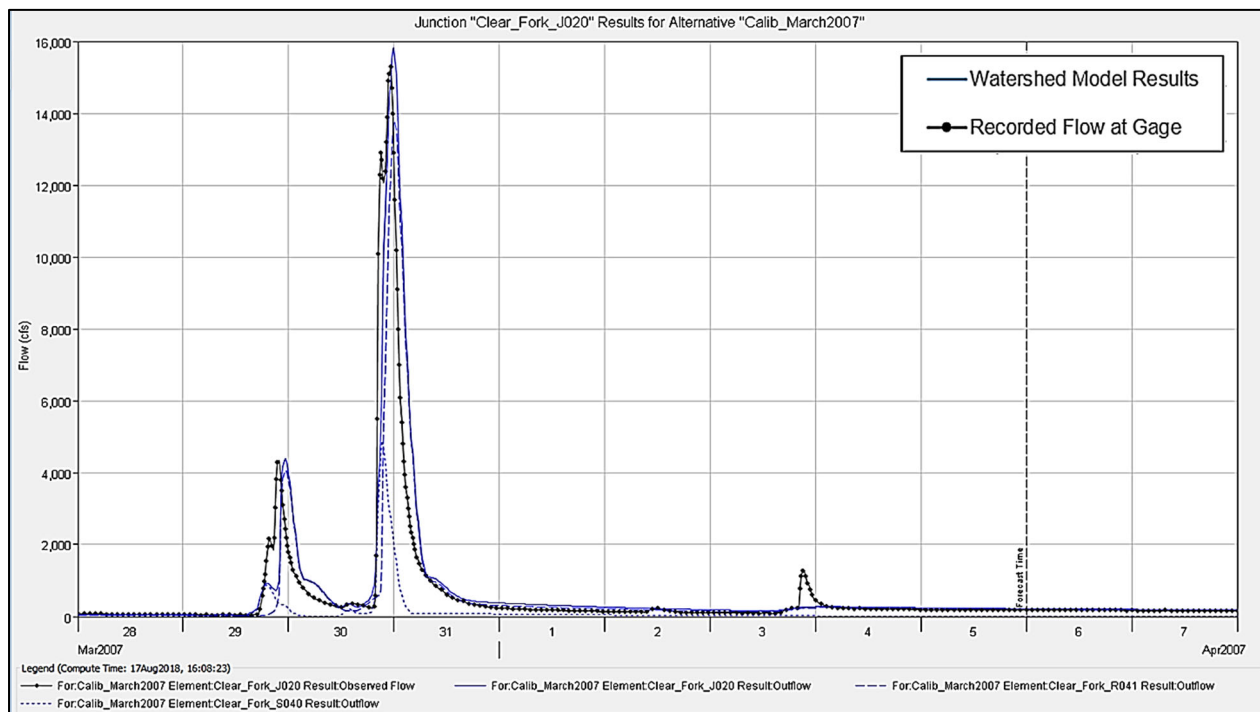


Figure 34b. March 28, 2007 Calibration Results for the Clear Fork at Fort Worth, TX Gage

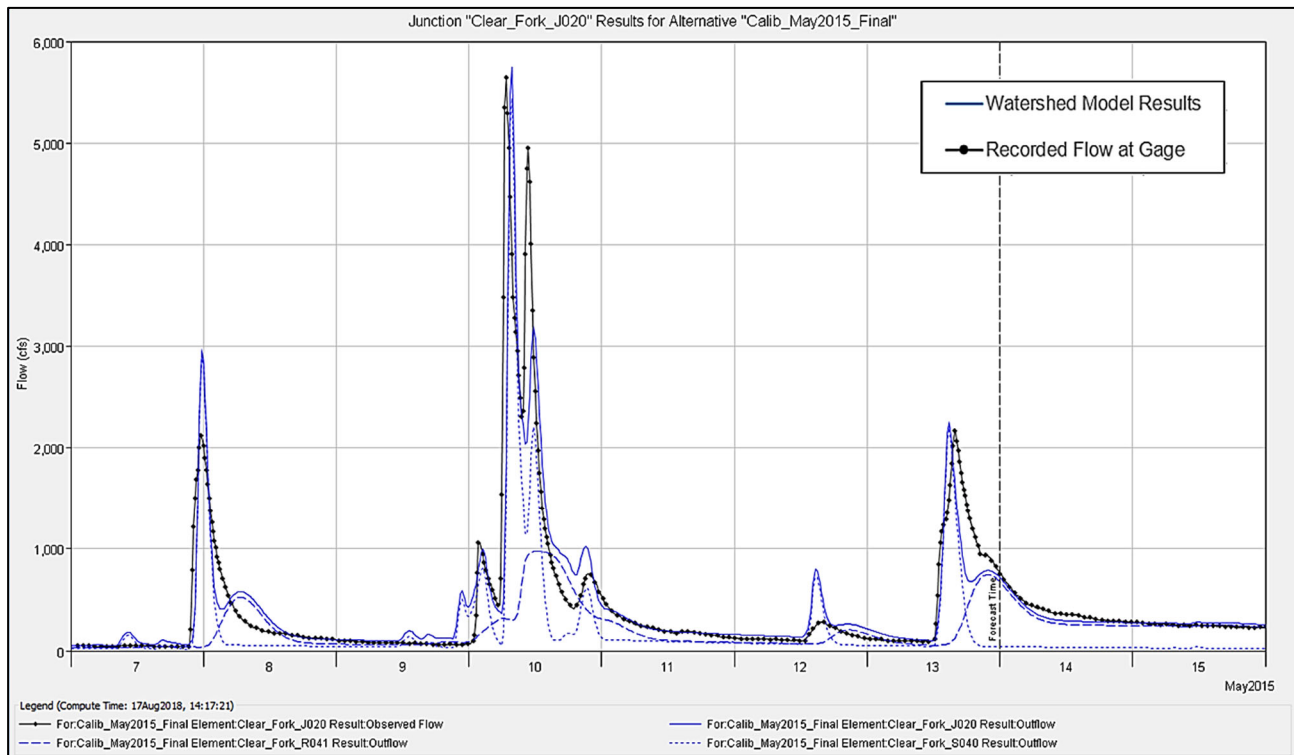


Figure 34c. May 8, 2015 Calibration Results for the Clear Fork at Fort Worth, TX Gage

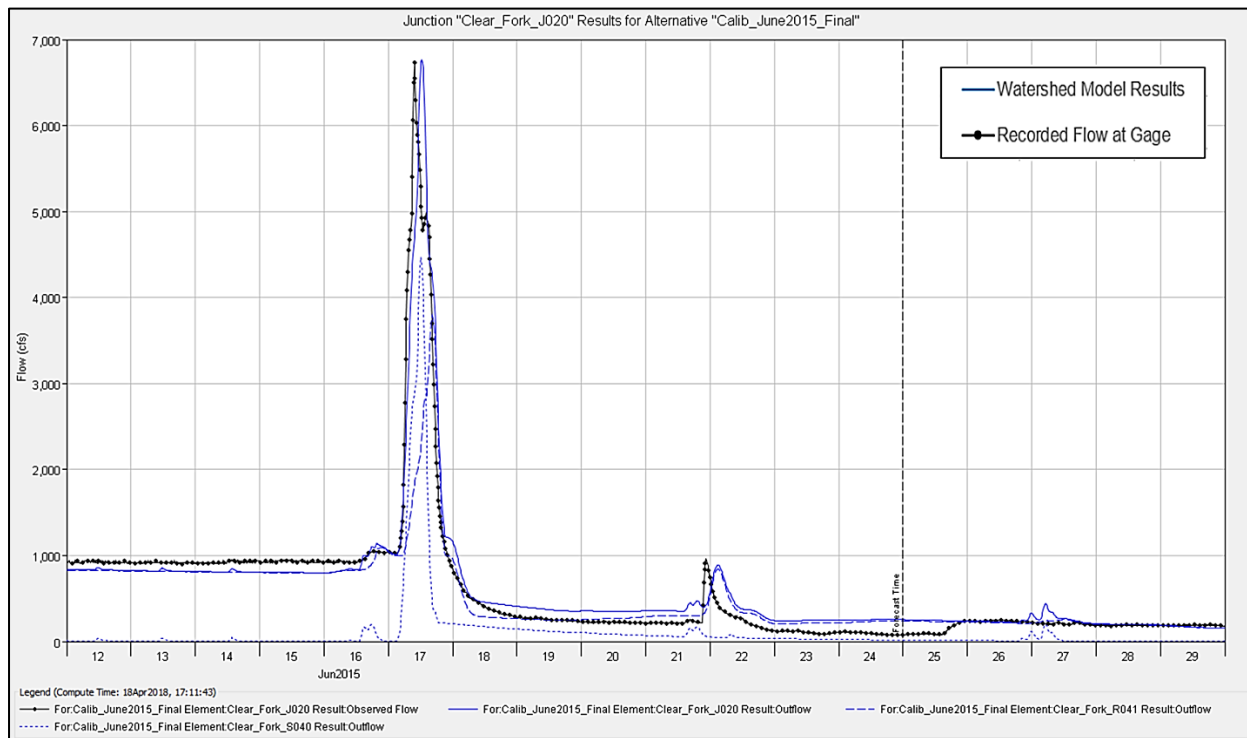


Figure 34d. June 18, 2015 Calibration Results for the Clear Fork at Fort Worth, TX Gage

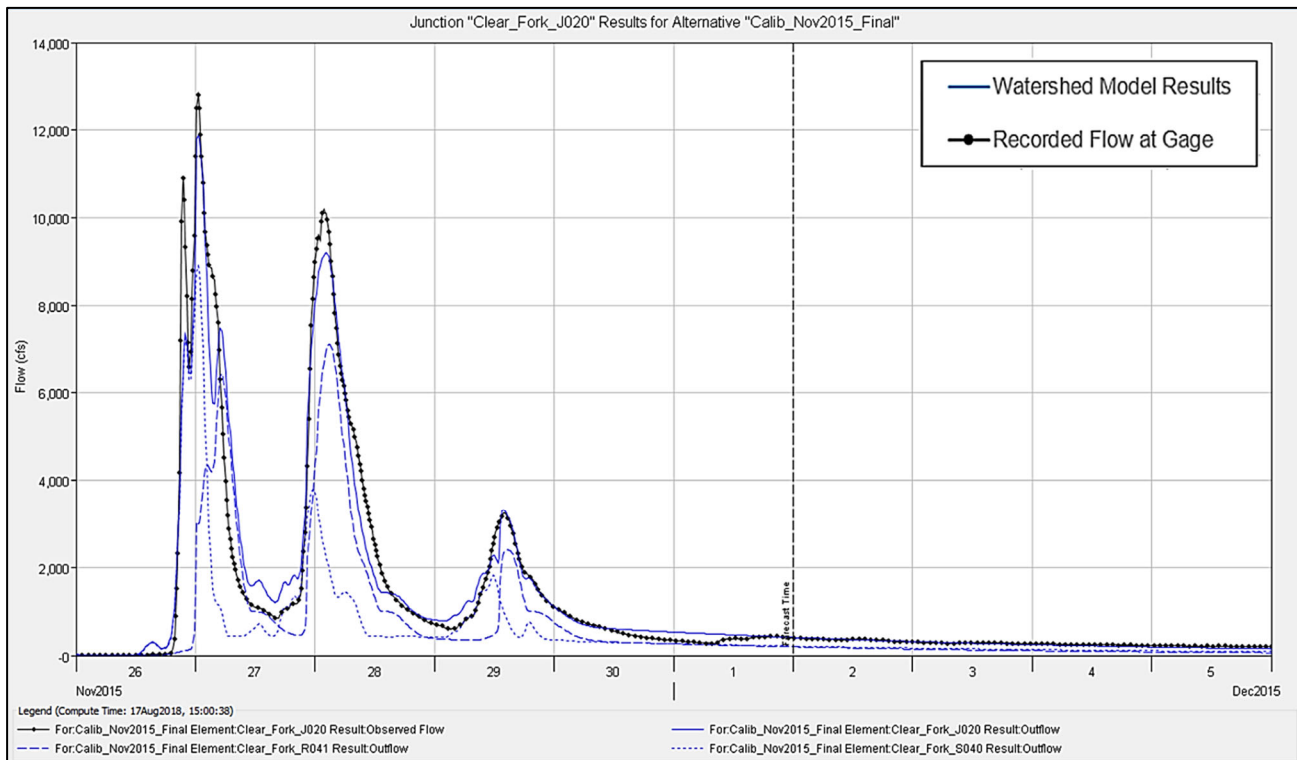


Figure 34e. November 29, 2015 Calibration Results for the Clear Fork at Fort Worth, TX Gage

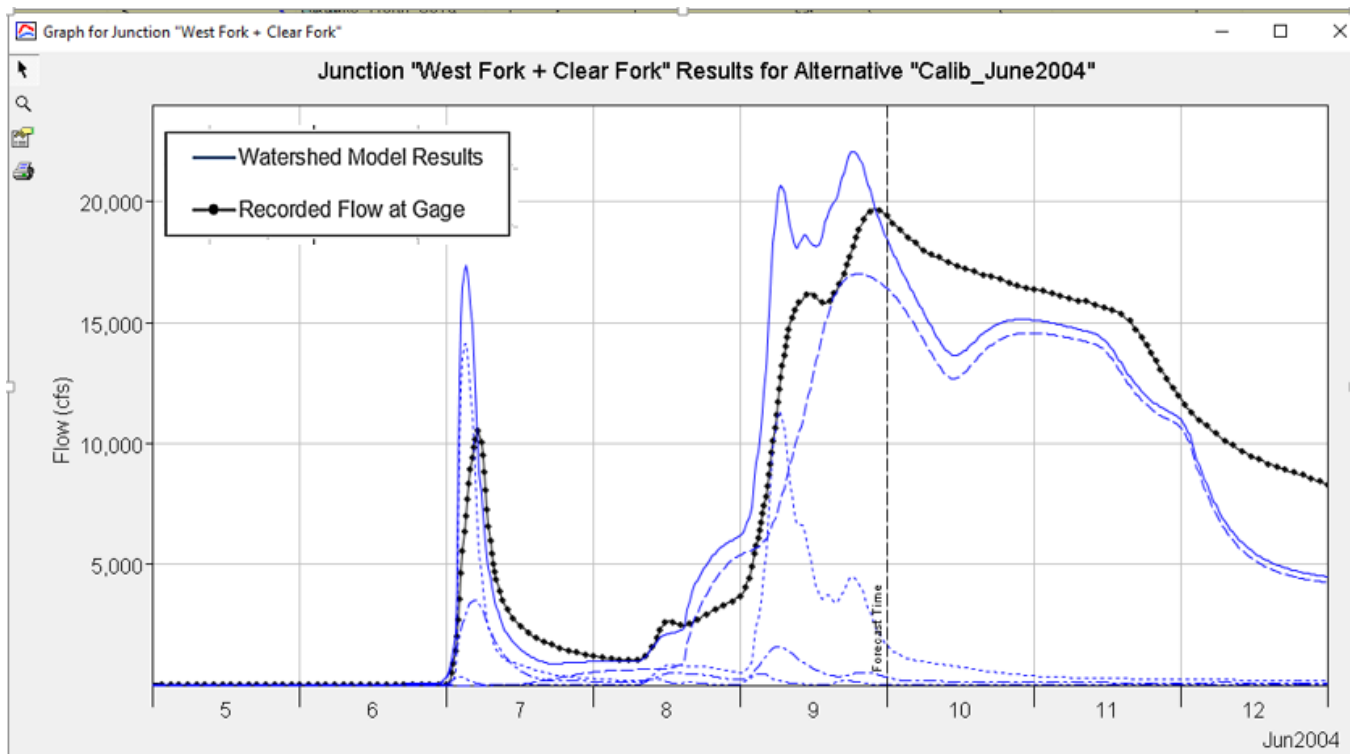


Figure 35a. June 8, 2004 Calibration Results for the West Fork at Fort Worth, TX Gage

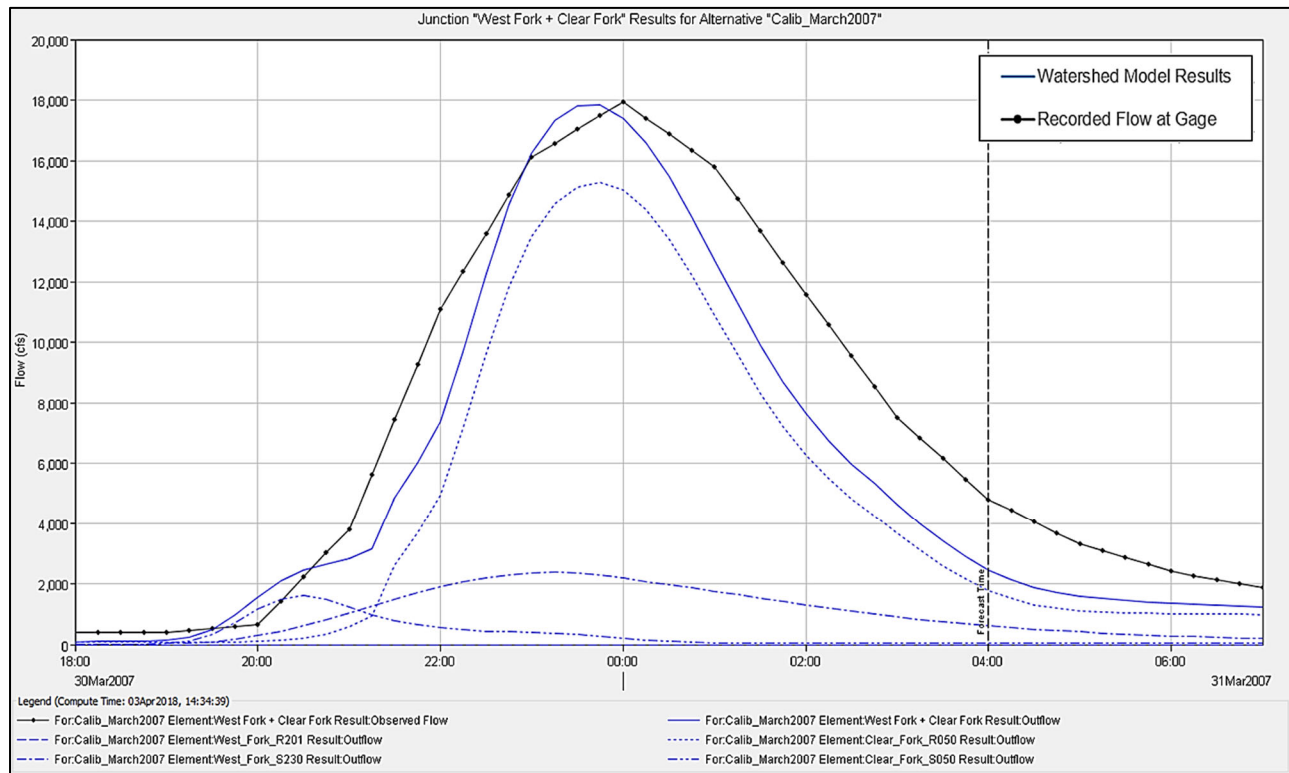


Figure 35b. March 28, 2007 Calibration Results for the West Fork at Fort Worth, TX Gage

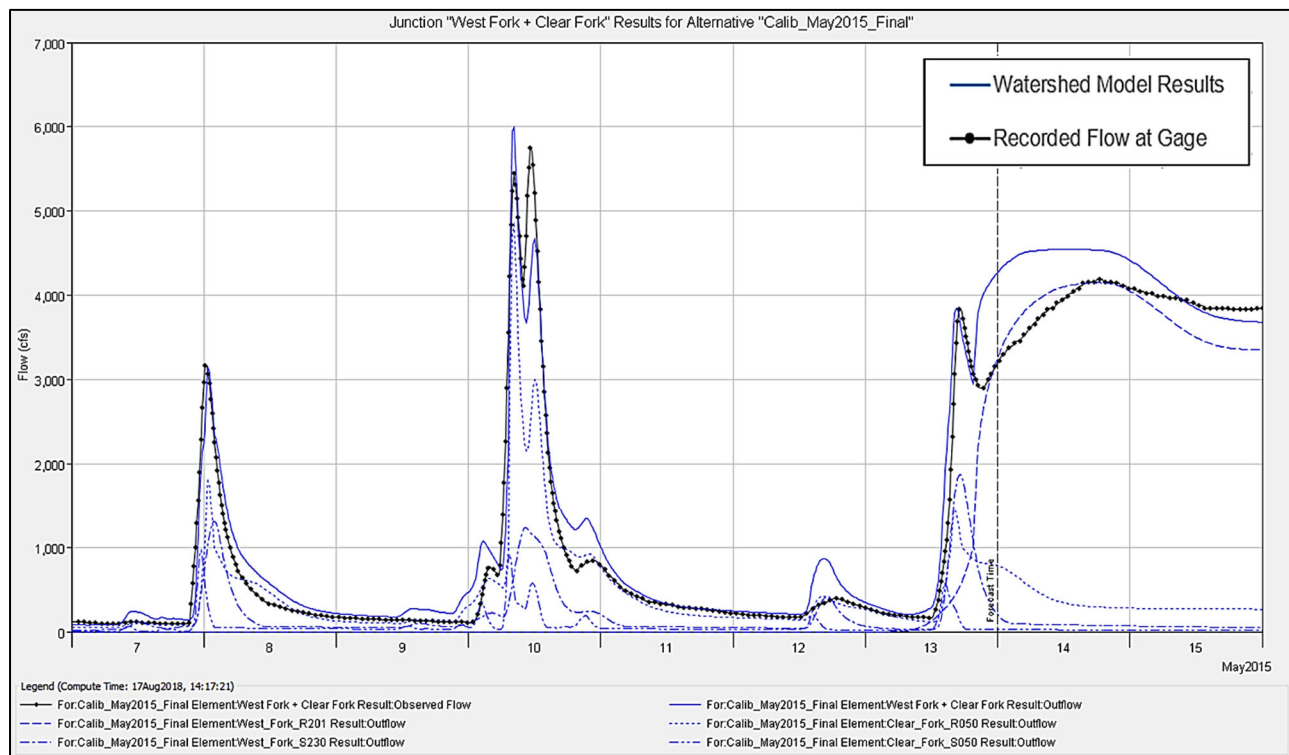


Figure 35c. May 8, 2015 Calibration Results for the West Fork at Fort Worth, TX Gage

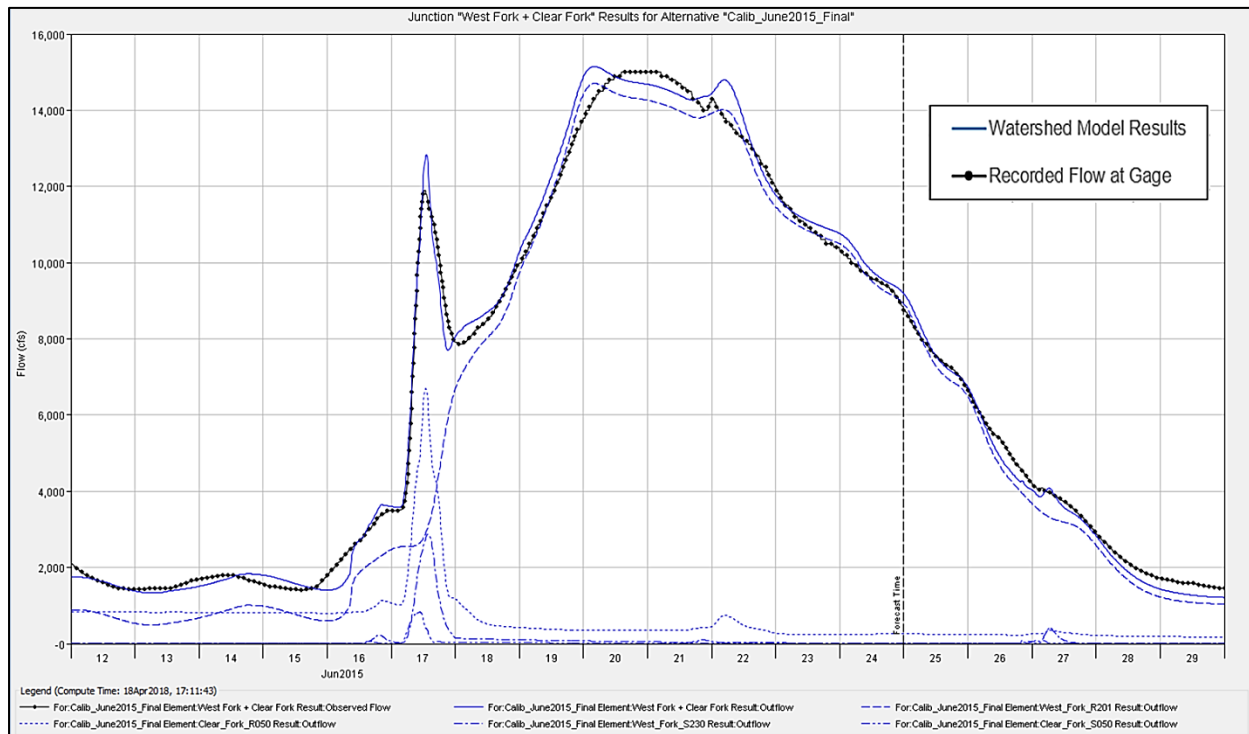


Figure 35d. June 18, 2015 Calibration Results for the West Fork at Fort Worth, TX Gage

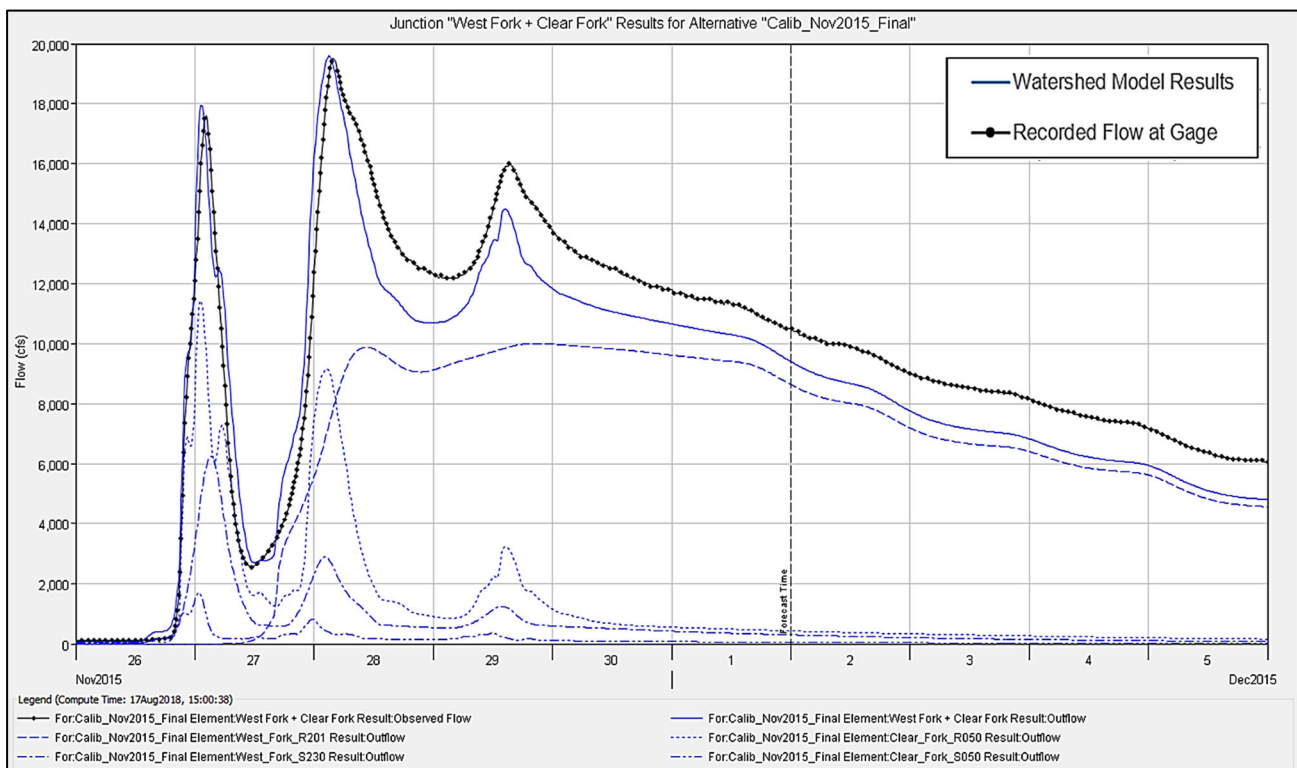


Figure 35e. November 29, 2015 Calibration Results for the West Fork at Fort Worth, TX Gage

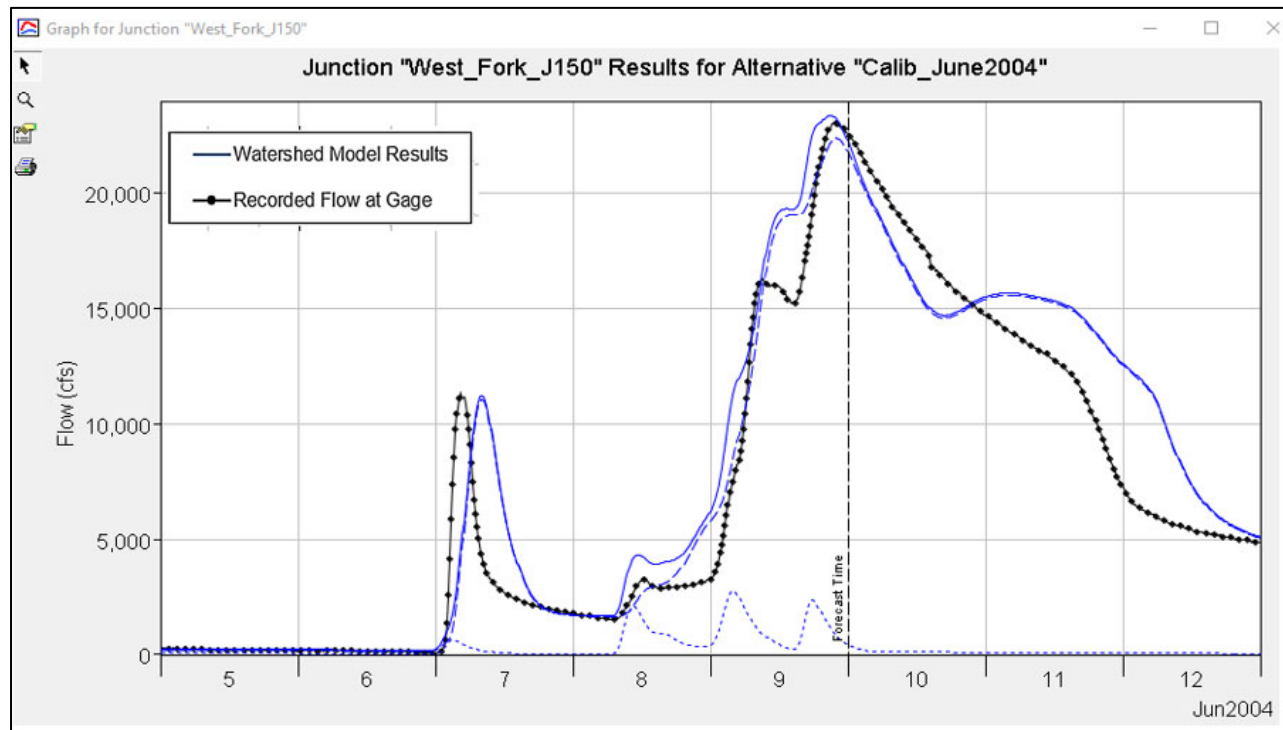


Figure 36a. June 2004 Calibration Results for the West Fork at Beach Street Gage

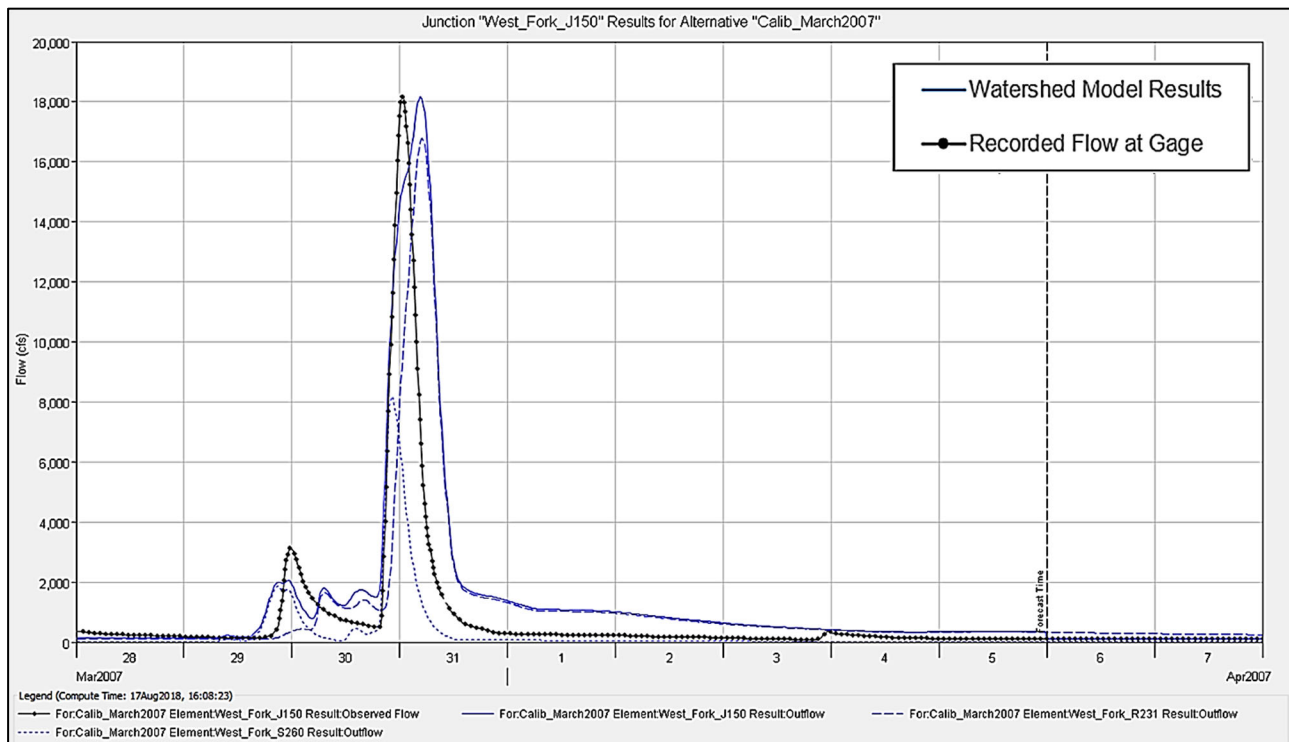


Figure 36b. March 28, 2007 Calibration Results for the West Fork at Beach Street Gage

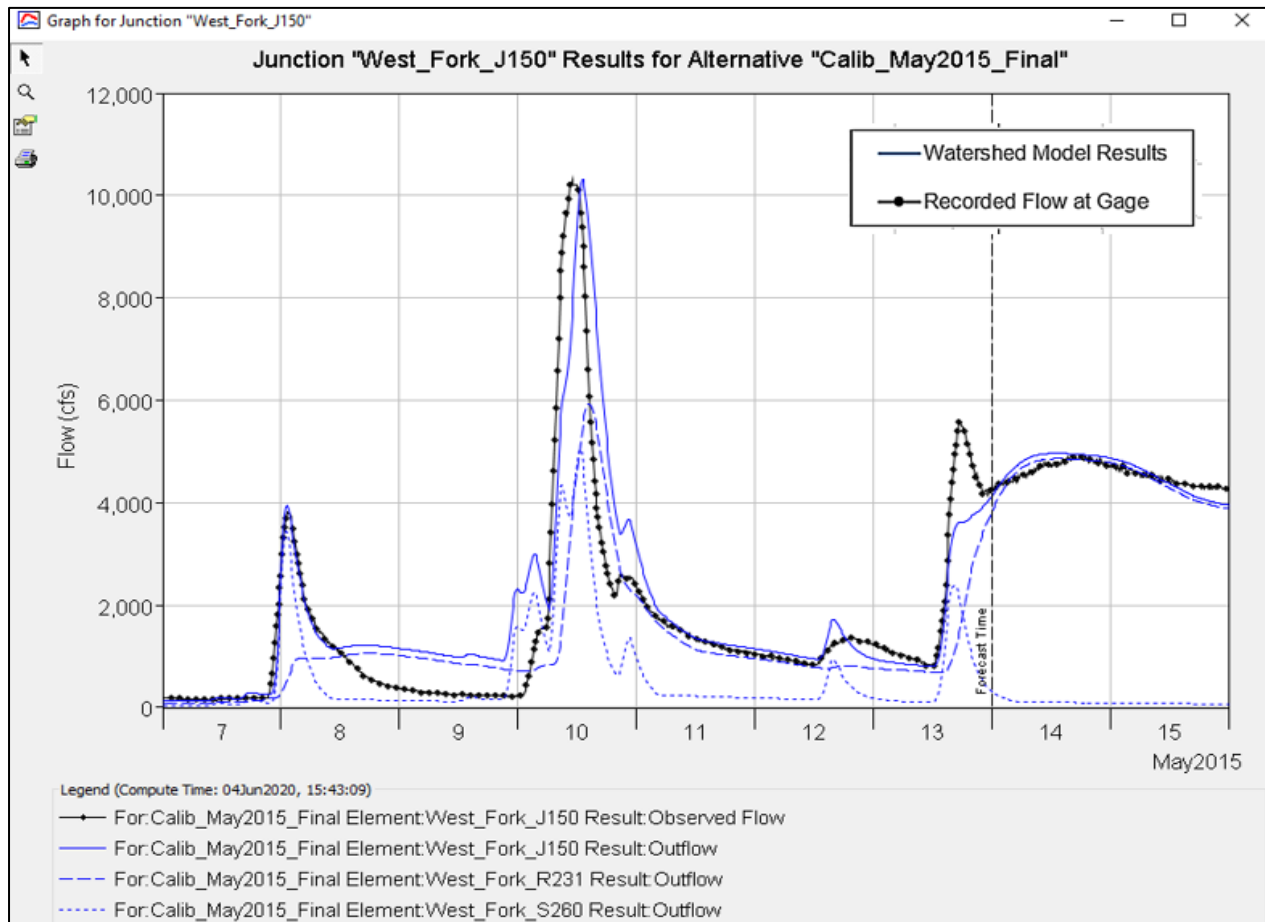


Figure 36c. May 2015 Calibration Results for the West Fork at Beach Street Gage

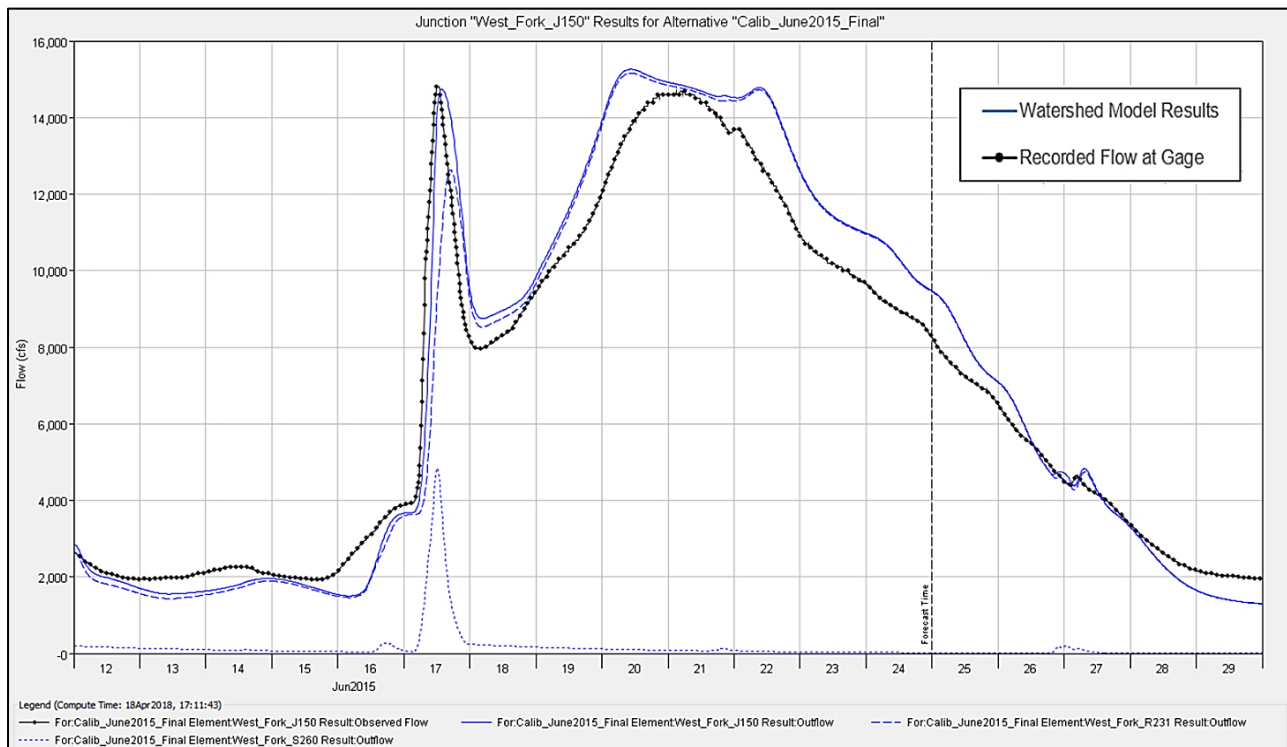


Figure 36d. June 18, 2015 Calibration Results for the West Fork at Beach Street Gage

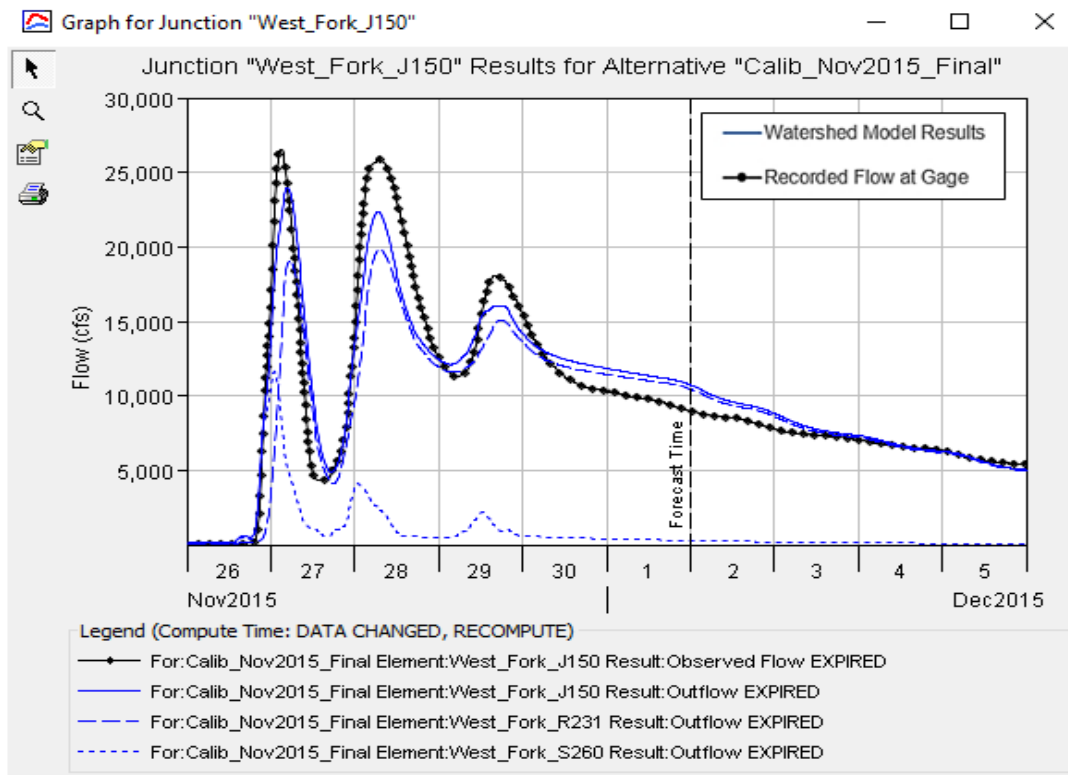


Figure 36e. November 29, 2015 Calibration Results for the West Fork at Beach Street Gage

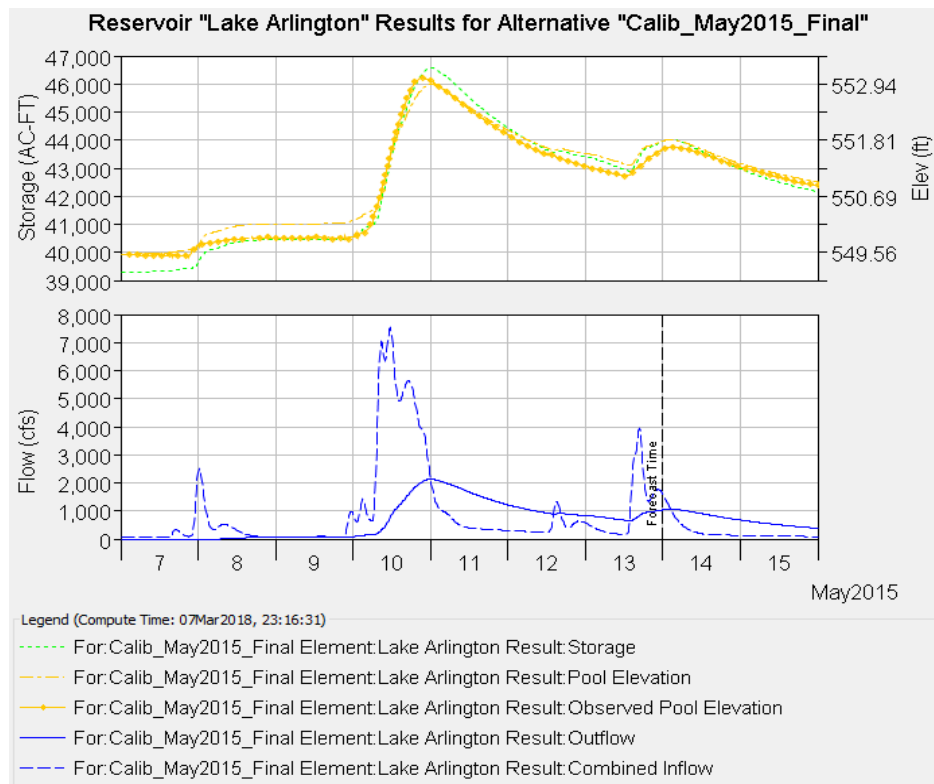


Figure 37a. May 2015 Calibration Results for Lake Arlington

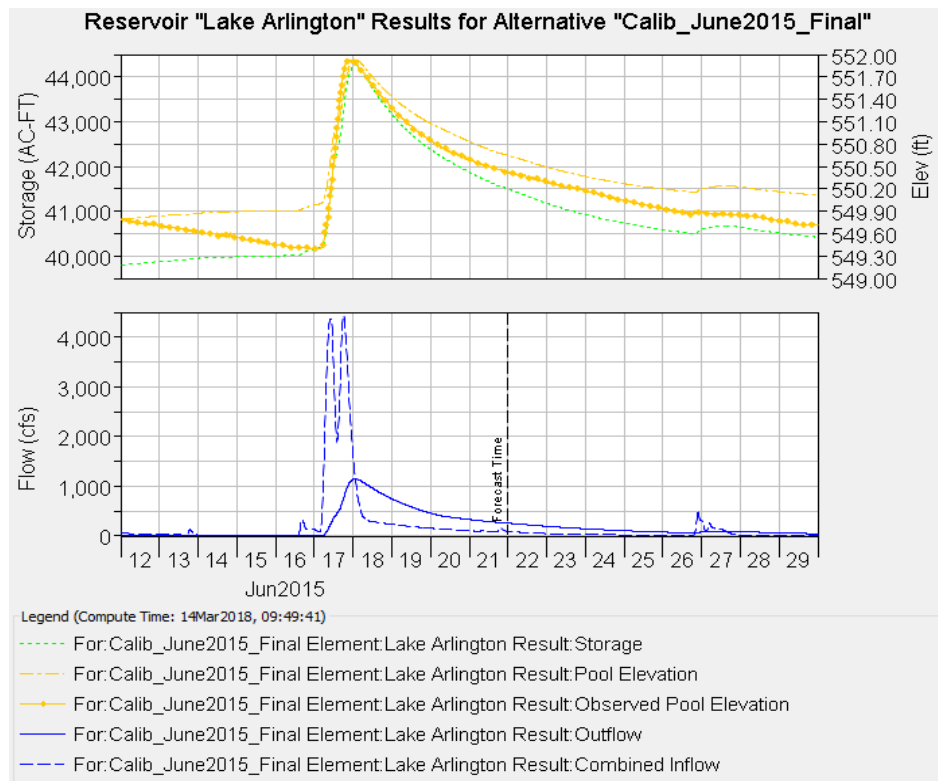


Figure 37b. June 2015 Calibration Results for Lake Arlington

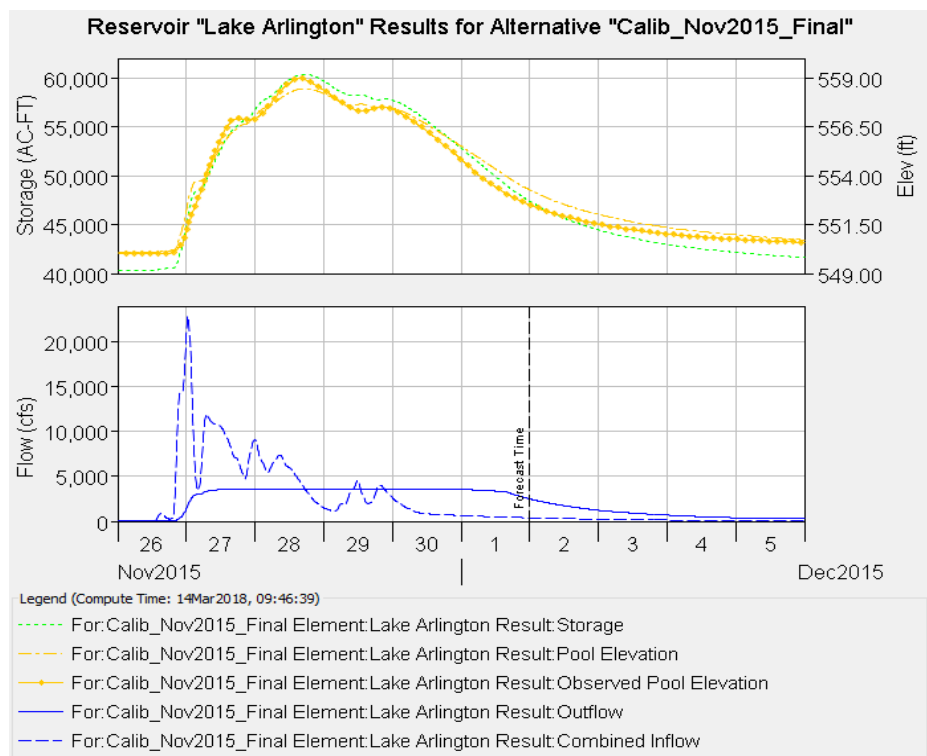


Figure 37c. November 2015 Calibration Results for Lake Arlington

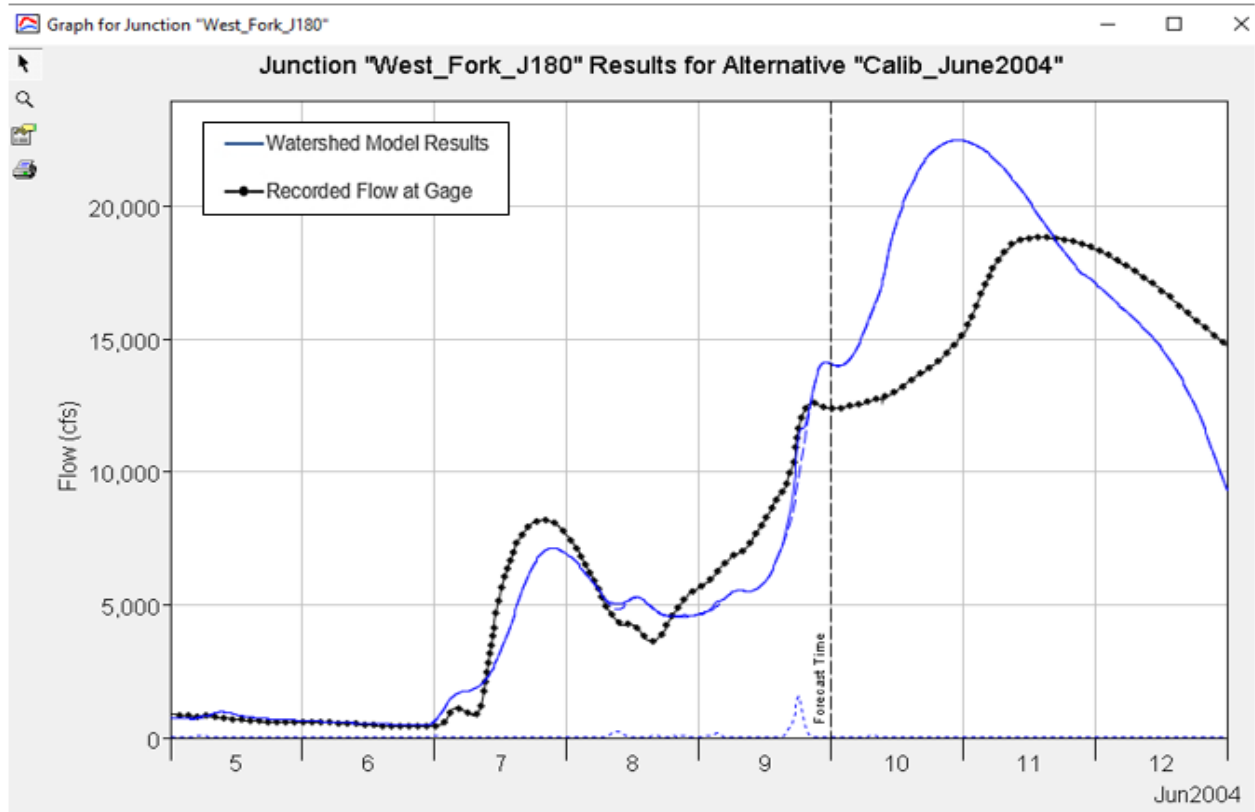


Figure 38a. June 8, 2004 Calibration Results for the West Fork at Grand Prairie, TX Gage

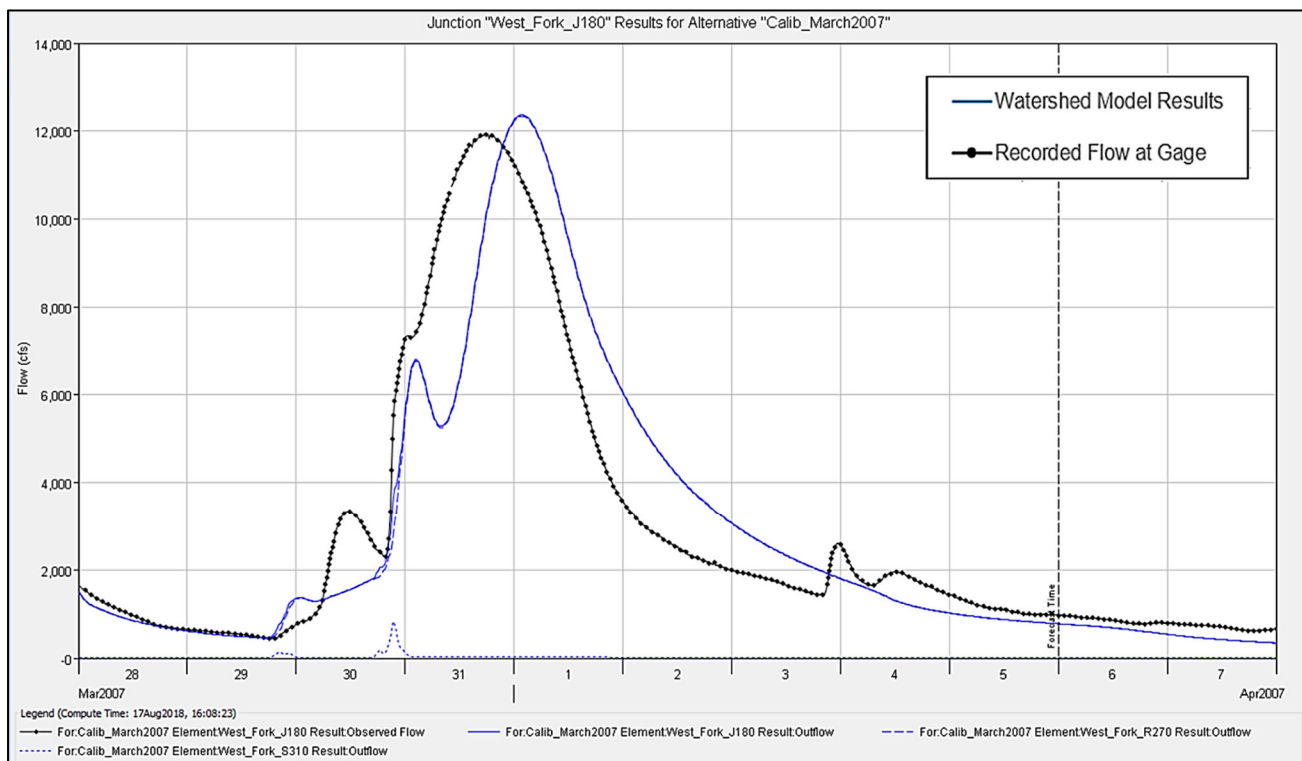


Figure 38b. March 28, 2007 Calibration Results for the West Fork at Grand Prairie, TX Gage

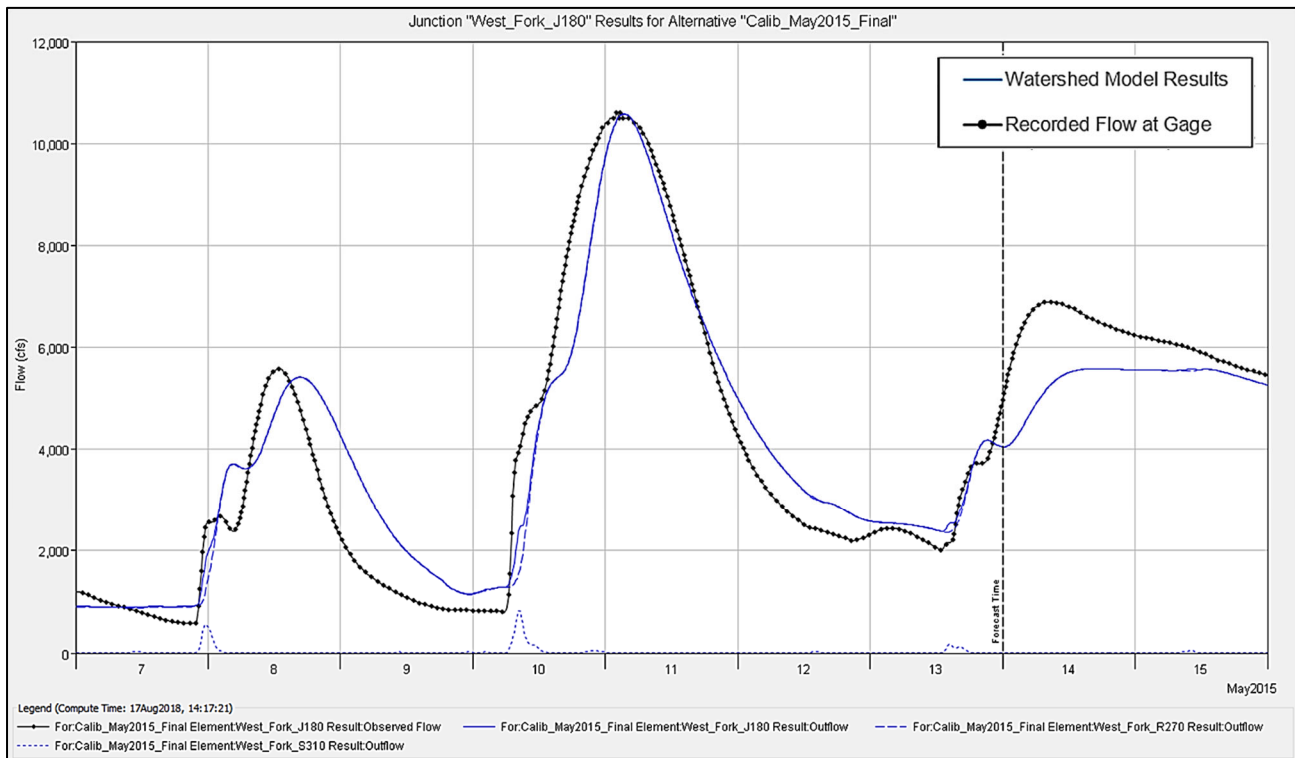


Figure 38c. May 8, 2015 Calibration Results for the West Fork at Grand Prairie, TX Gage

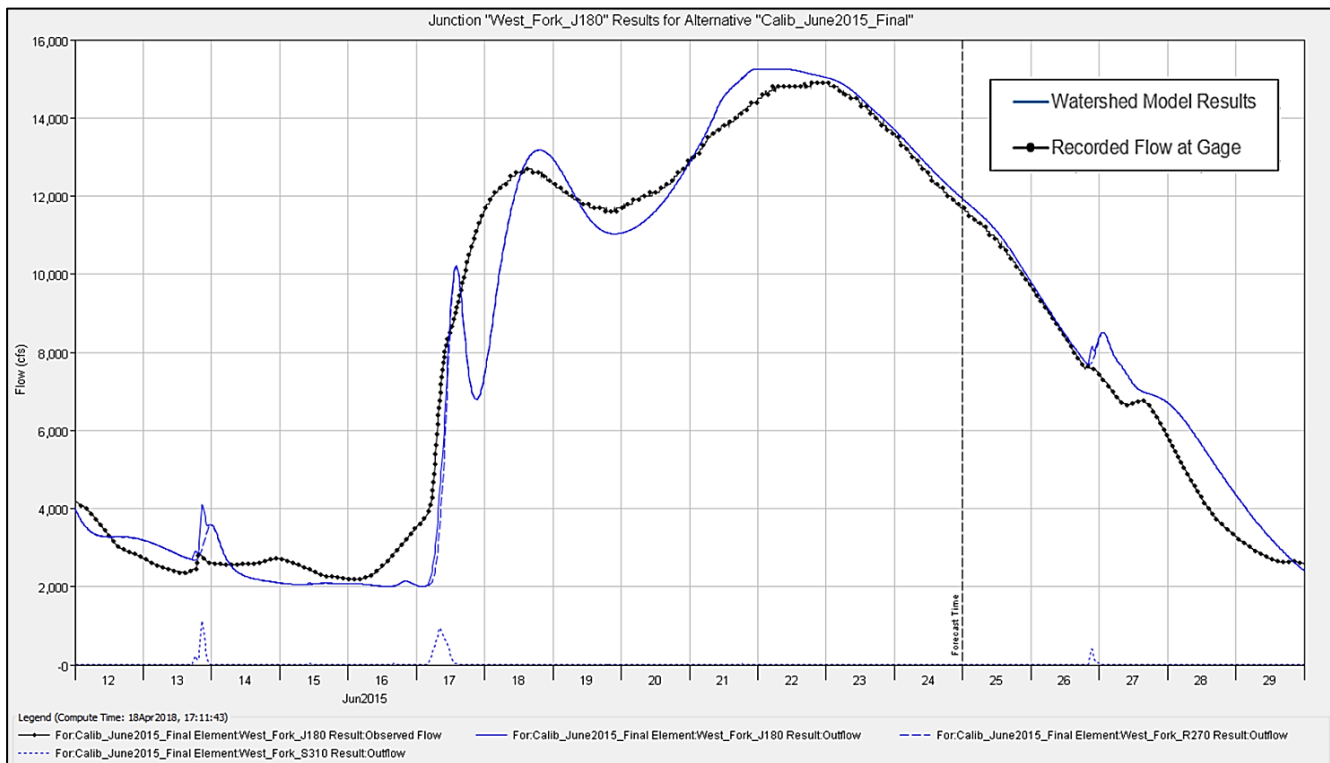


Figure 38d. June 18, 2015 Calibration Results for the West Fork at Grand Prairie, TX Gage

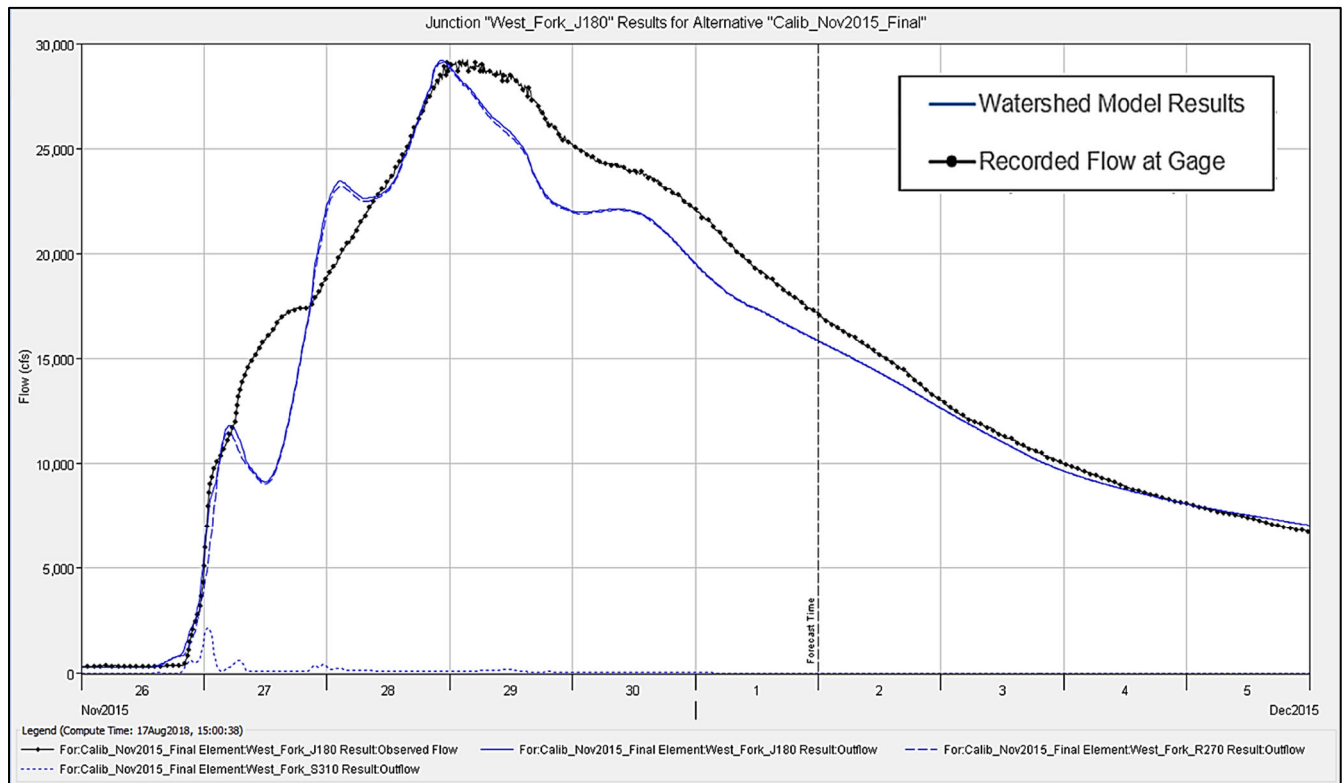


Figure 10. November 29, 2015 Calibration Results for the West Fork at Grand Prairie, TX Gage

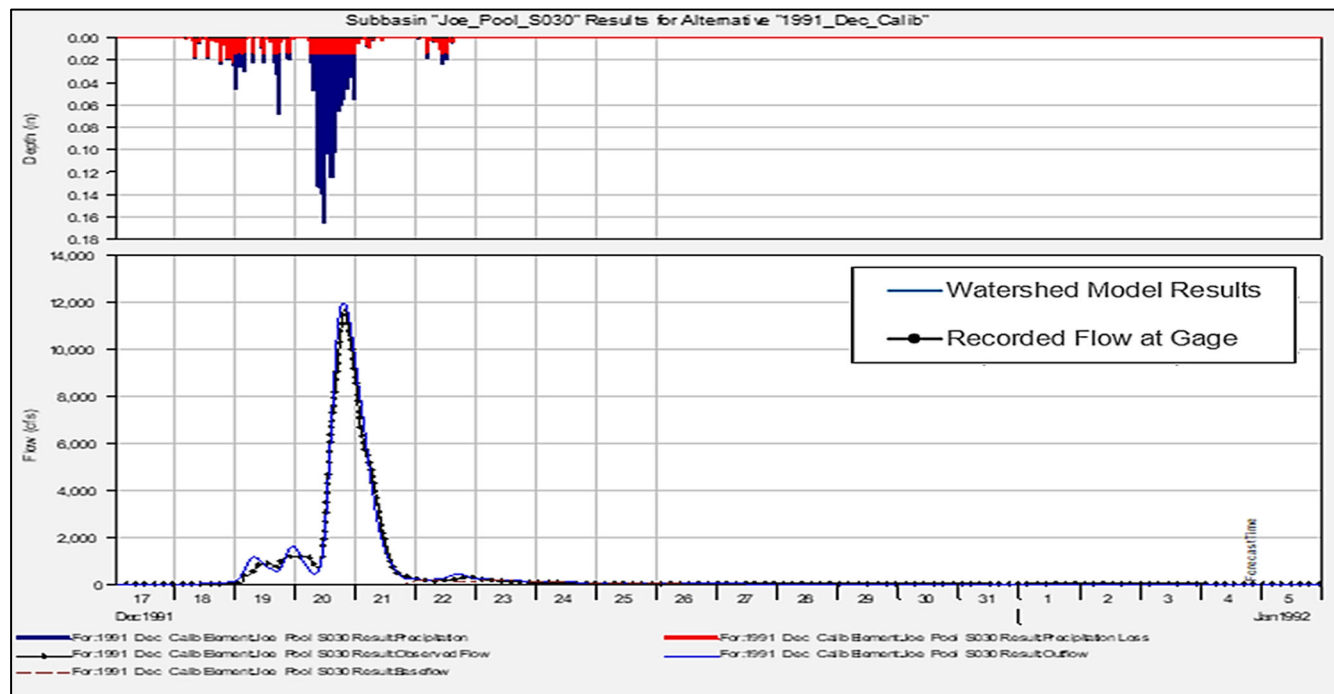


Figure 39a. December 20, 1991 Calibration Results for the Walnut Creek near Mansfield, TX Gage

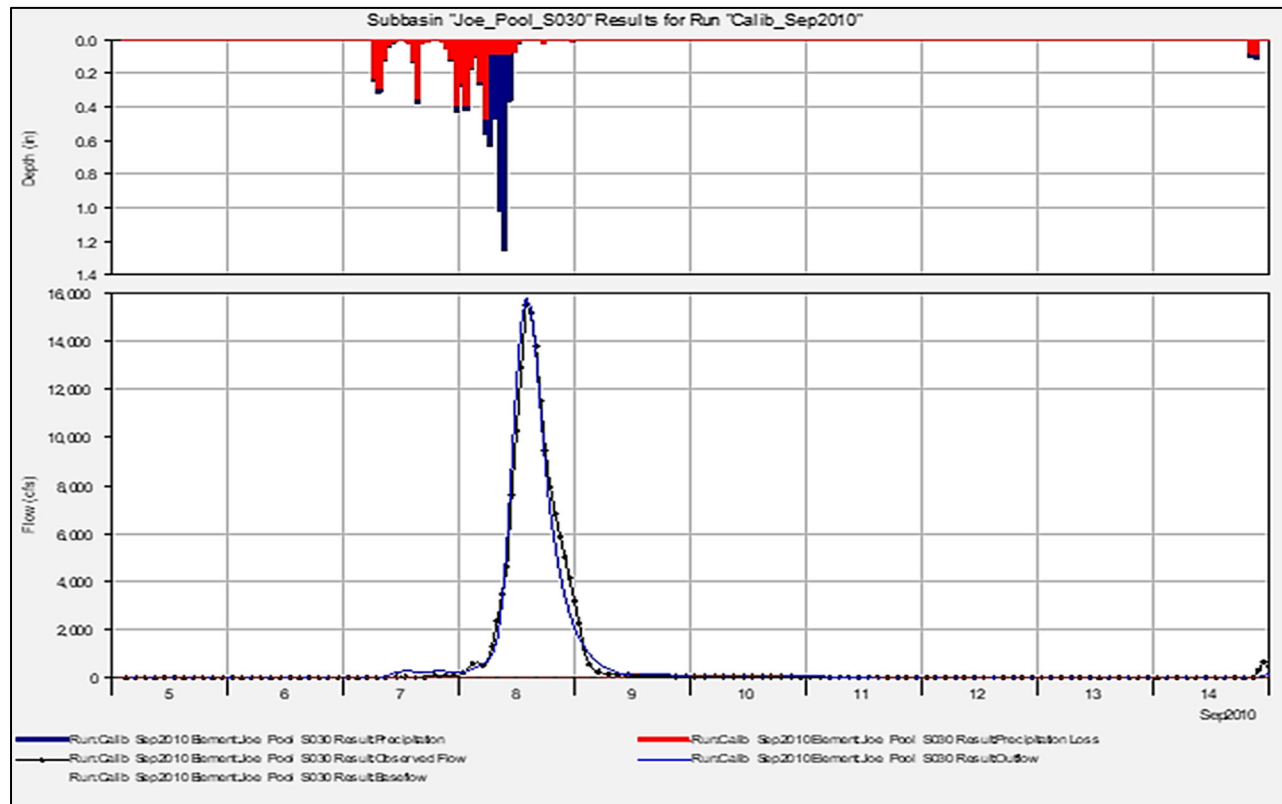


Figure 39b. September 8, 2010 Calibration Results for the Walnut Creek near Mansfield, TX Gage

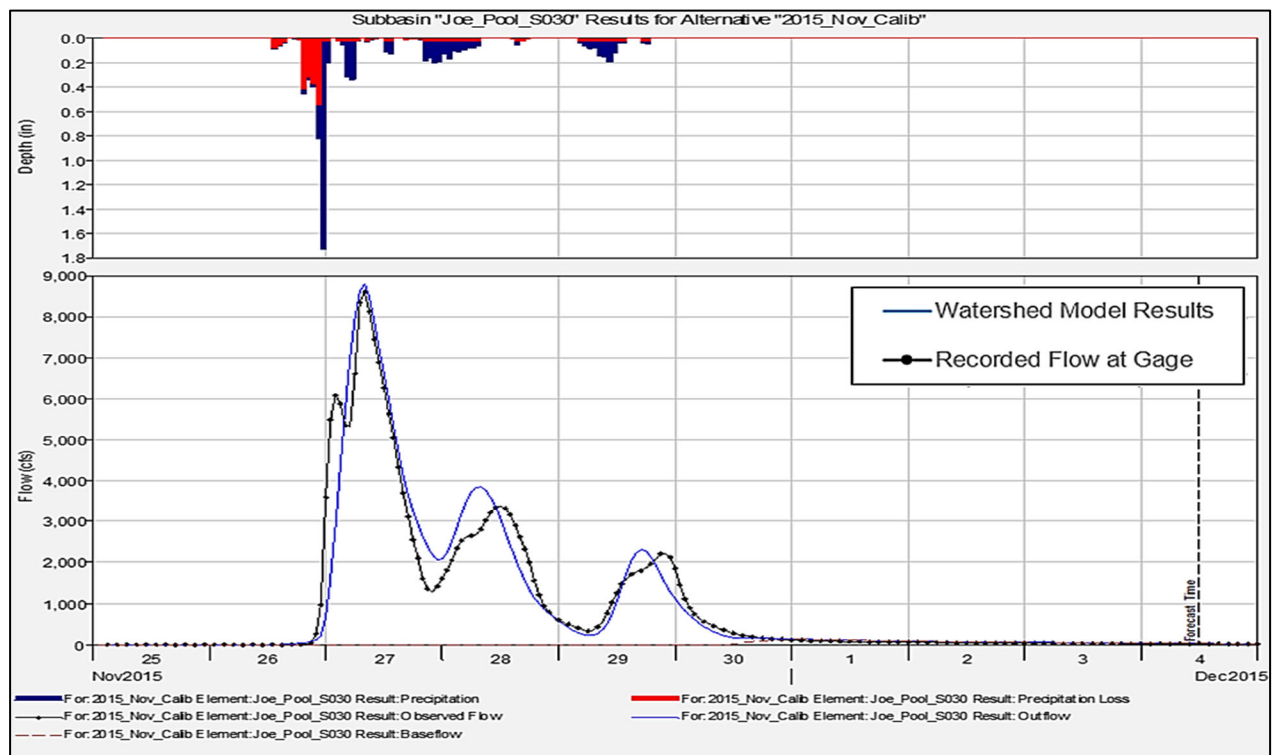


Figure 39c. November 27, 2015 Calibration Results for the Walnut Creek near Mansfield, TX Gage

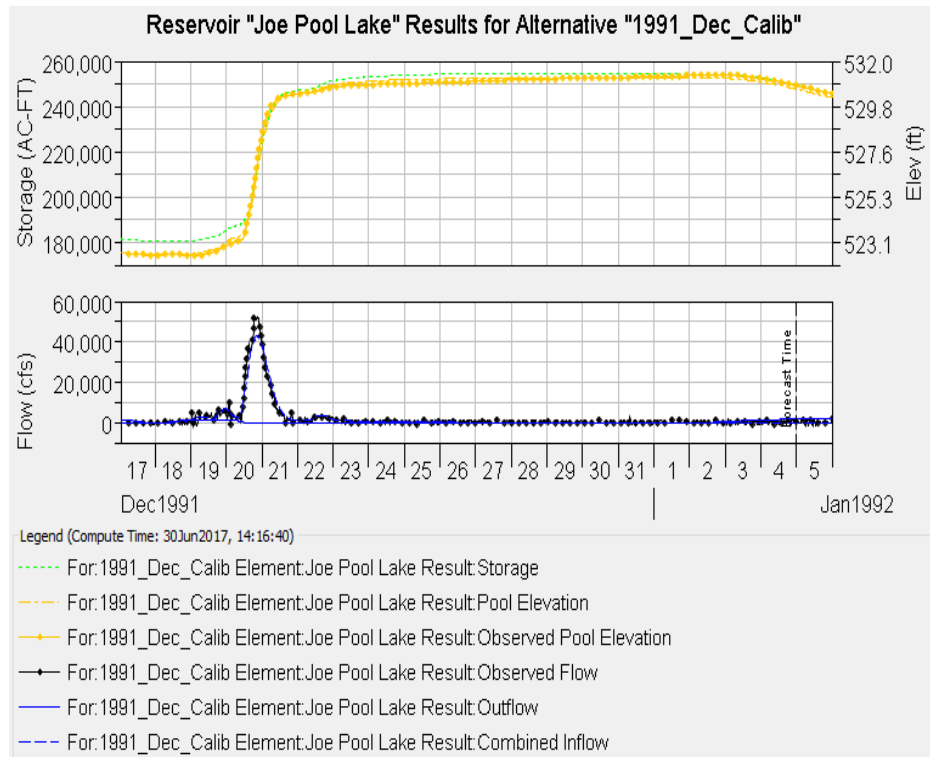


Figure 40a. December 1991 Calibration Results for Joe Pool Reservoir

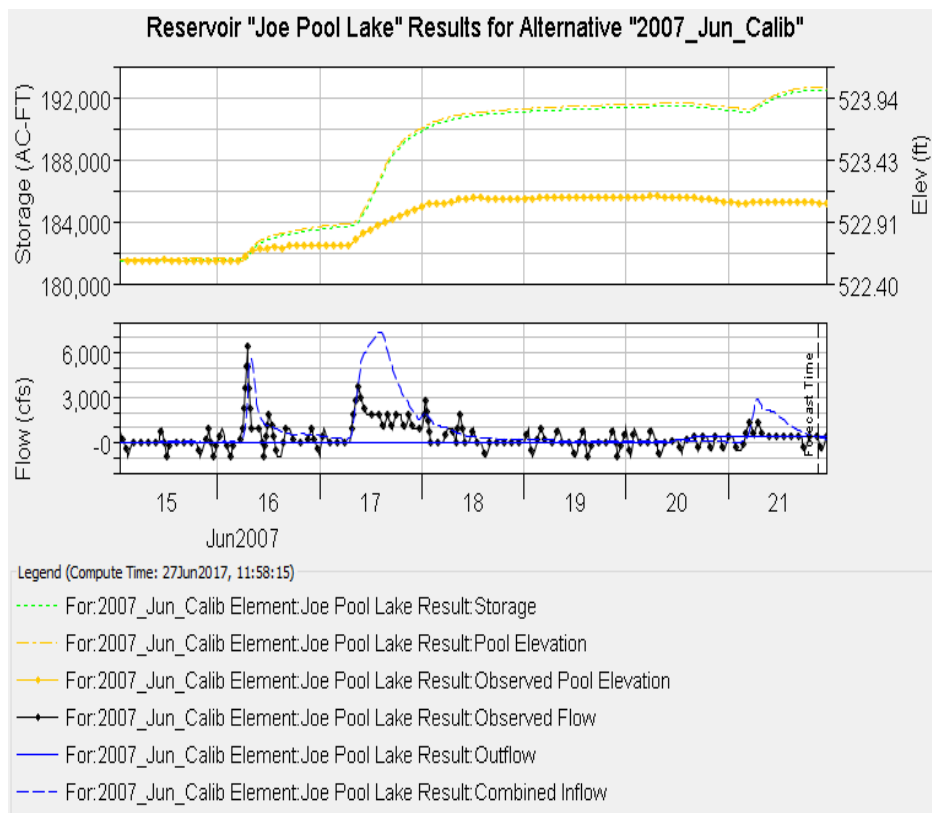


Figure 40b. June 2007 Calibration Results for Joe Pool Reservoir

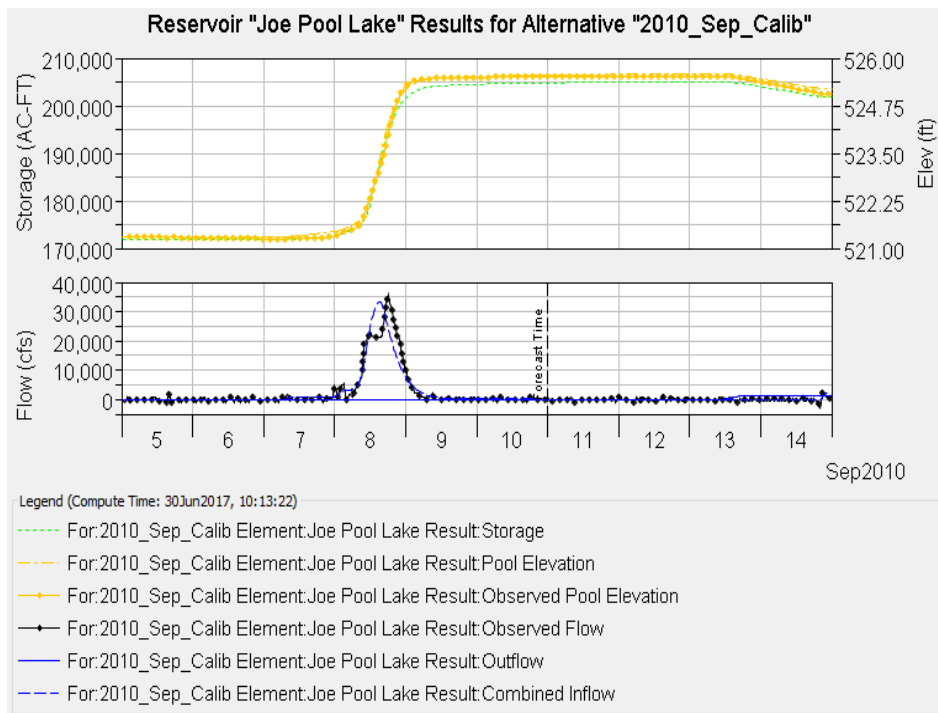


Figure 40c. September 2010 Calibration Results for Joe Pool Reservoir

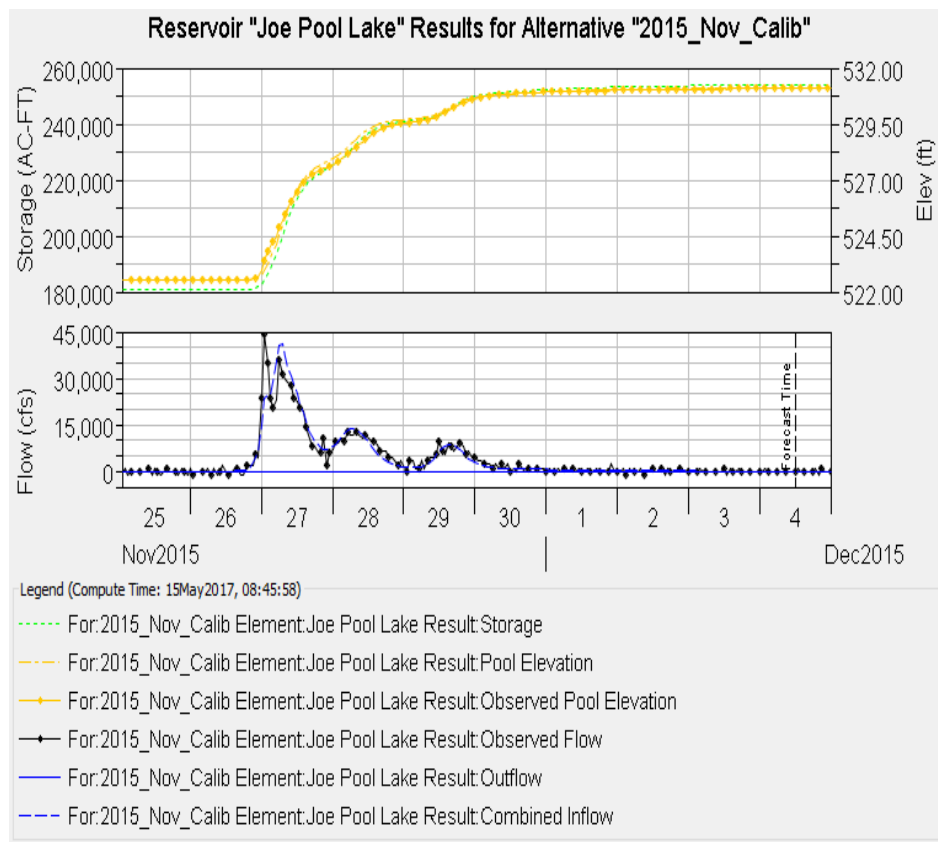


Figure 40d. November 2015 Calibration Results for Joe Pool Reservoir

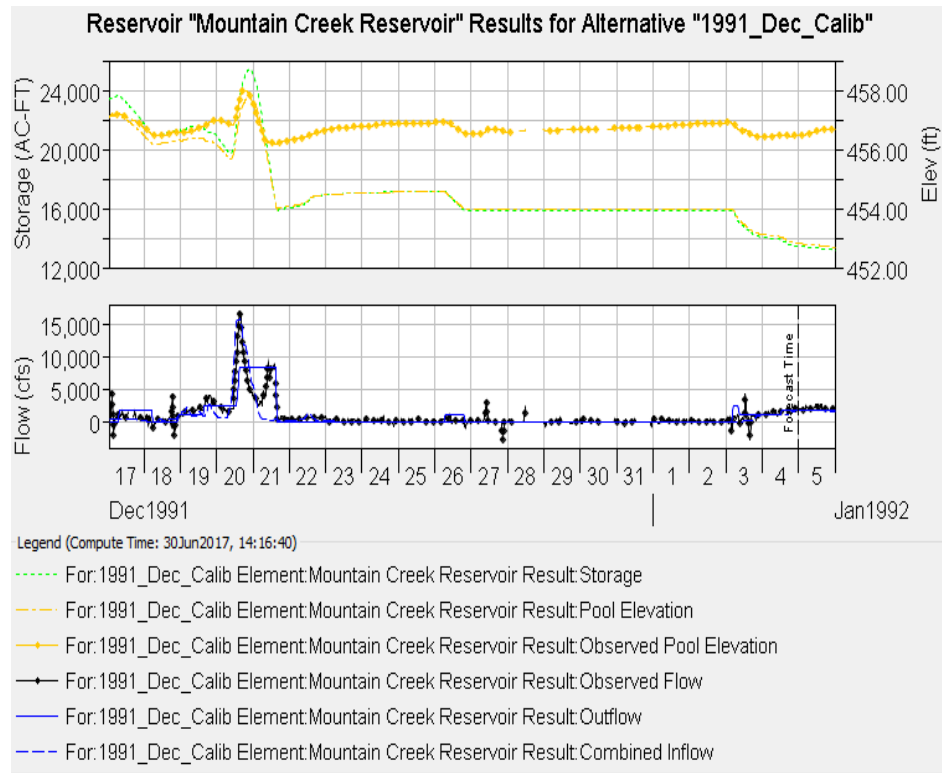


Figure 41a. December 1991 Calibration Results for Mountain Creek Reservoir

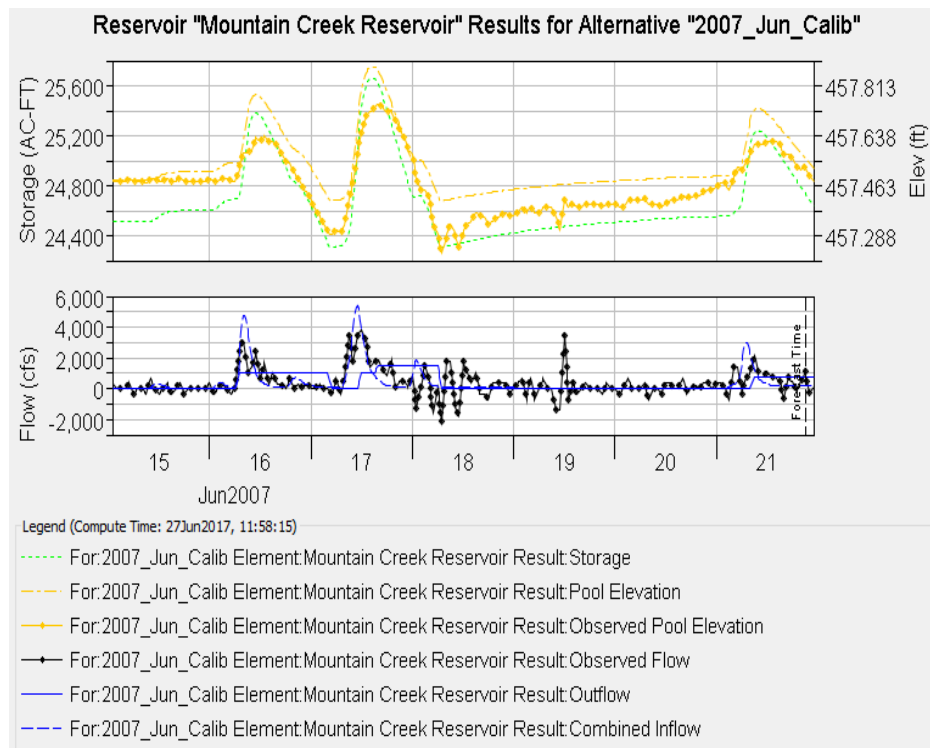


Figure 41b. June 2007 Calibration Results for Mountain Creek Reservoir

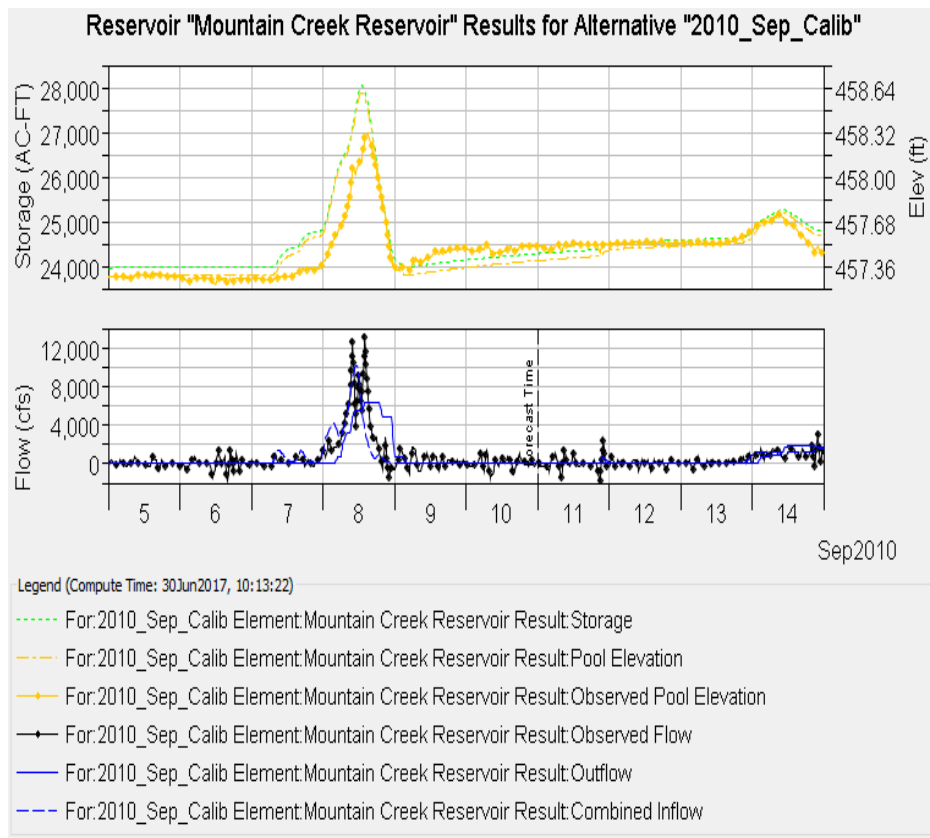


Figure 41c. September 2010 Calibration Results for Mountain Creek Reservoir

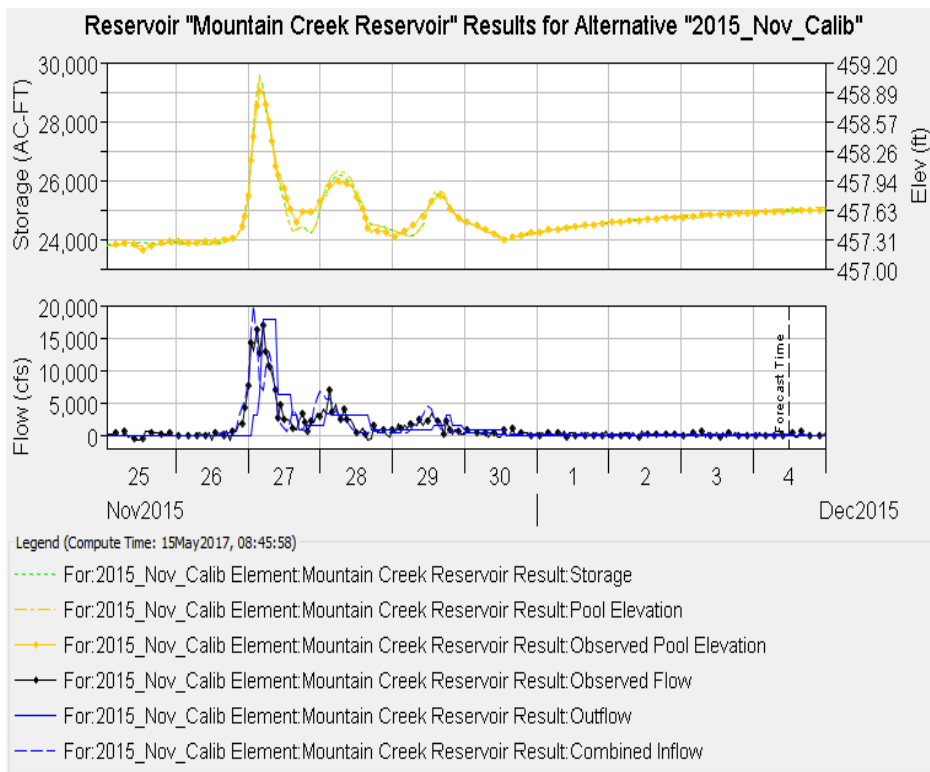


Figure 41d. November 2015 Calibration Results for Mountain Creek Reservoir

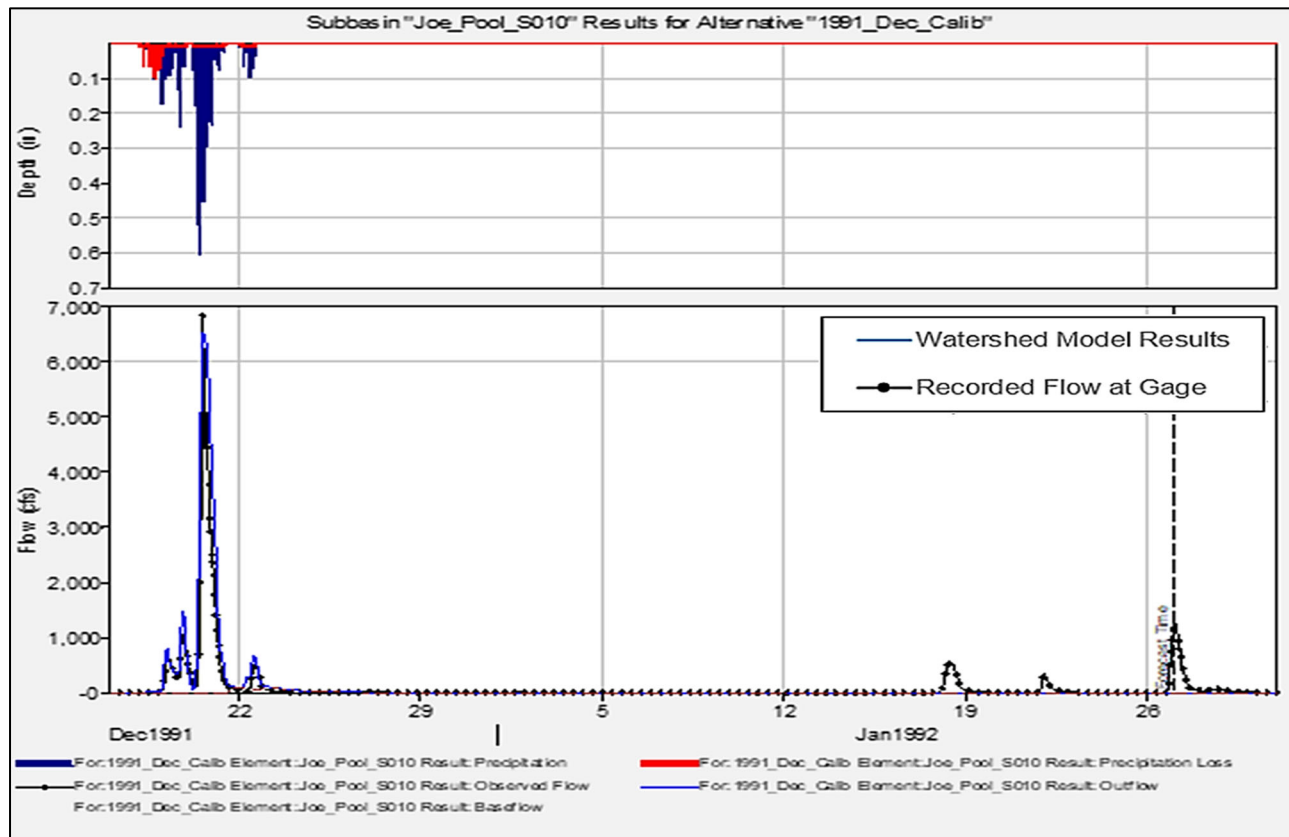


Figure 42a. December 20, 1991 Calibration Results for the Mountain Creek near Venus, TX Gage

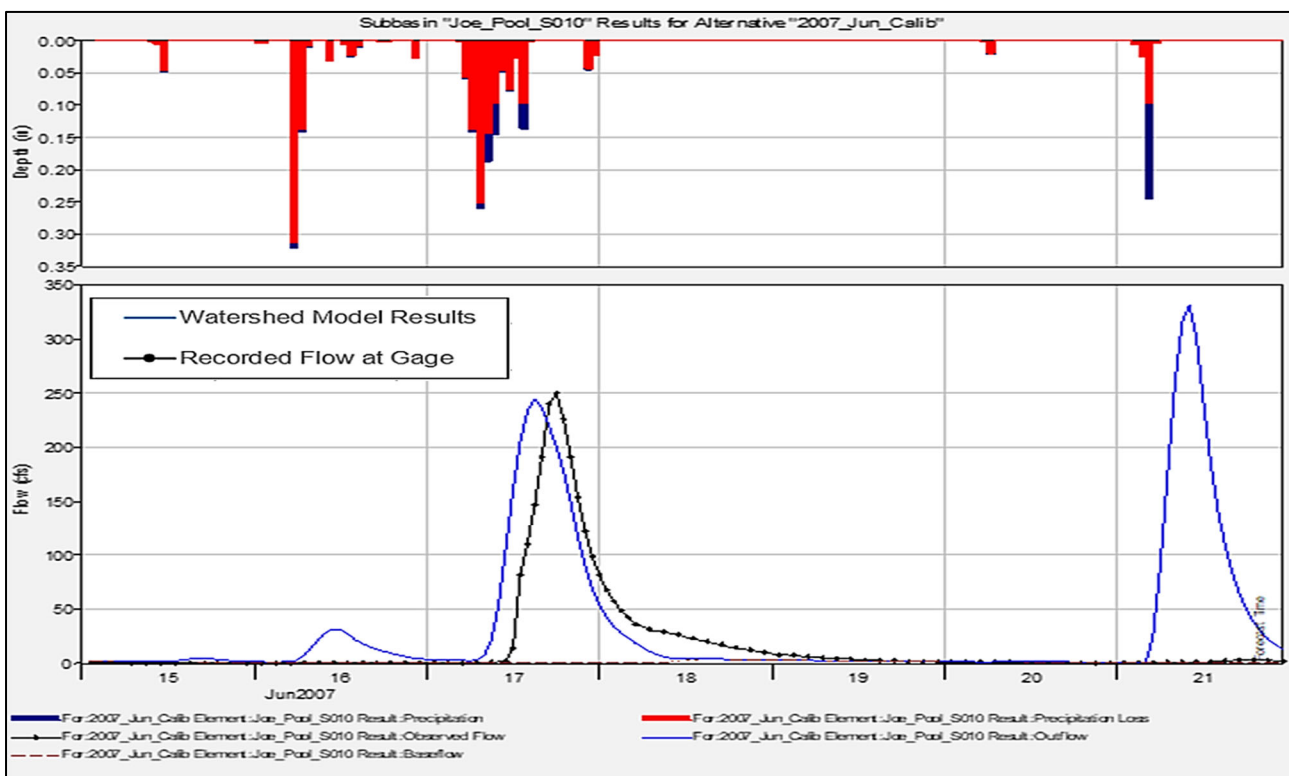


Figure 42b. June 17, 2007 Calibration Results for the Mountain Creek near Venus, TX Gage

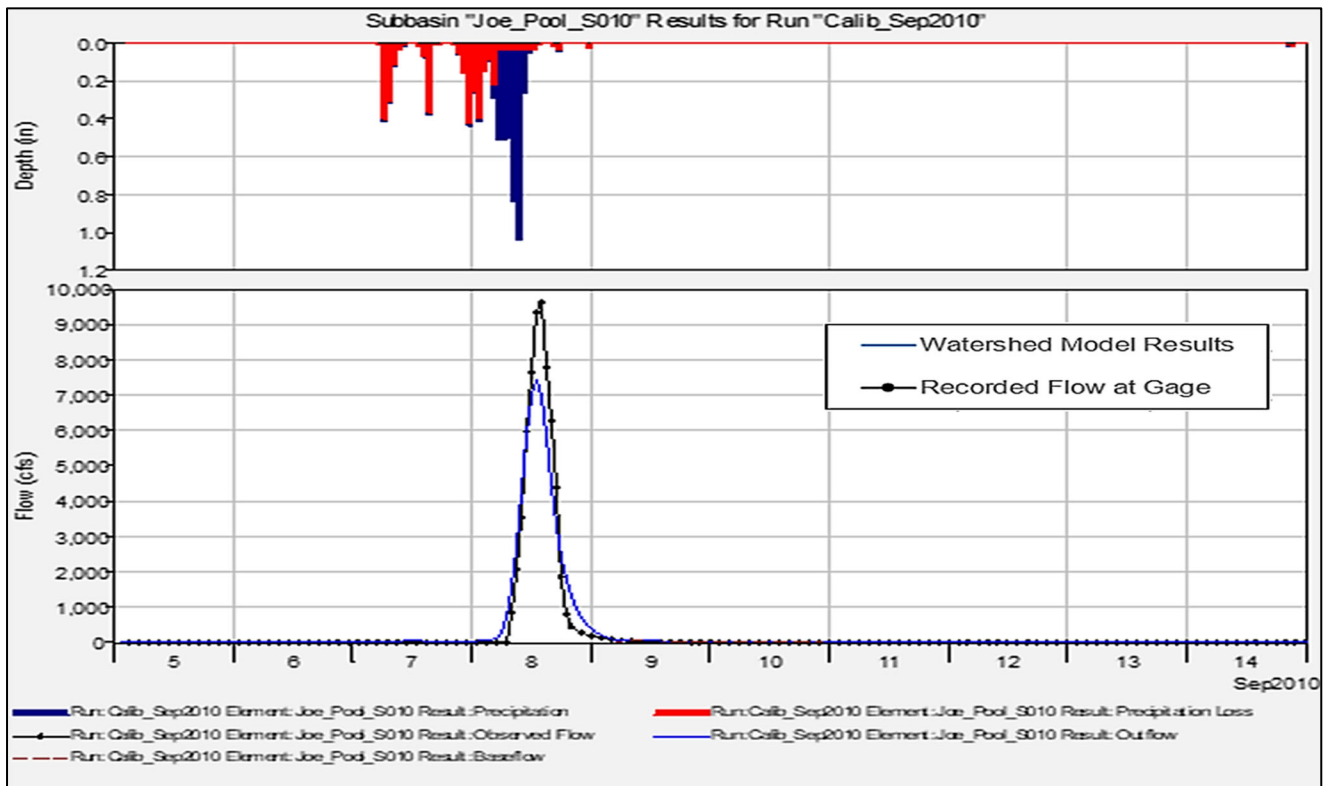


Figure 42c. September 8, 2010 Calibration Results for the Mountain Creek near Venus, TX Gage

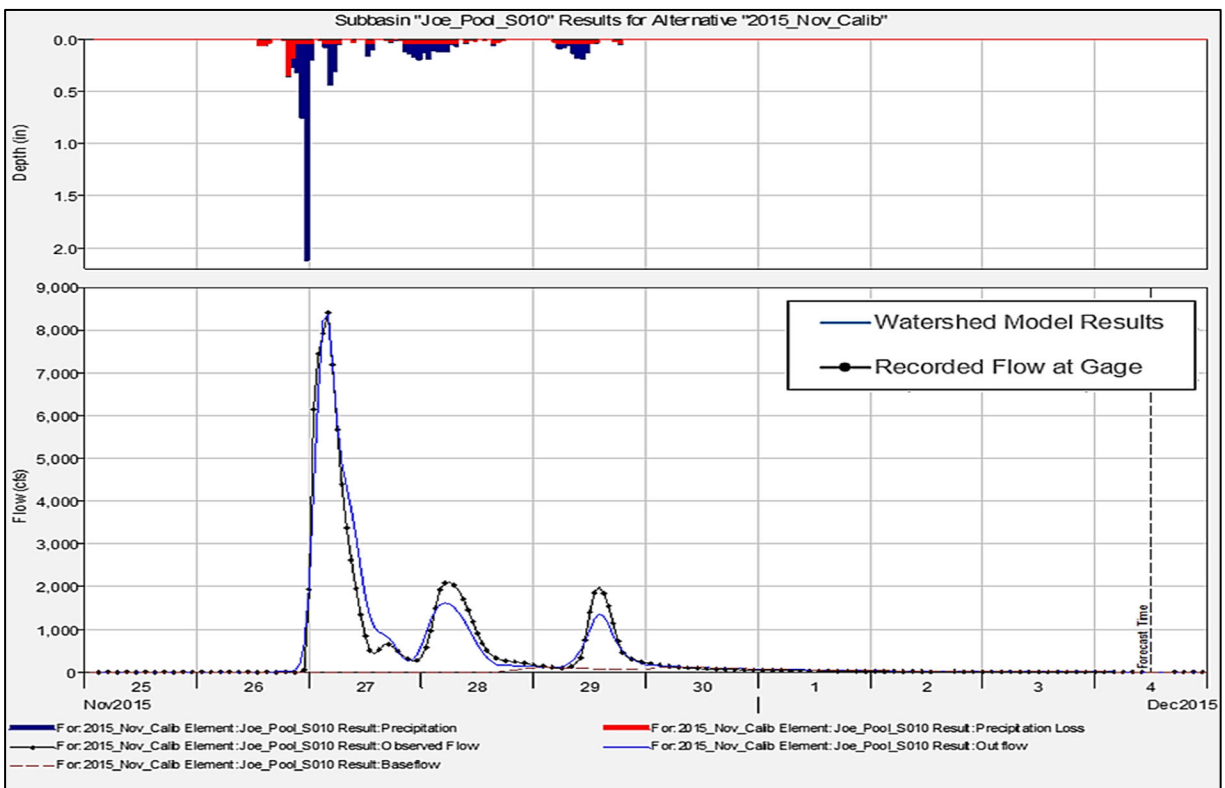


Figure 11. November 27, 2015 Calibration Results for the Mountain Creek near Venus, TX Gage

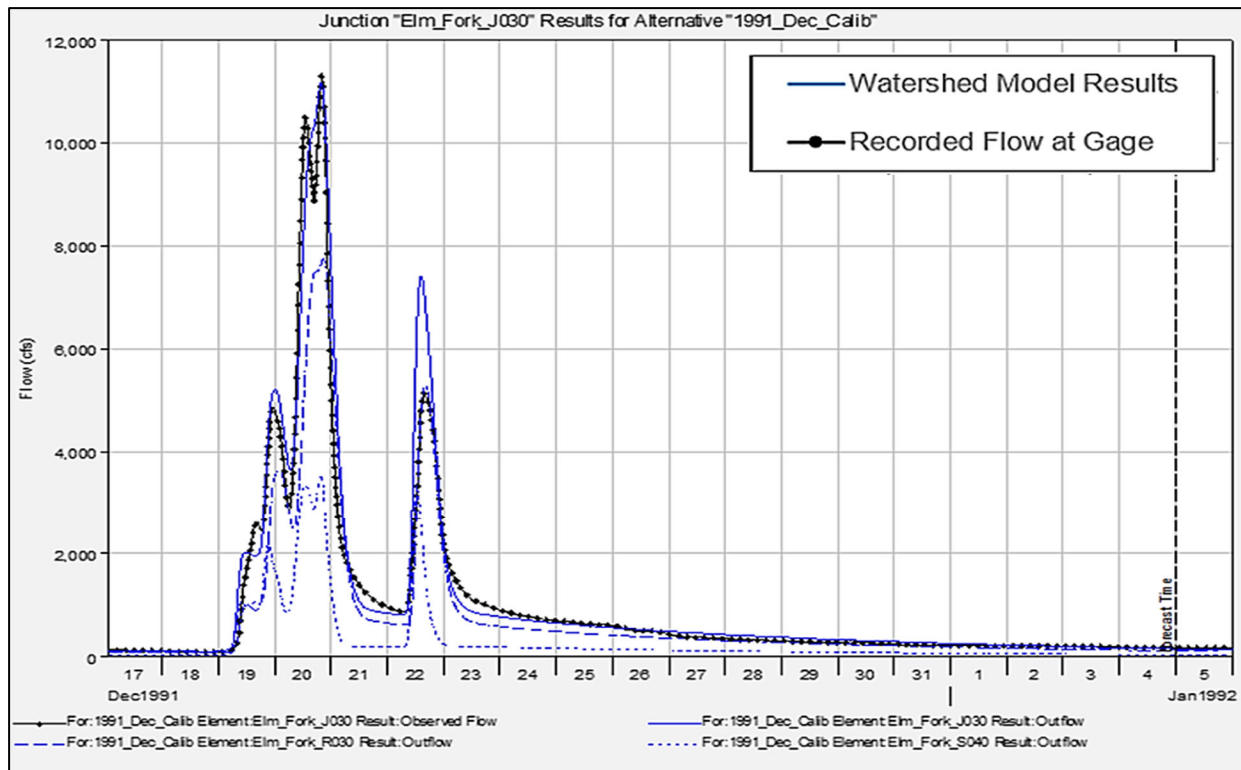


Figure 43a. December 20, 1991 Calibration Results for the Elm Fork at Gainesville, TX Gage

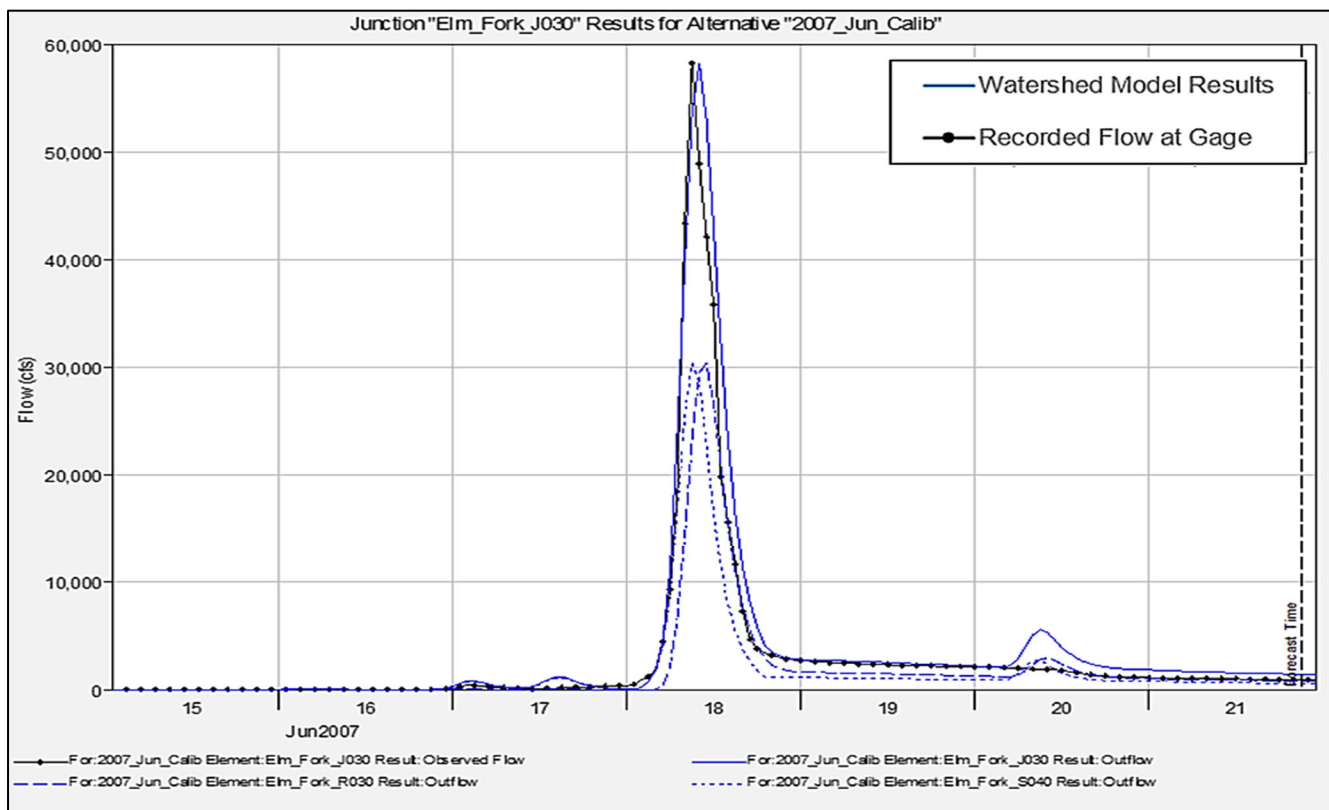


Figure 43b. June 17, 2007 Calibration Results for the Elm Fork at Gainesville, TX Gage

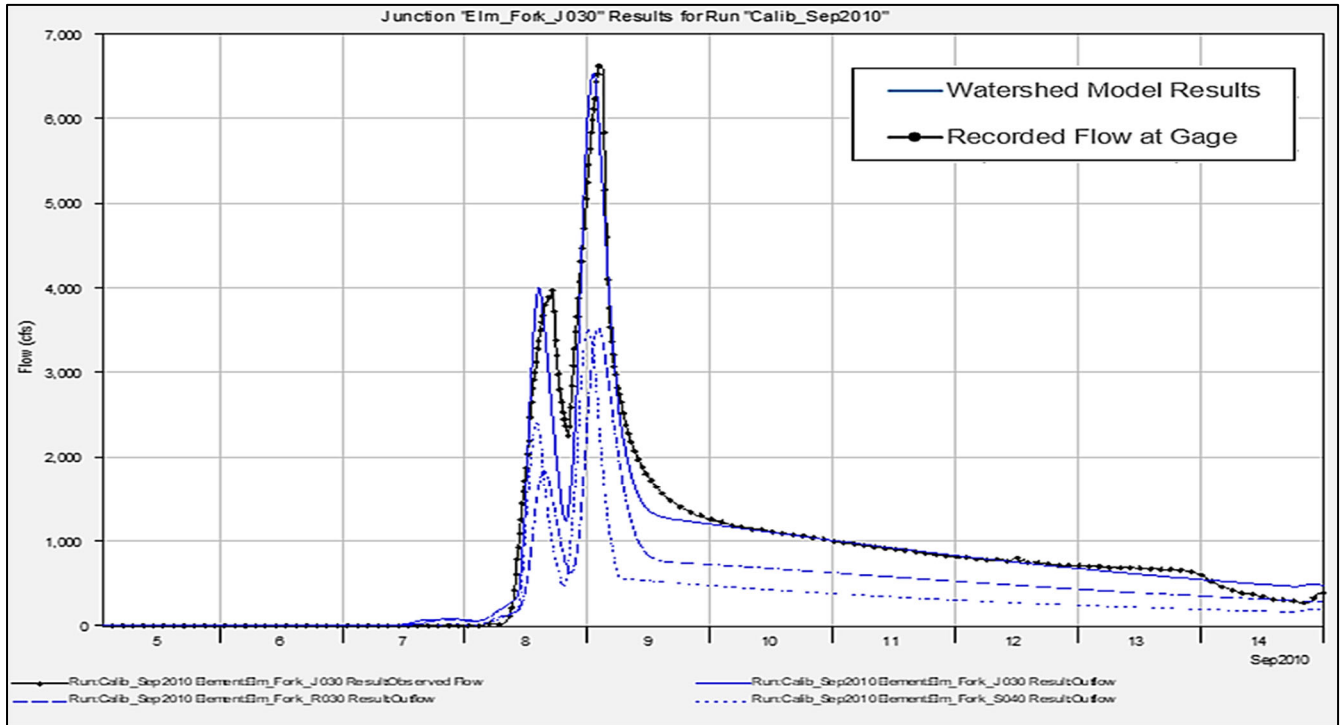


Figure 43c. September 8, 2010 Calibration Results for the Elm Fork at Gainesville, TX Gage

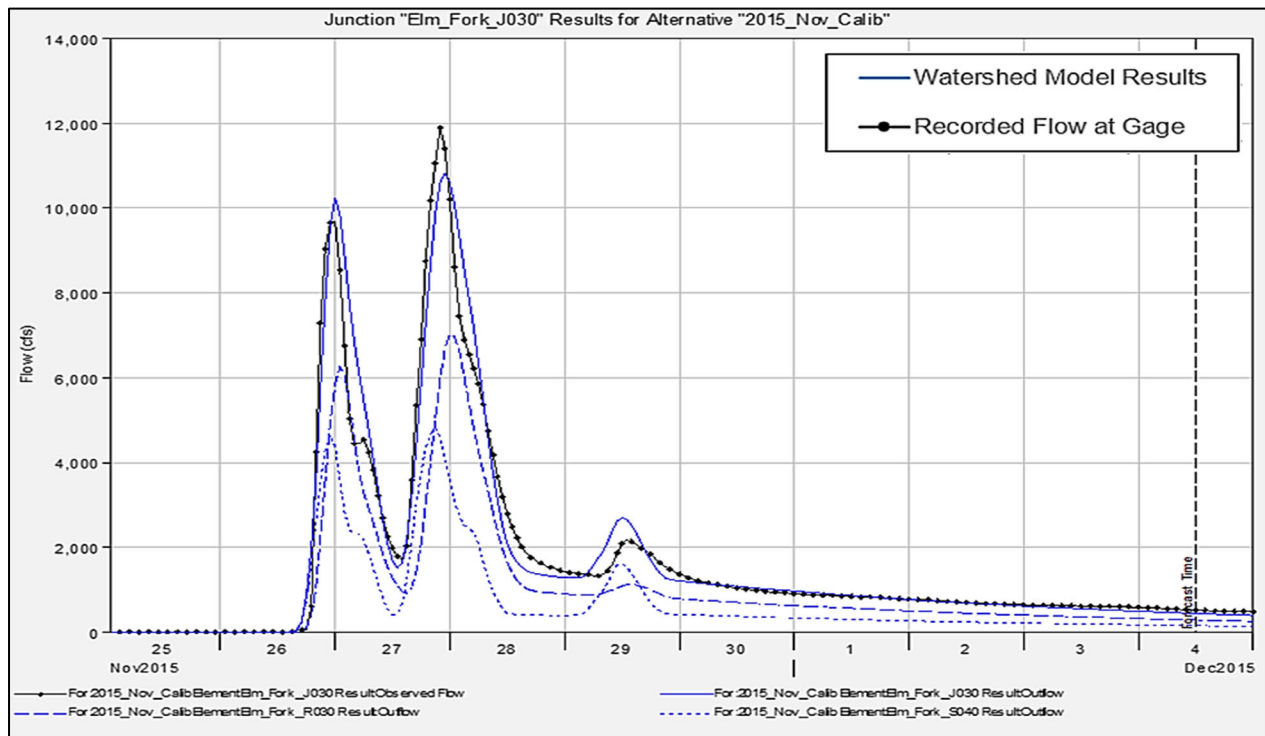


Figure 43d. November 27, 2015 Calibration Results for the Elm Fork at Gainesville, TX Gage

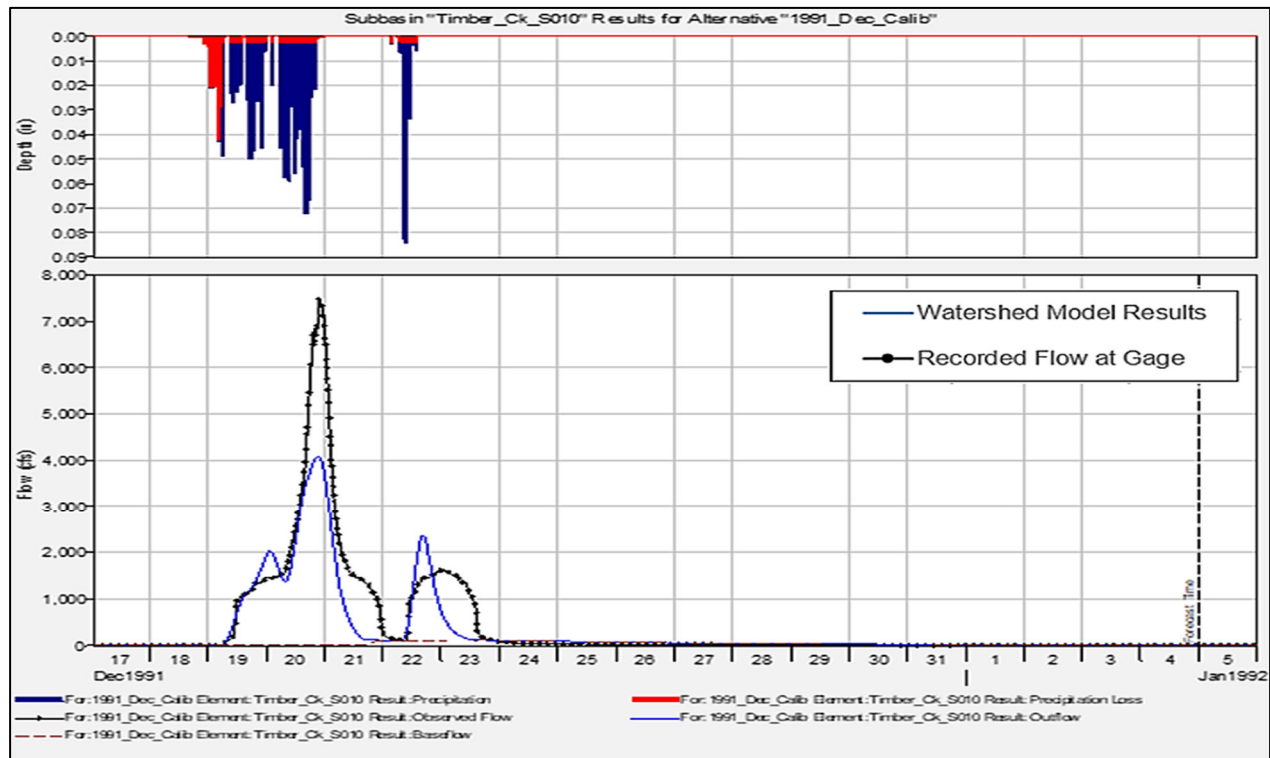


Figure 44a. December 20, 1991 Calibration Results for the Timber Creek near Collinsville, TX Gage

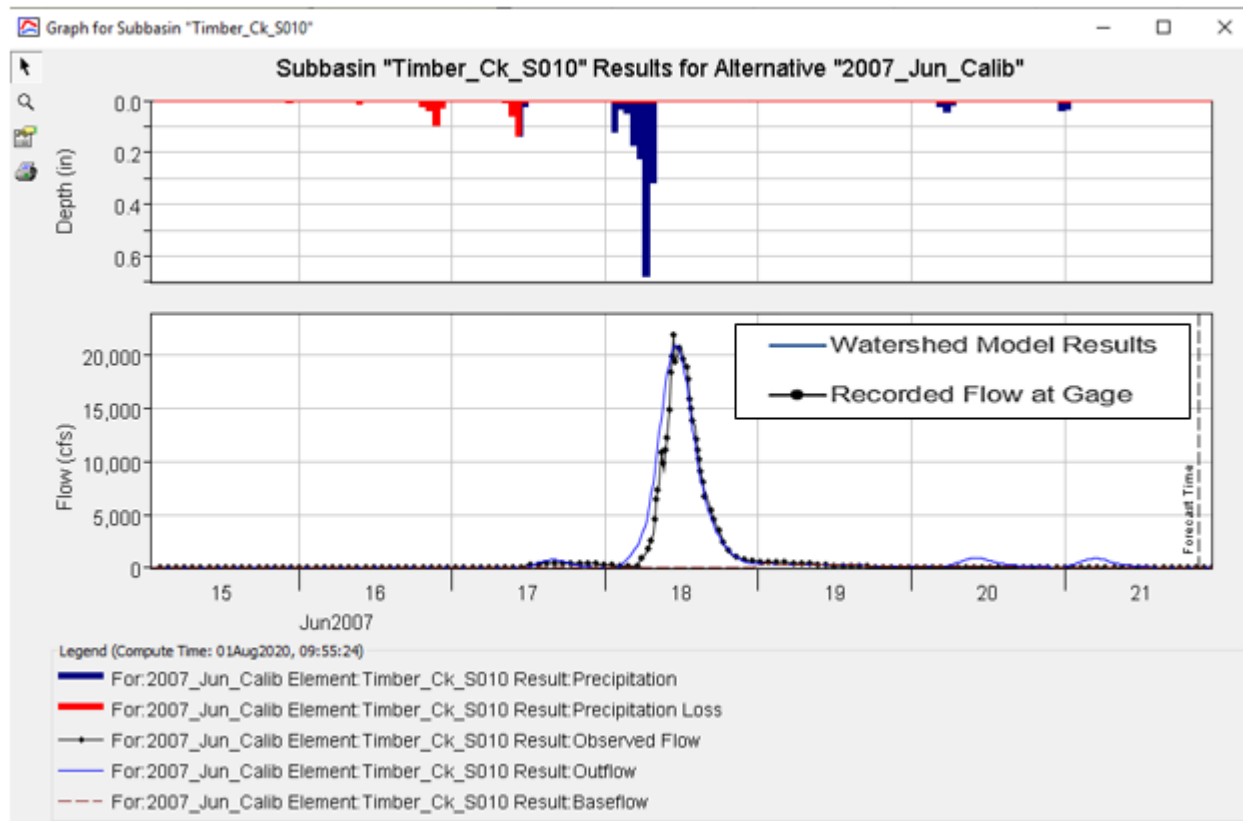


Figure 44b. June 17, 2007 Calibration Results for the Timber Creek near Collinsville, TX Gage

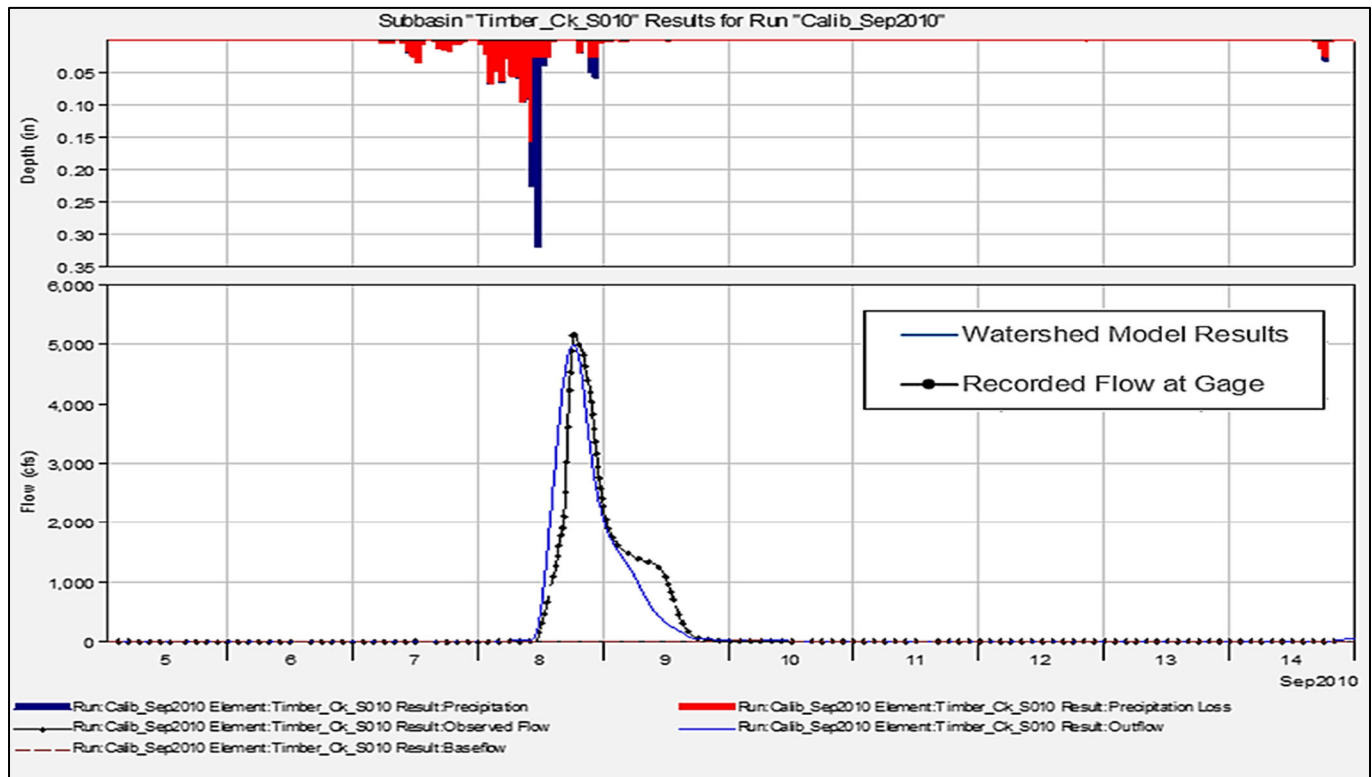


Figure 44c. September 8, 2010 Calibration Results for the Timber Creek near Collinsville, TX Gauge

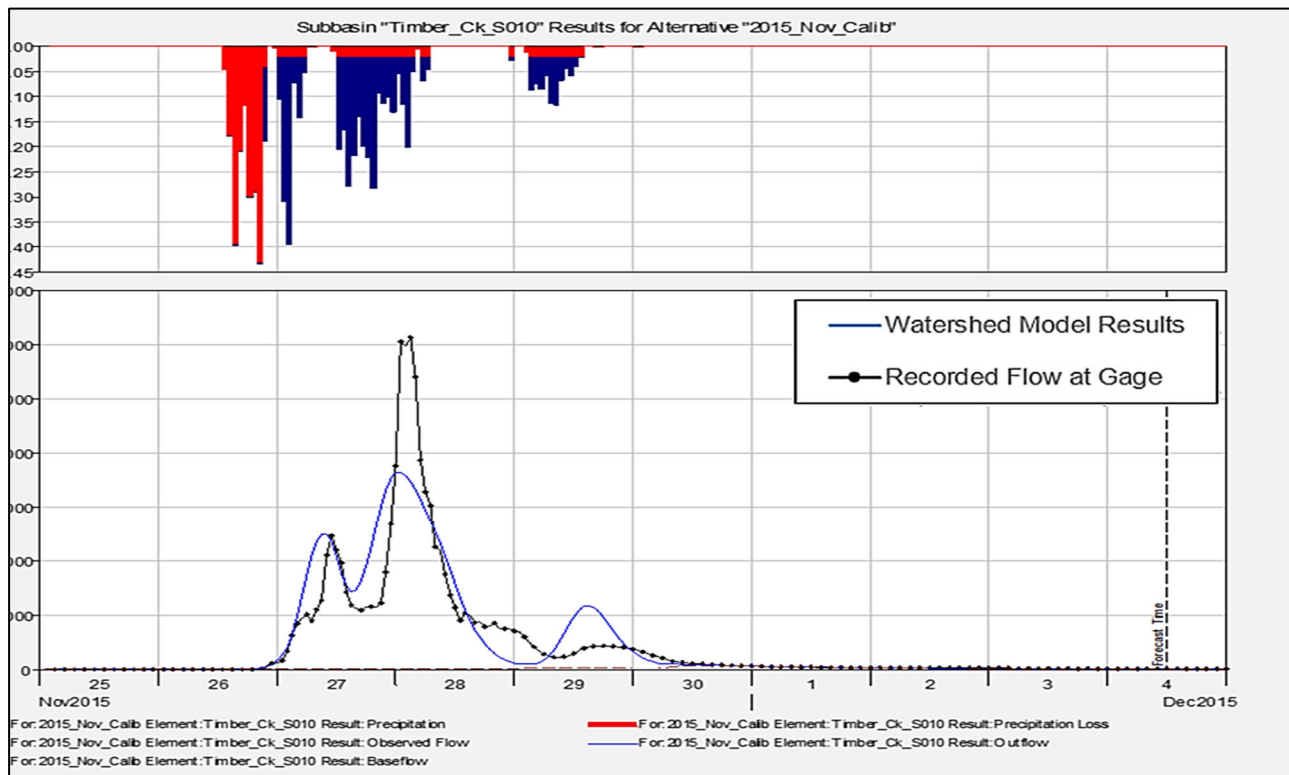


Figure 44d. November 27, 2015 Calibration Results for the Timber Creek near Collinsville, TX Gauge

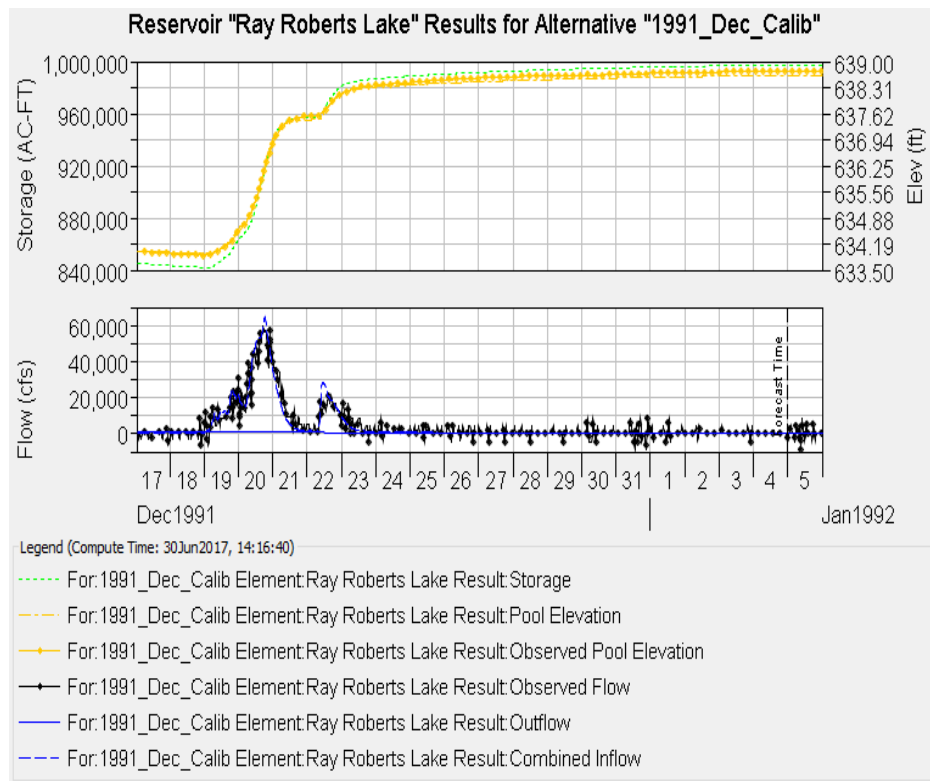


Figure 45a. December 1991 Calibration Results for Ray Roberts Reservoir

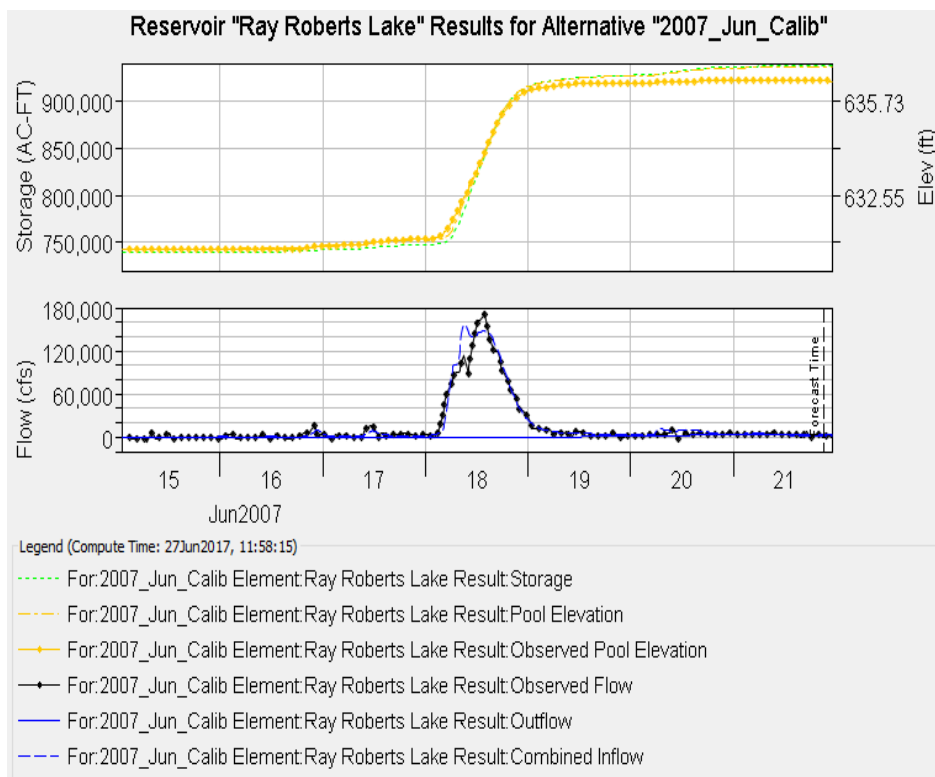


Figure 45b. June 2007 Calibration Results for Ray Roberts Reservoir

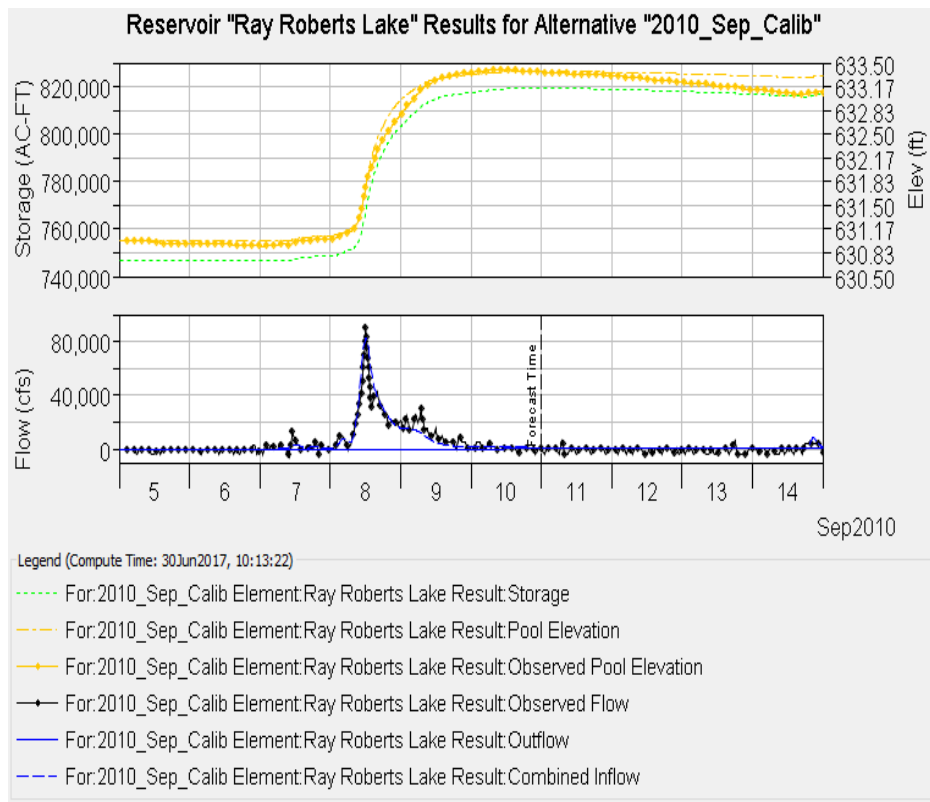


Figure 45c. September 2010 Calibration Results for Ray Roberts Reservoir

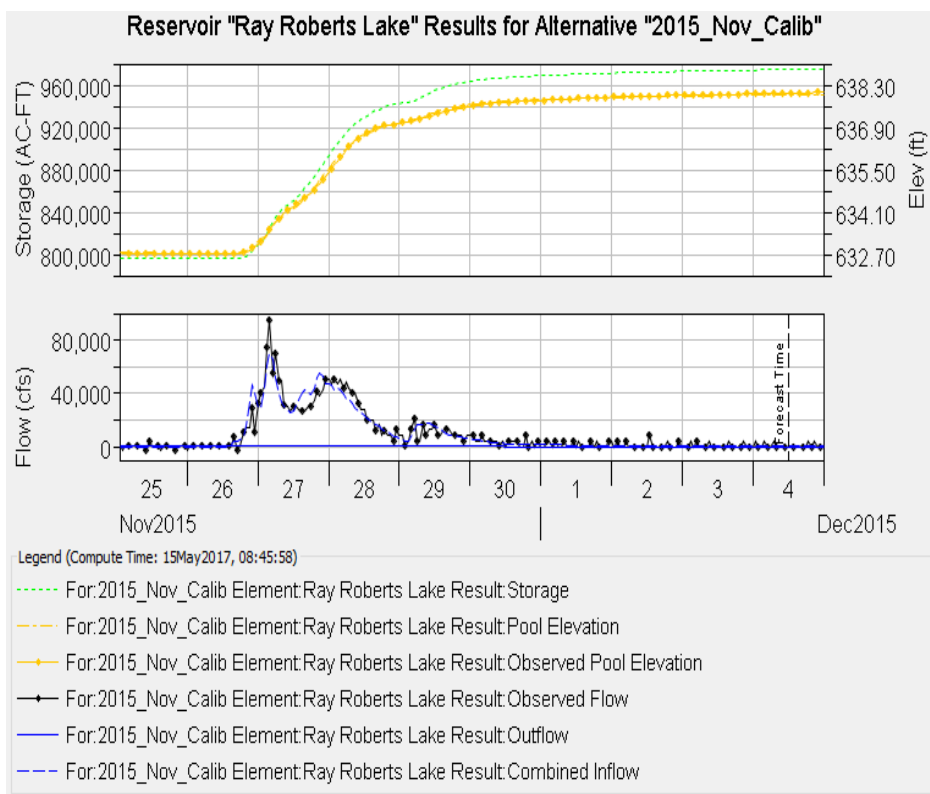


Figure 45d. November 2015 Calibration Results for Ray Roberts Reservoir

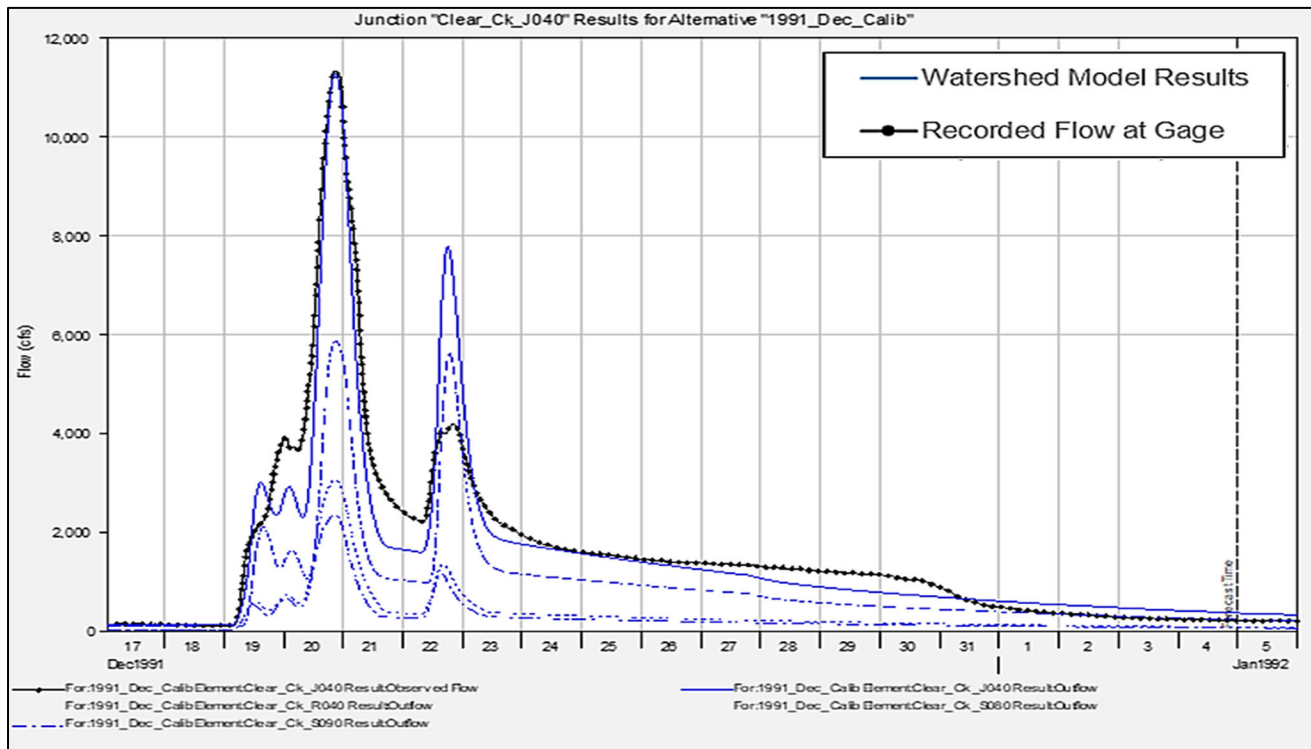


Figure 46a. December 20, 1991 Calibration Results for the Clear Creek near Sanger, TX Gauge

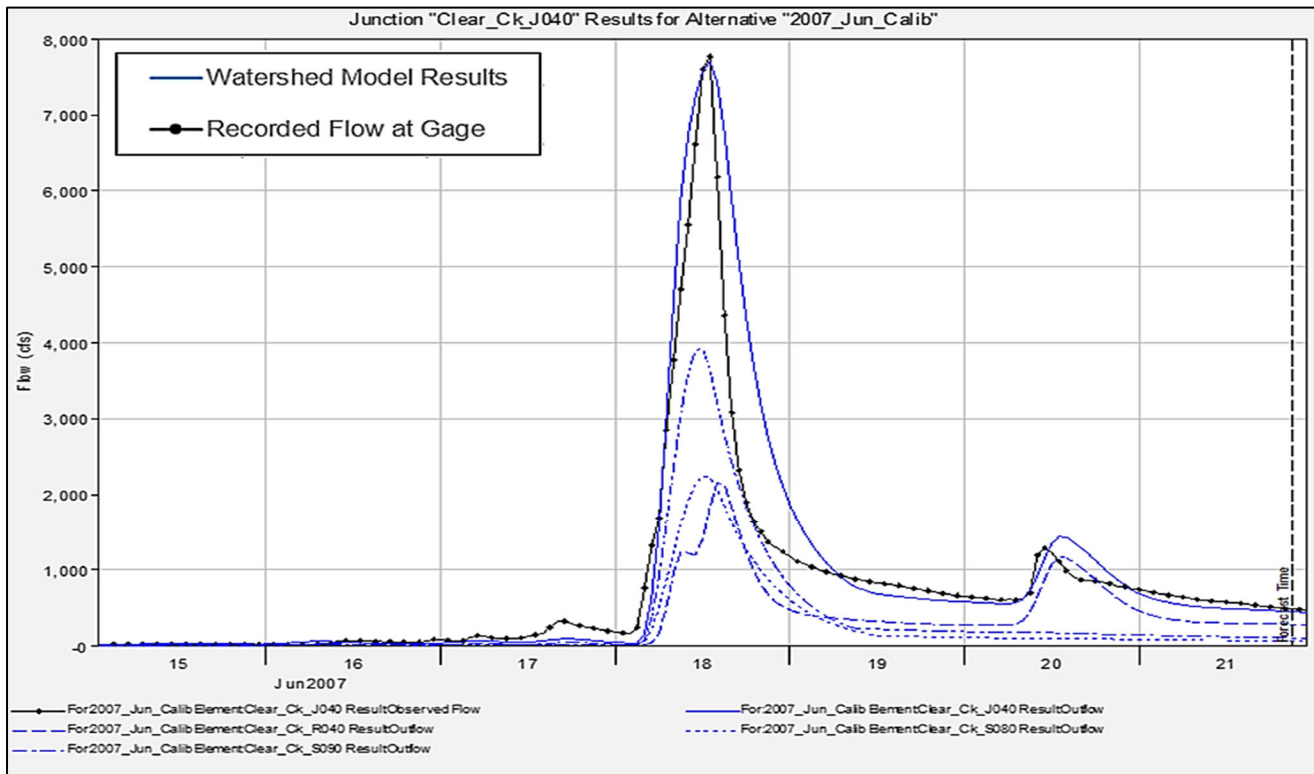


Figure 46b. June 17, 2007 Calibration Results for the Clear Creek near Sanger, TX Gauge

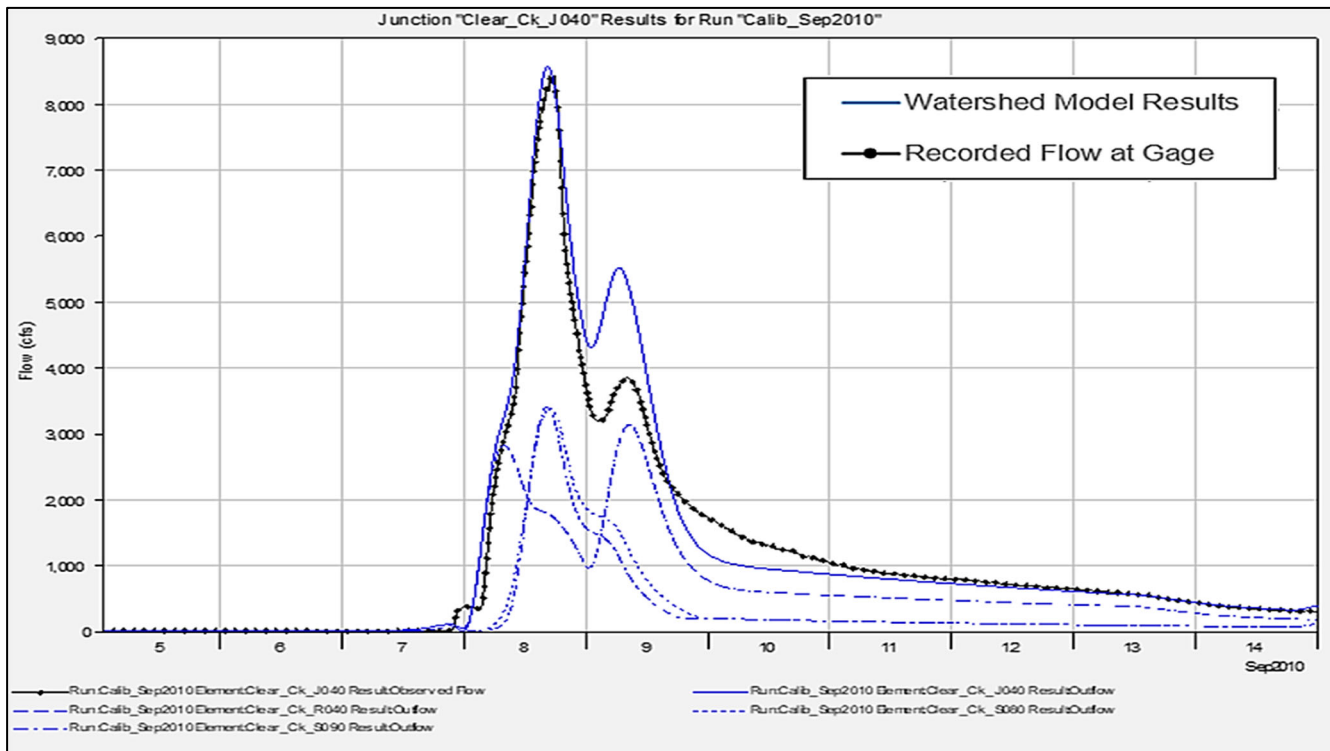


Figure 46c. September 8, 2010 Calibration Results for the Clear Creek near Sanger, TX Gage

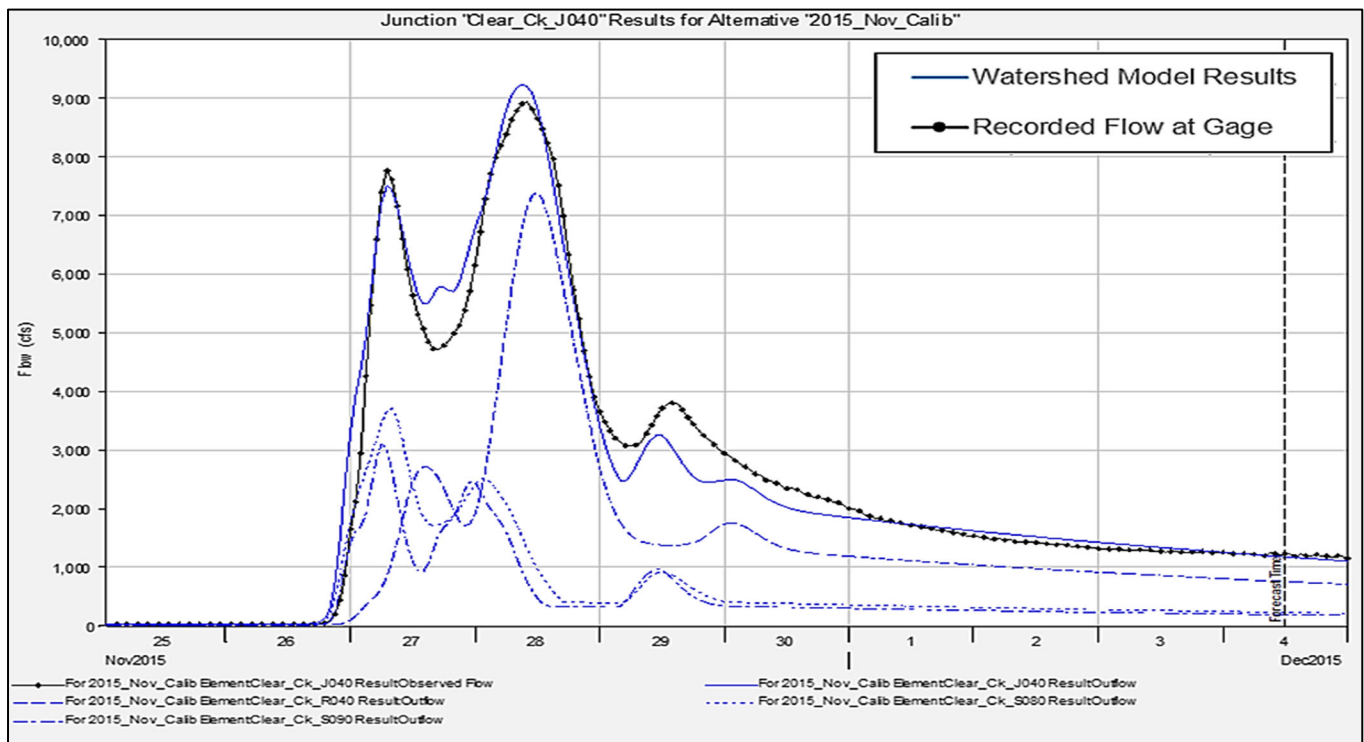


Figure 46d. November 27, 2015 Calibration Results for the Clear Creek near Sanger, TX Gage

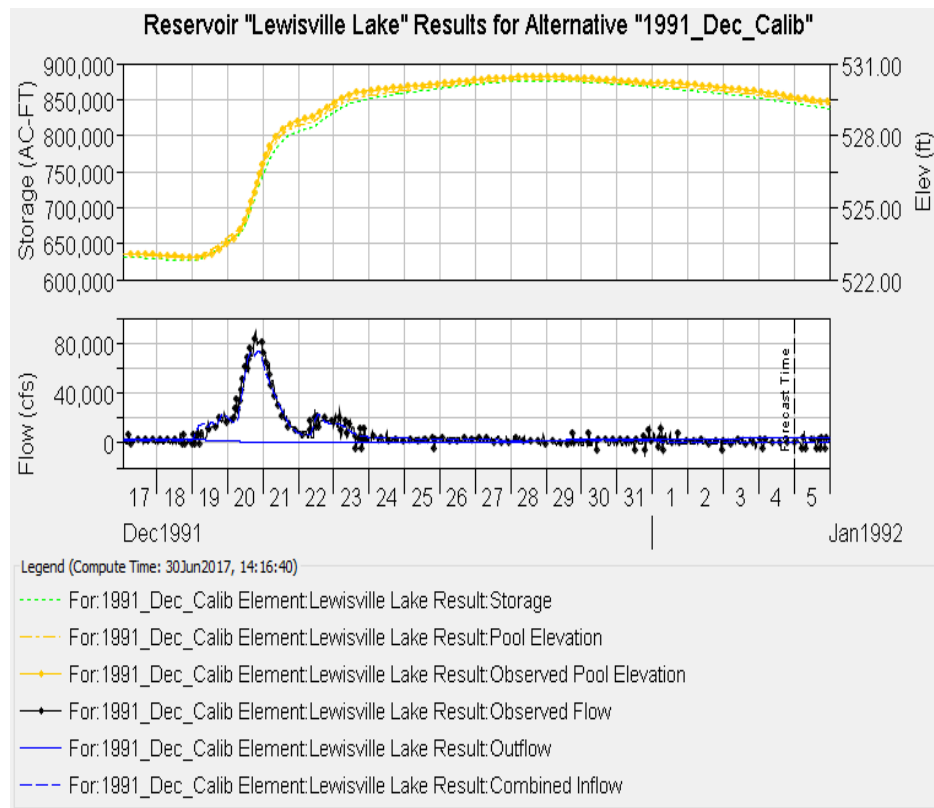


Figure 47a. December 1991 Calibration Results for Lewisville Reservoir

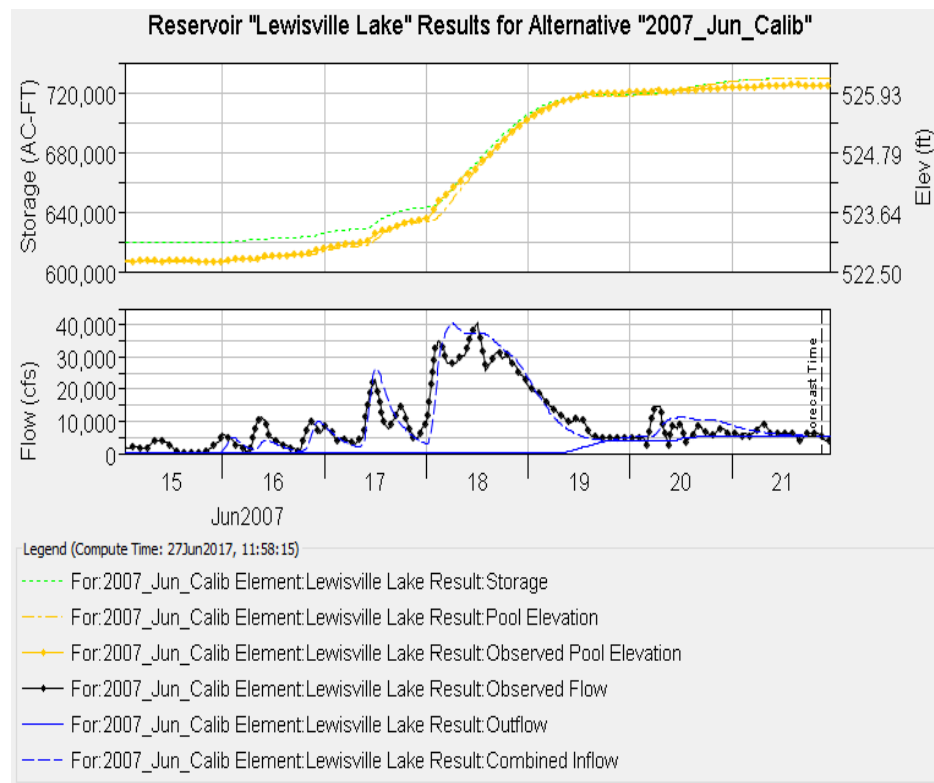


Figure 47b. June 2007 Calibration Results for Lewisville Reservoir

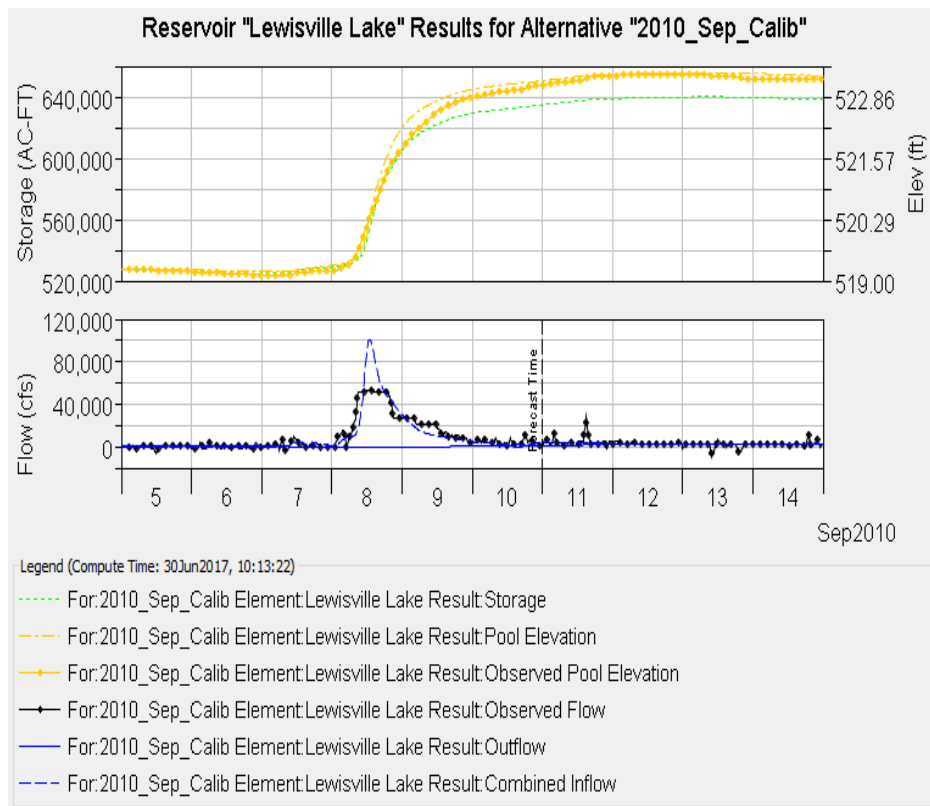


Figure 47c. September 2010 Calibration Results for Lewisville Reservoir

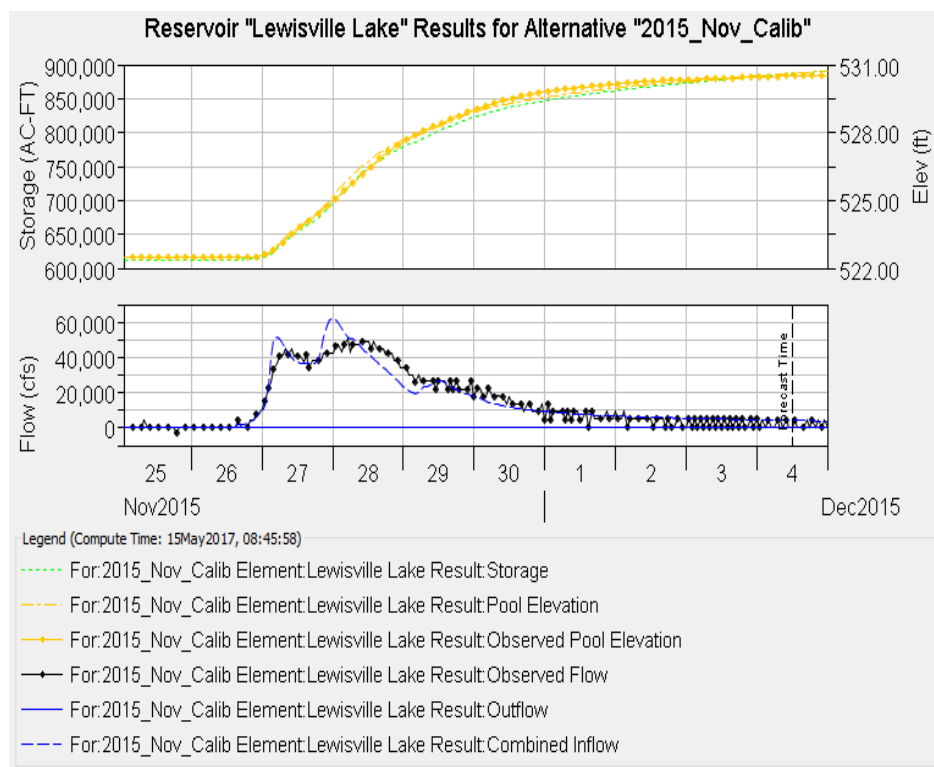


Figure 47d. November 2015 Calibration Results for Lewisville Reservoir

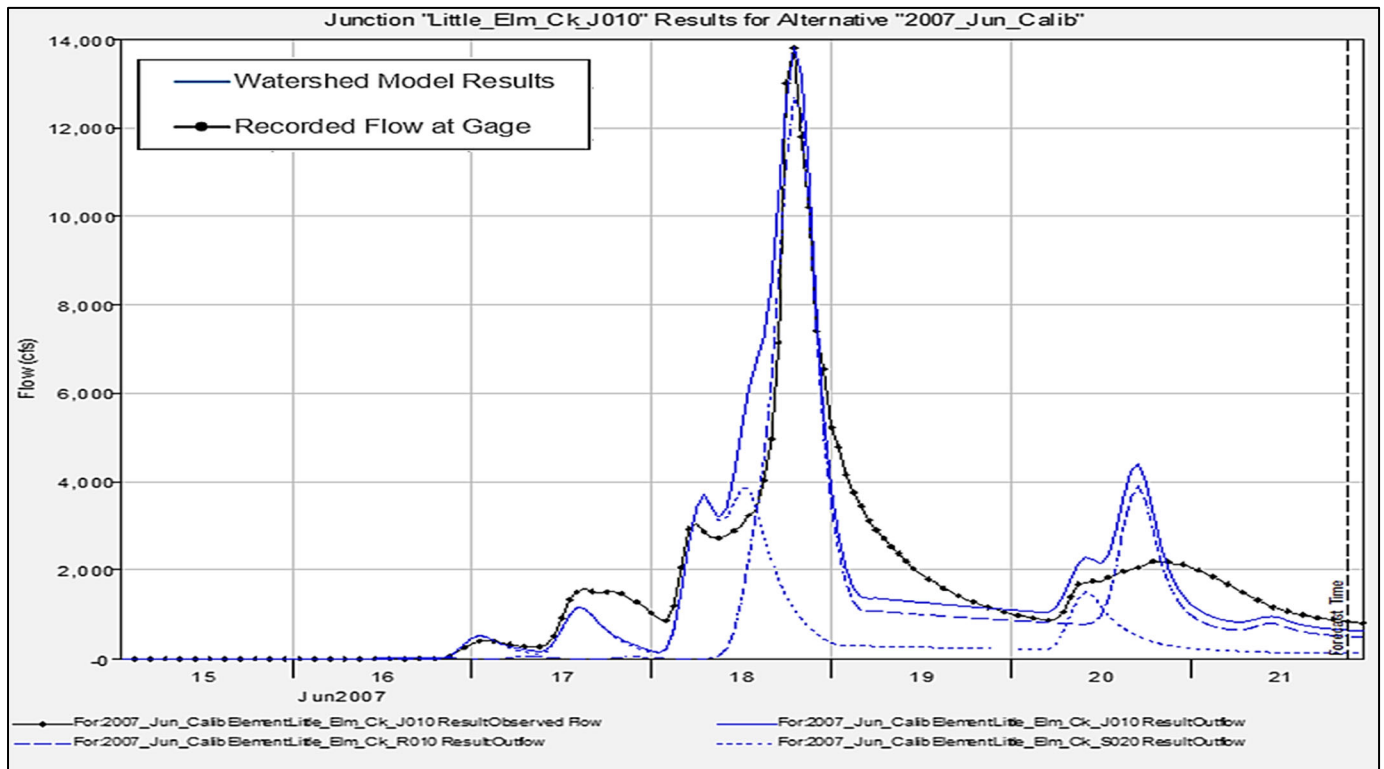


Figure 48a. June 17, 2007 Calibration Results for the Little Elm near Aubrey, TX Gage

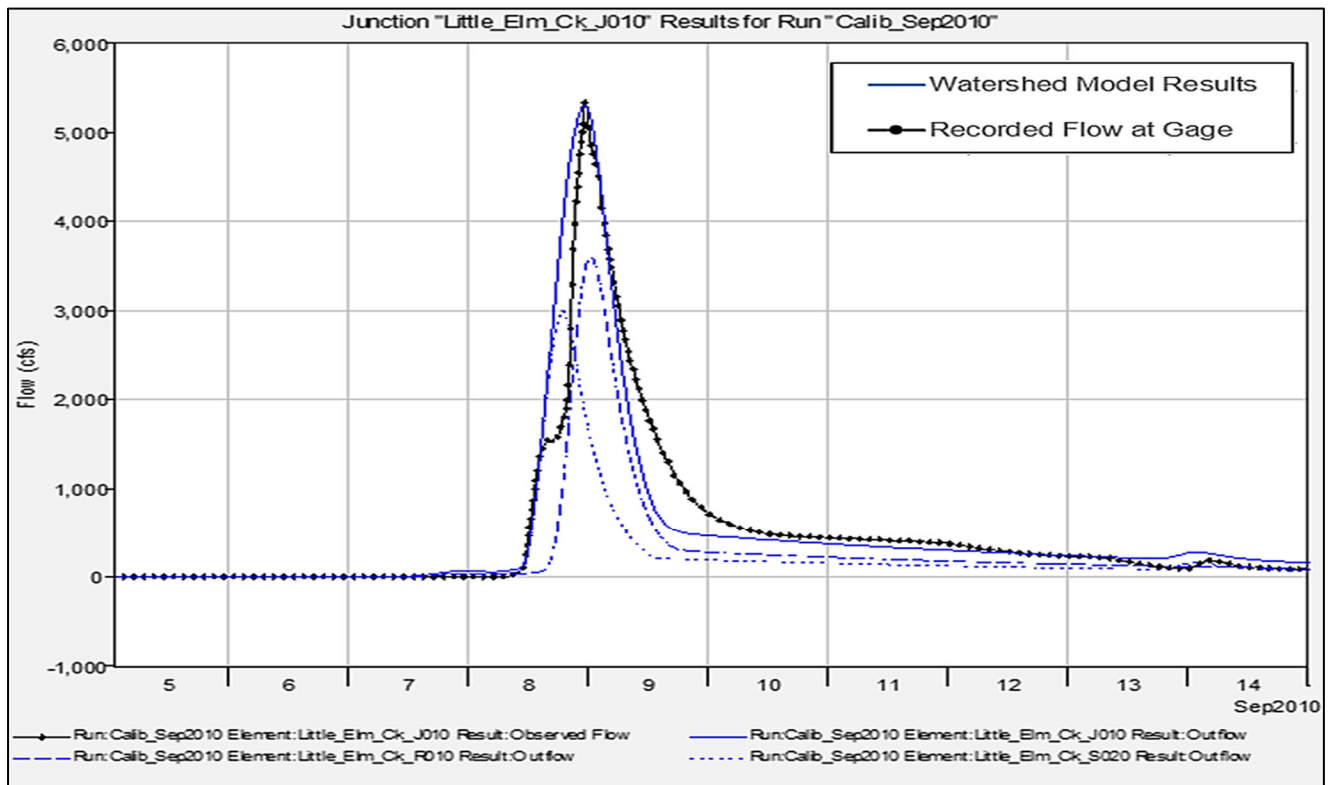


Figure 48b. September 8, 2010 Calibration Results for the Little Elm near Aubrey, TX Gage

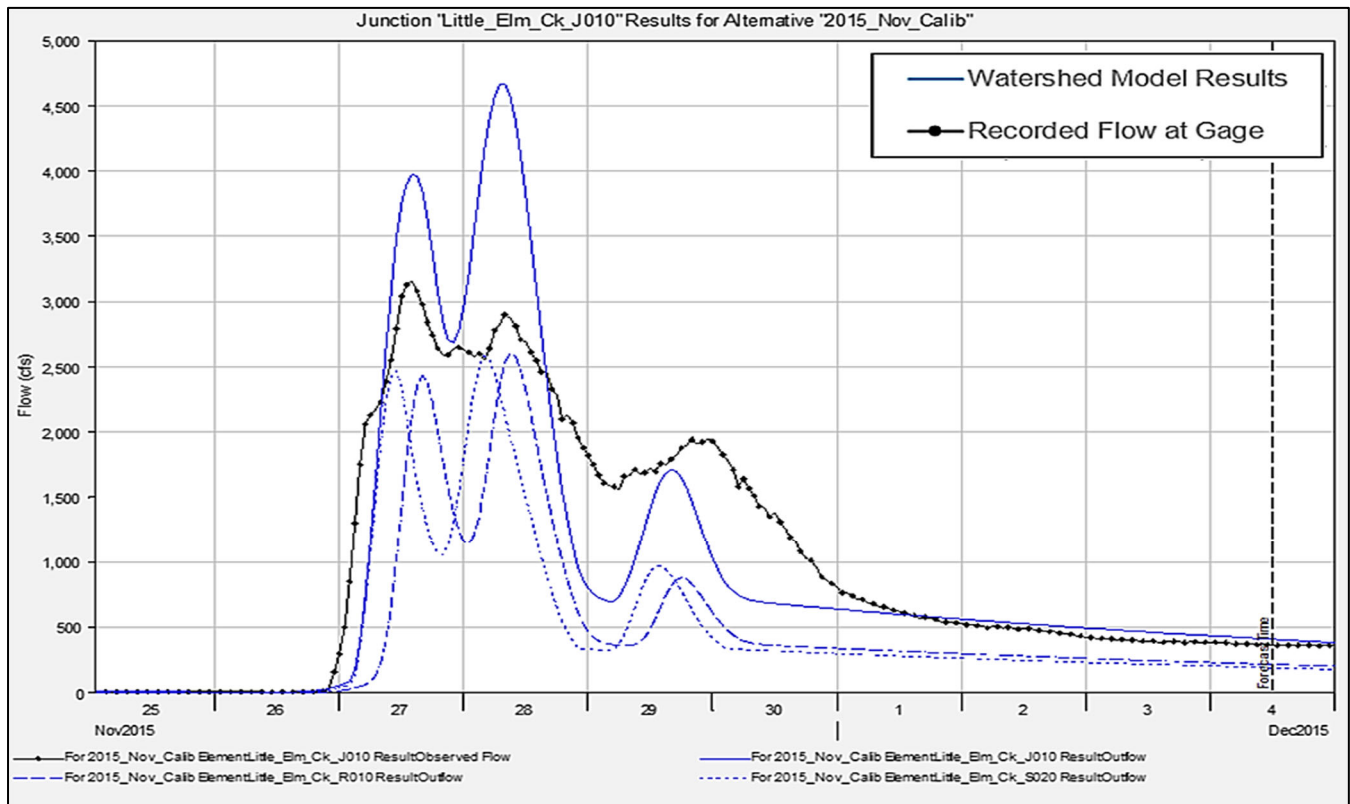


Figure 12. November 27, 2015 Calibration Results for the Little Elm near Aubrey, TX Gage

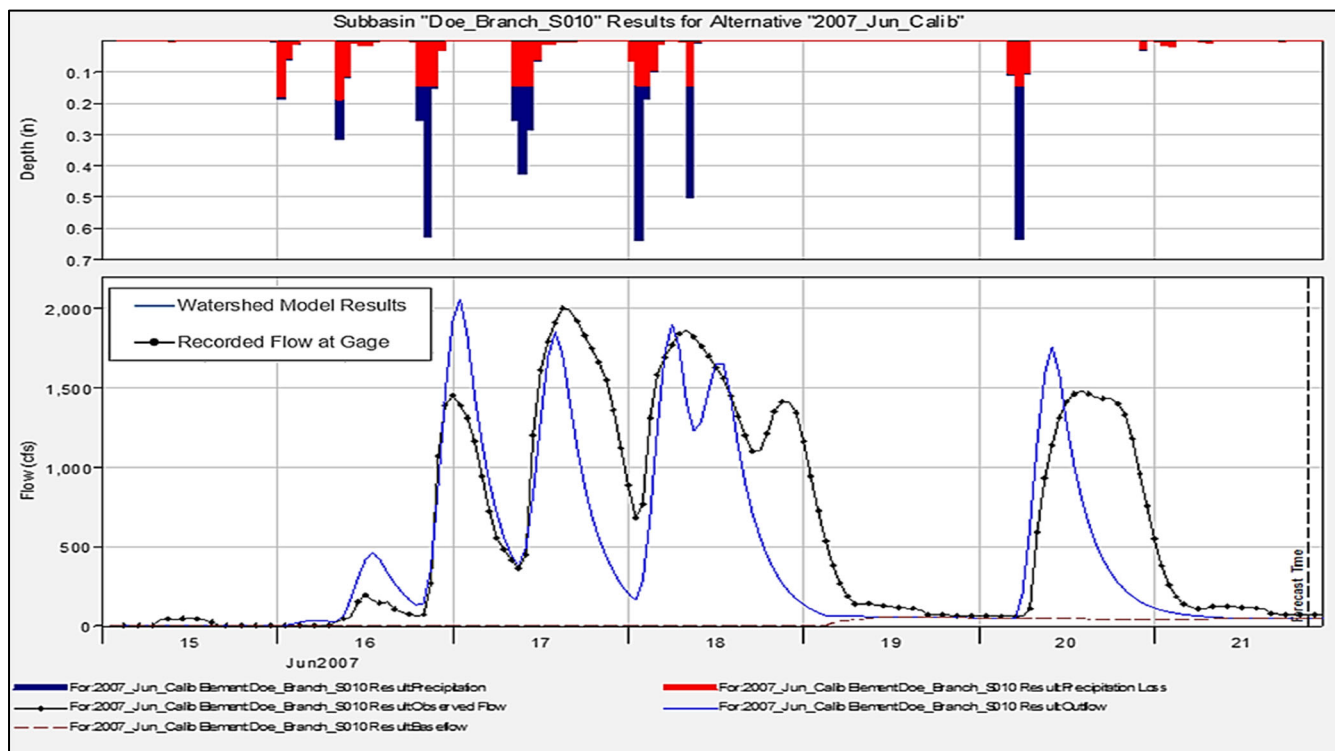


Figure 49a. June 17, 2007 Calibration Results for the Doe Branch near Prosper, TX Gage

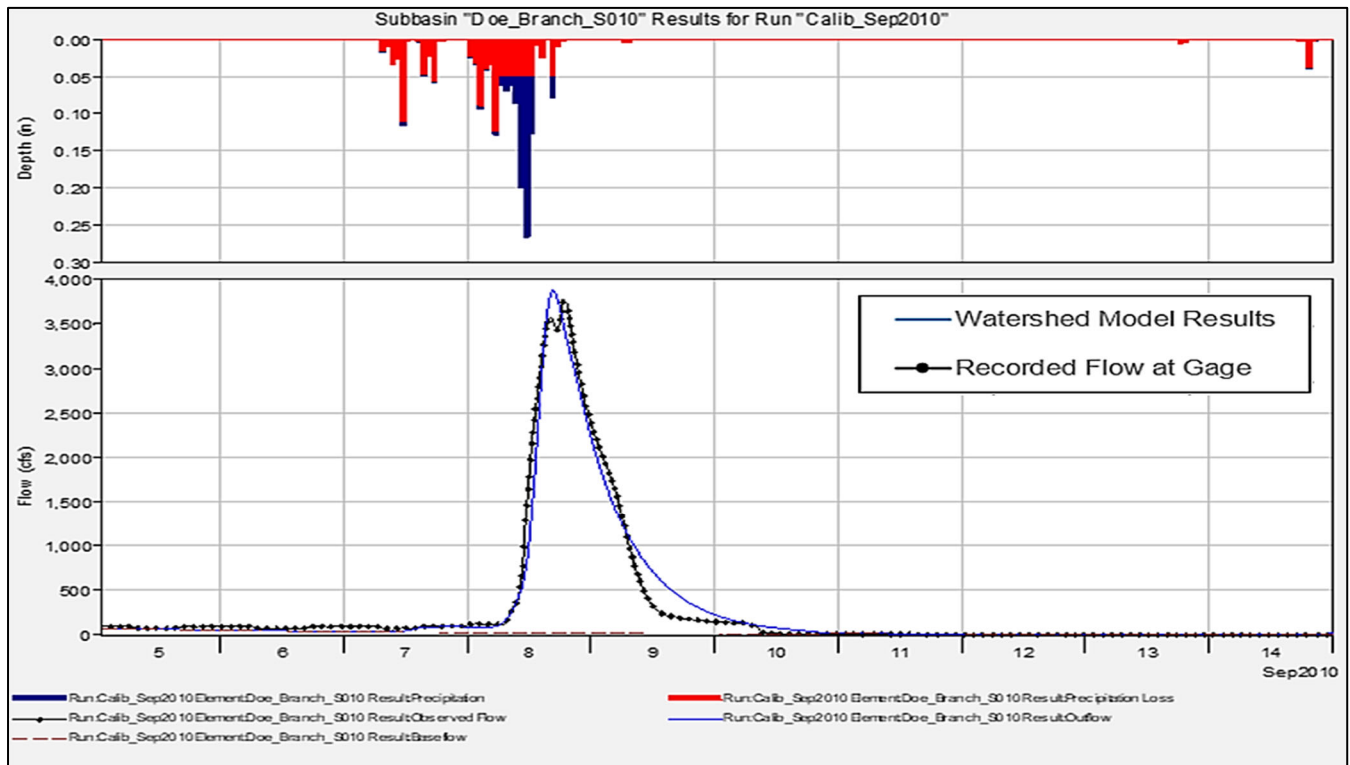


Figure 49b. September 8, 2010 Calibration Results for the Doe Branch near Prosper, TX Gage

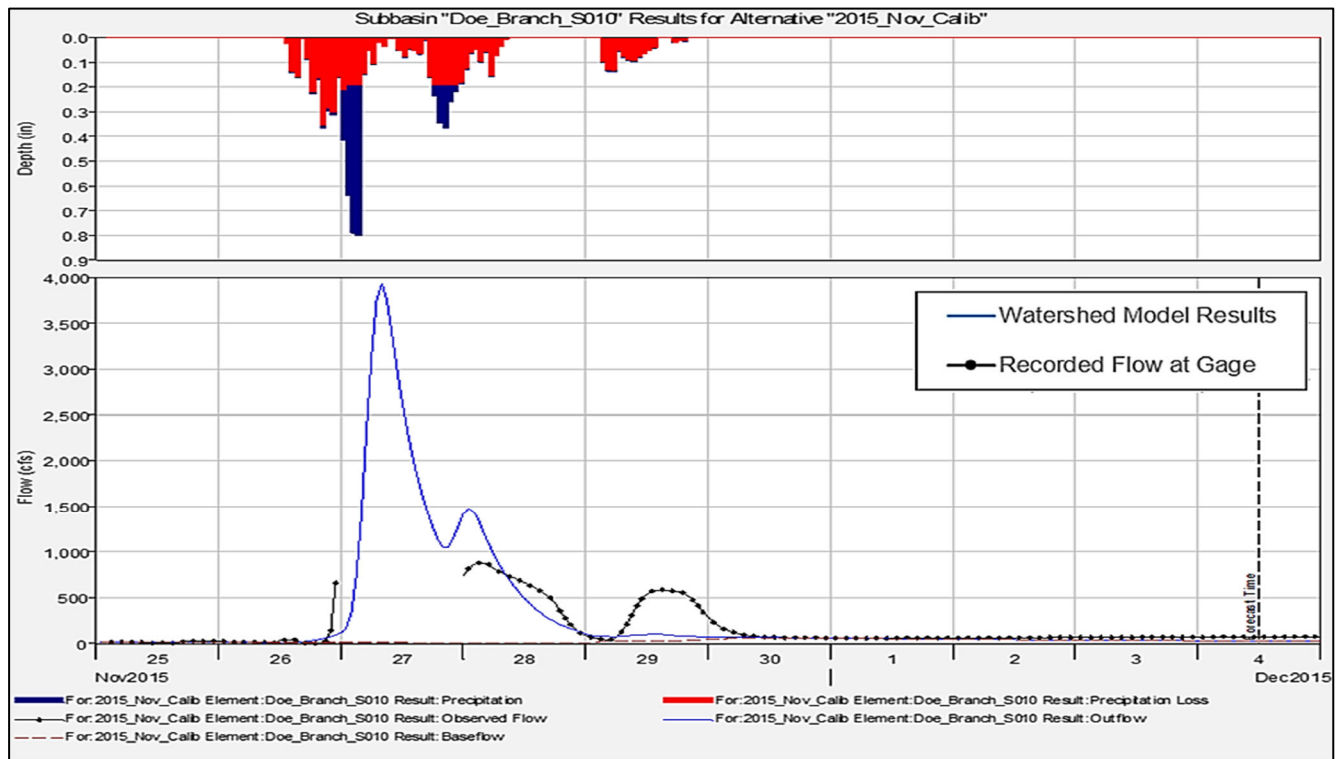


Figure 49c. November 27, 2015 Calibration Results for the Doe Branch near Prosper, TX Gage

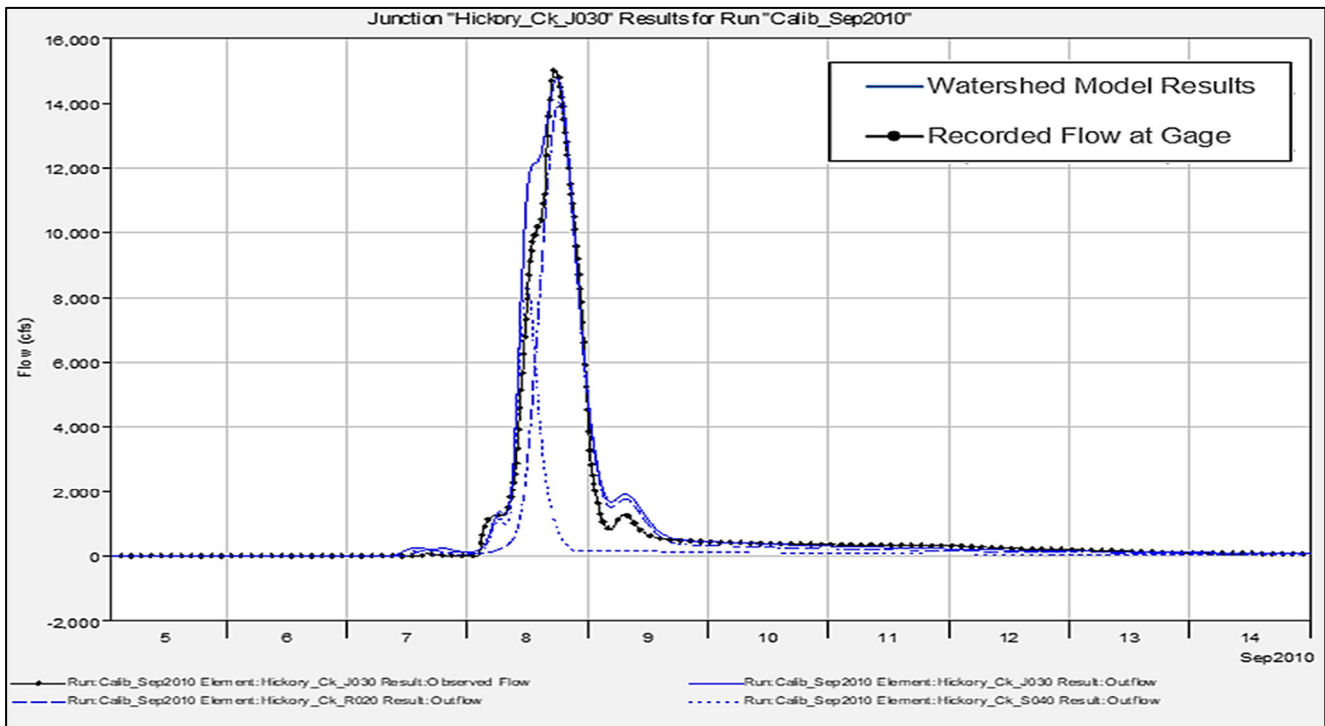


Figure 50a. September 8, 2010 Calibration Results for the Hickory Creek at Denton, TX Gage

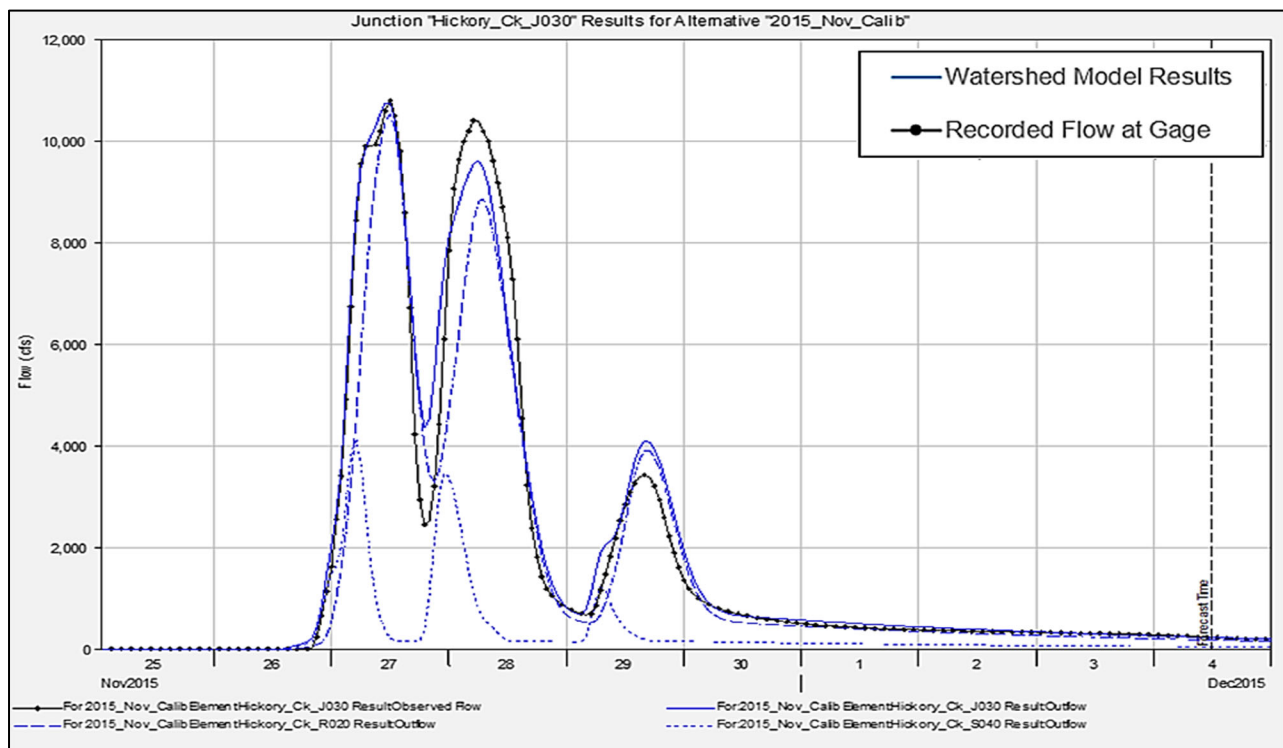


Figure 50b. November 27, 2015 Calibration Results for the Hickory Creek at Denton, TX Gage

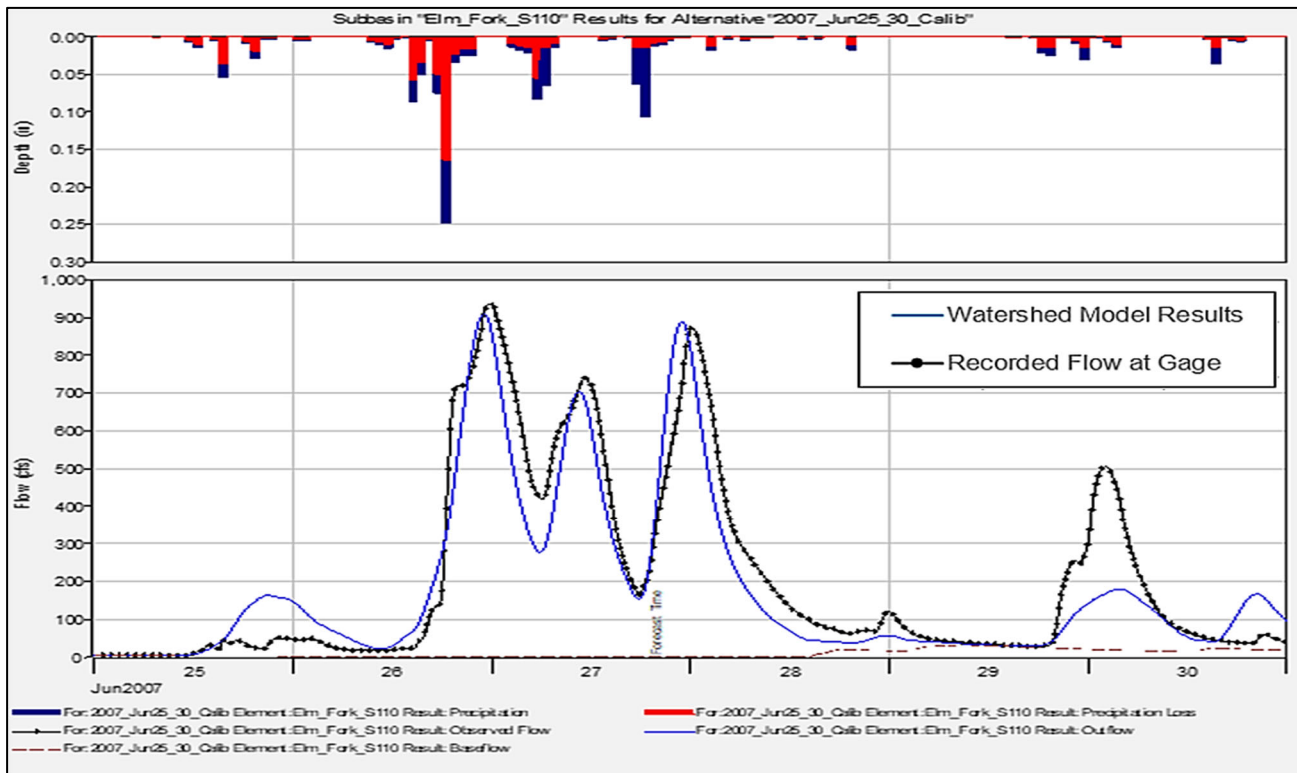


Figure 51a. June 26, 2007 Calibration Results for the Indian Creek at Carrollton, TX Gage

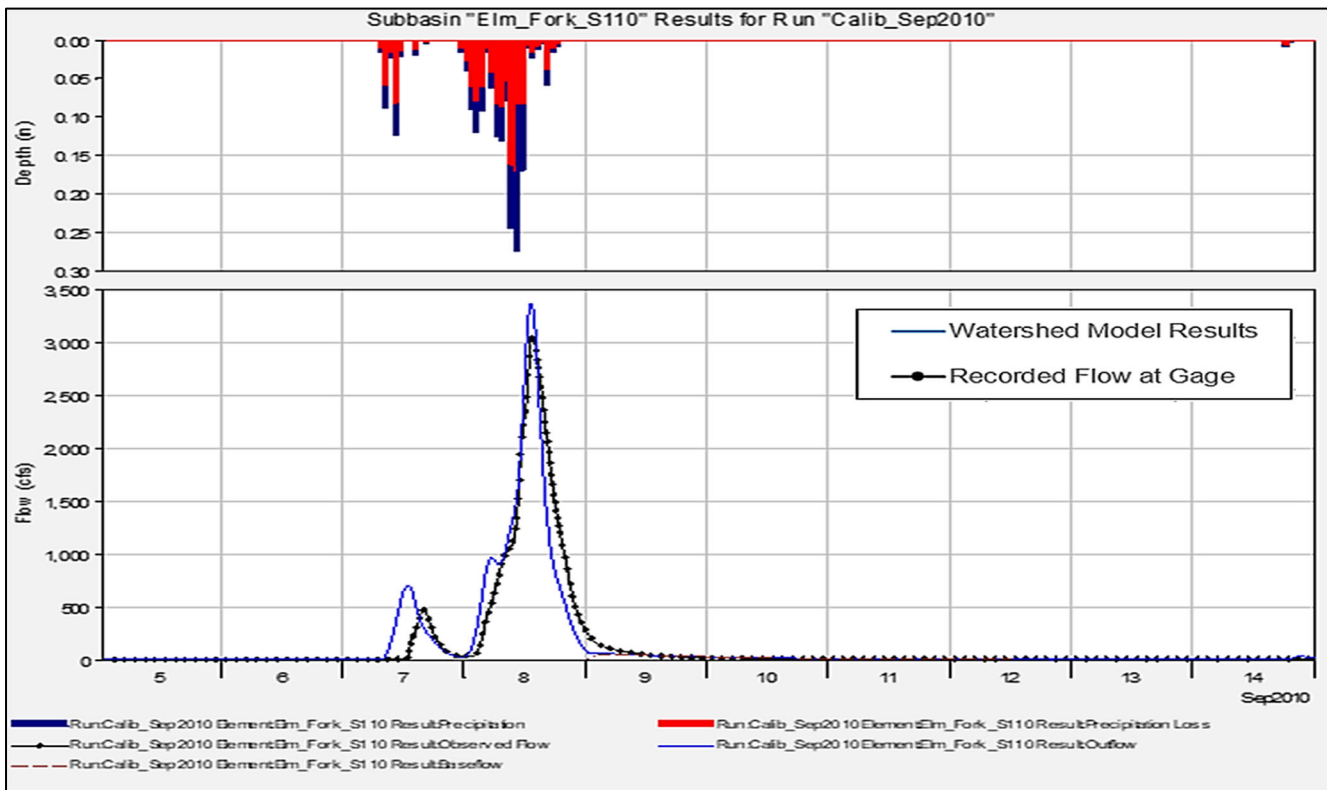


Figure 51b. September 8, 2010 Calibration Results for the Indian Creek at Carrollton, TX Gage

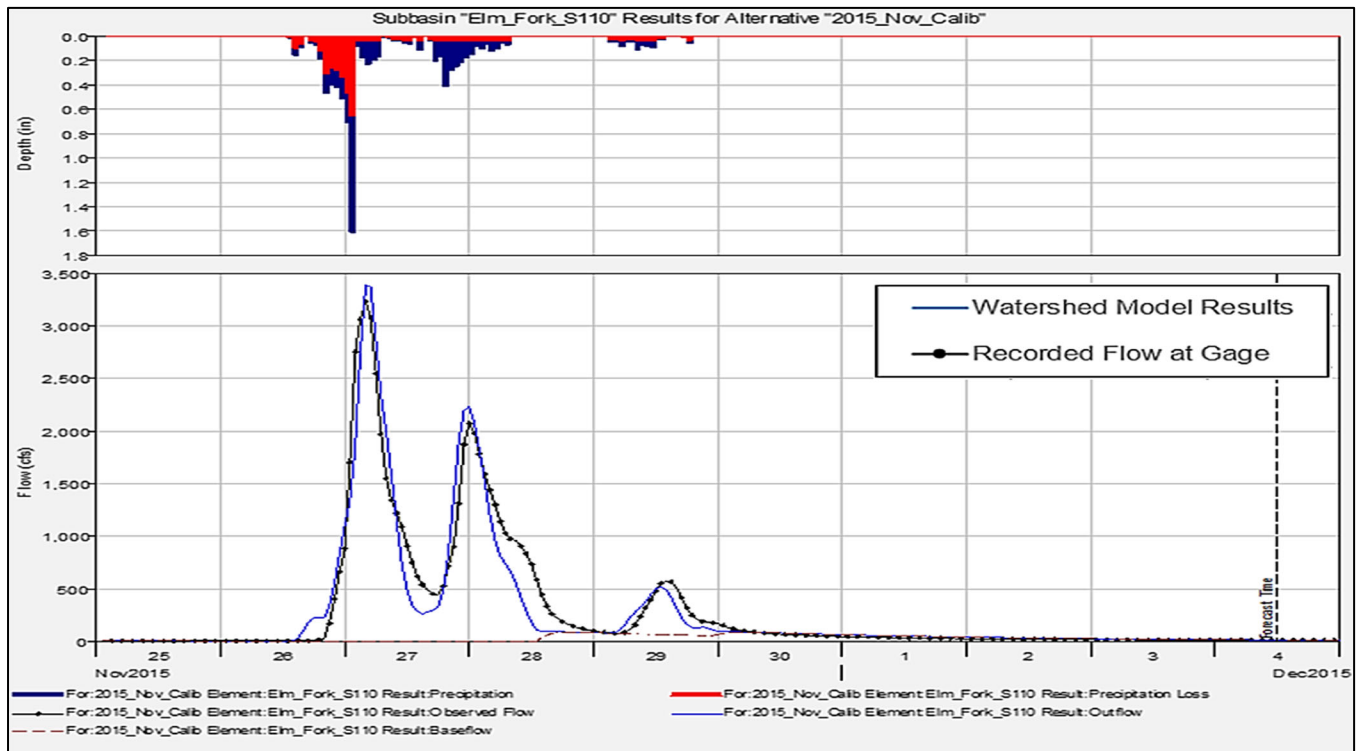


Figure 51c. November 27, 2015 Calibration Results for the Indian Creek near Carrollton, TX Gage

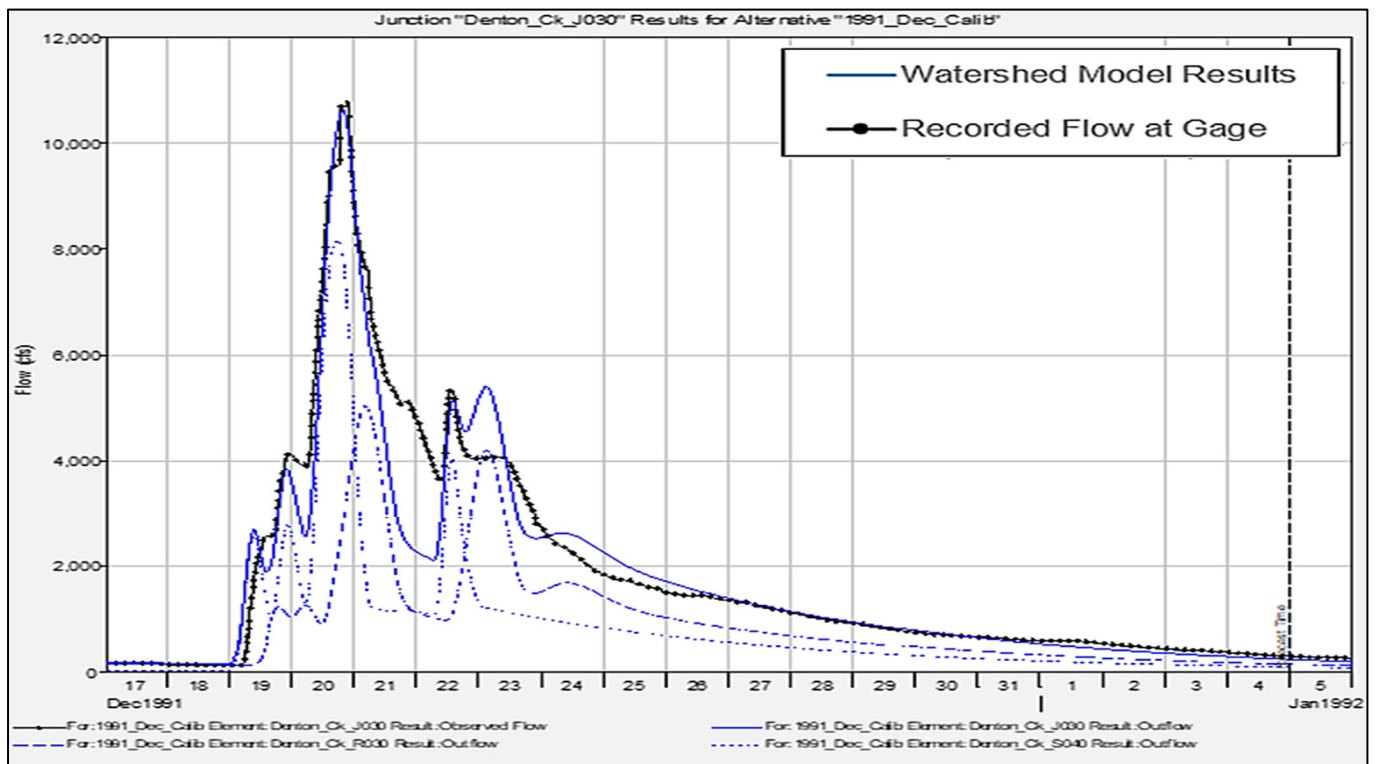


Figure 52a. December 20, 1991 Calibration Results for the Denton Creek near Justin, TX Gage

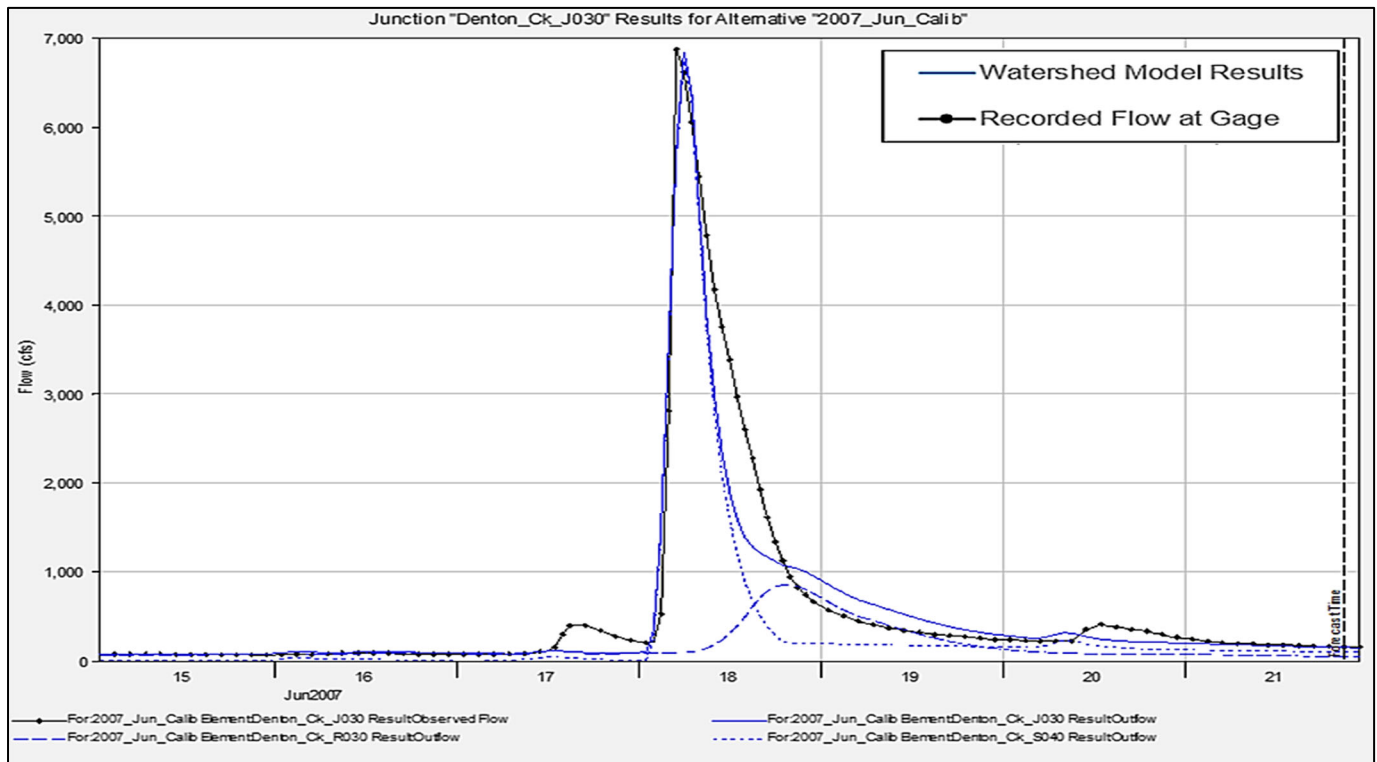


Figure 52b. June 17, 2007 Calibration Results for the Denton Creek near Justin, TX Gage

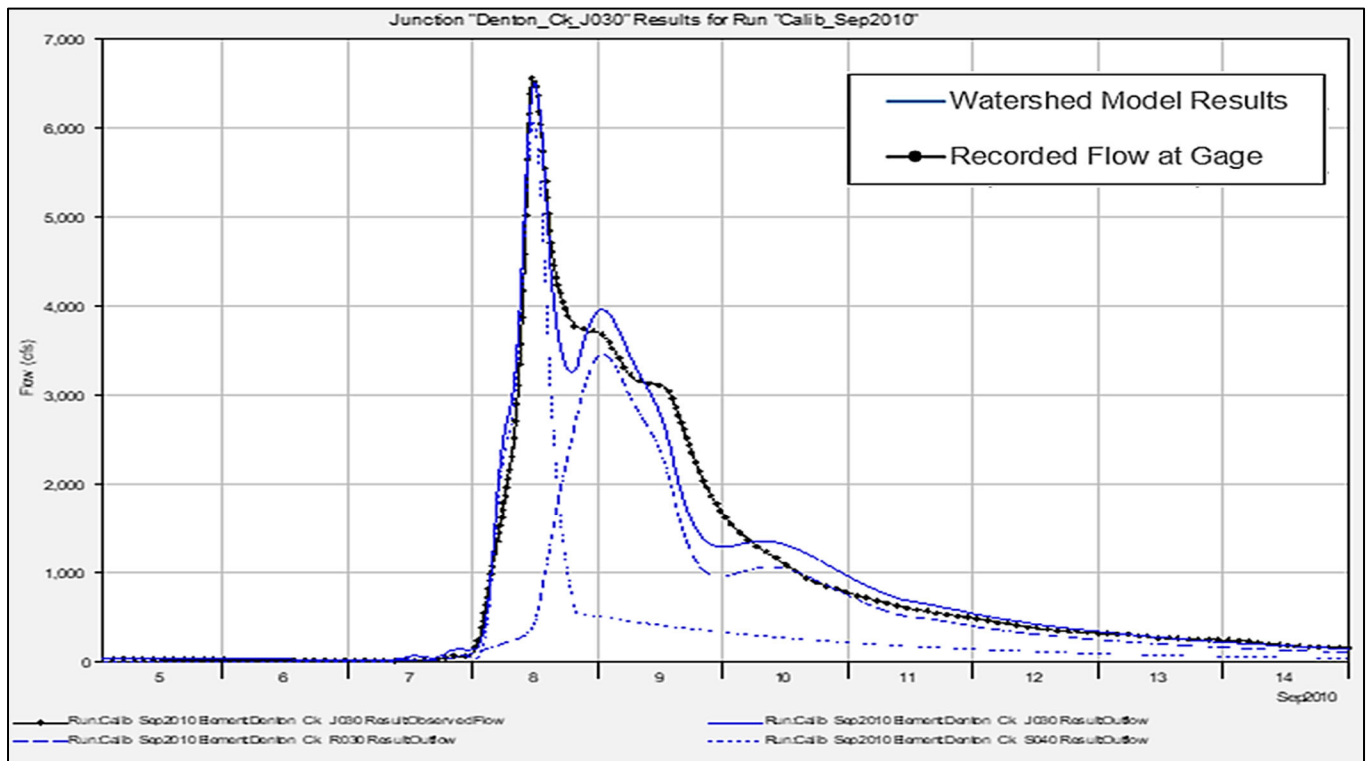


Figure 52c. September 8, 2010 Calibration Results for the Denton Creek near Justin, TX Gage

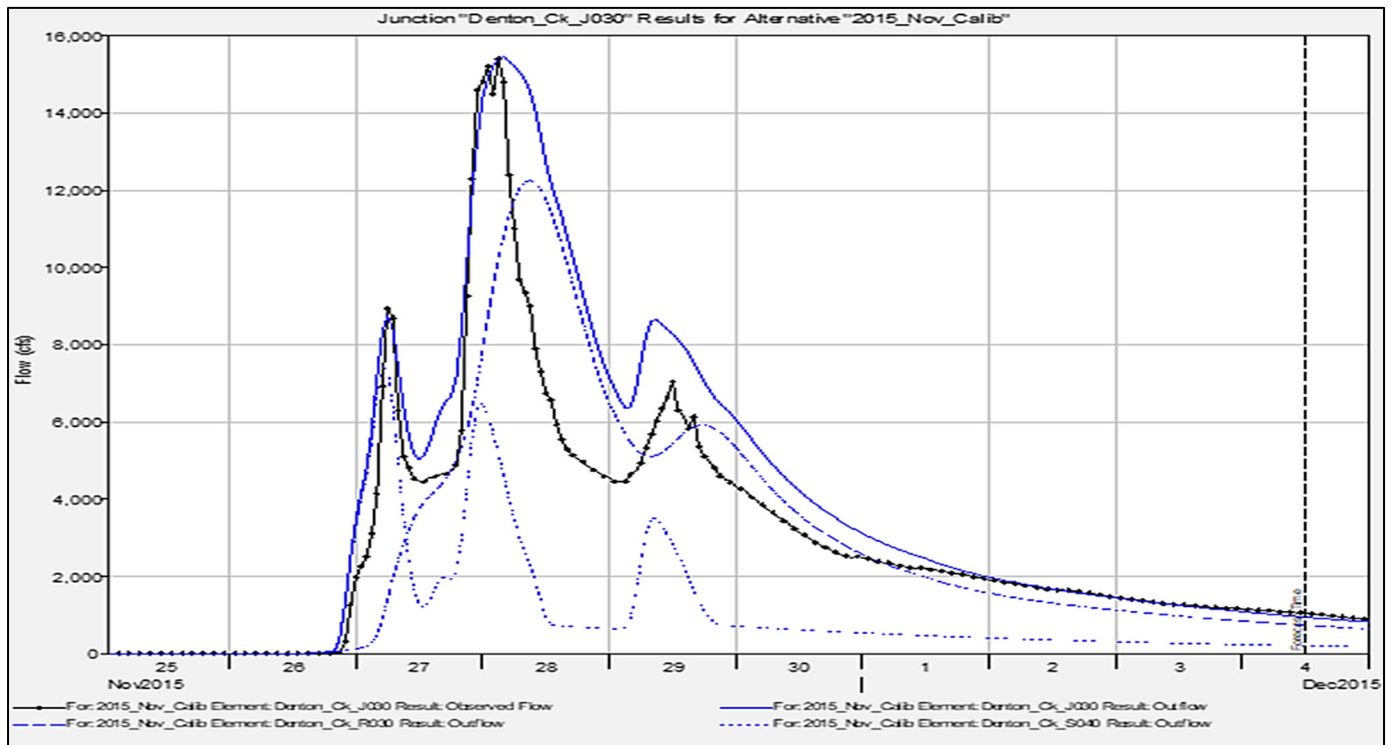


Figure 52d. November 27, 2015 Calibration Results for the Denton Creek near Justin, TX Gage

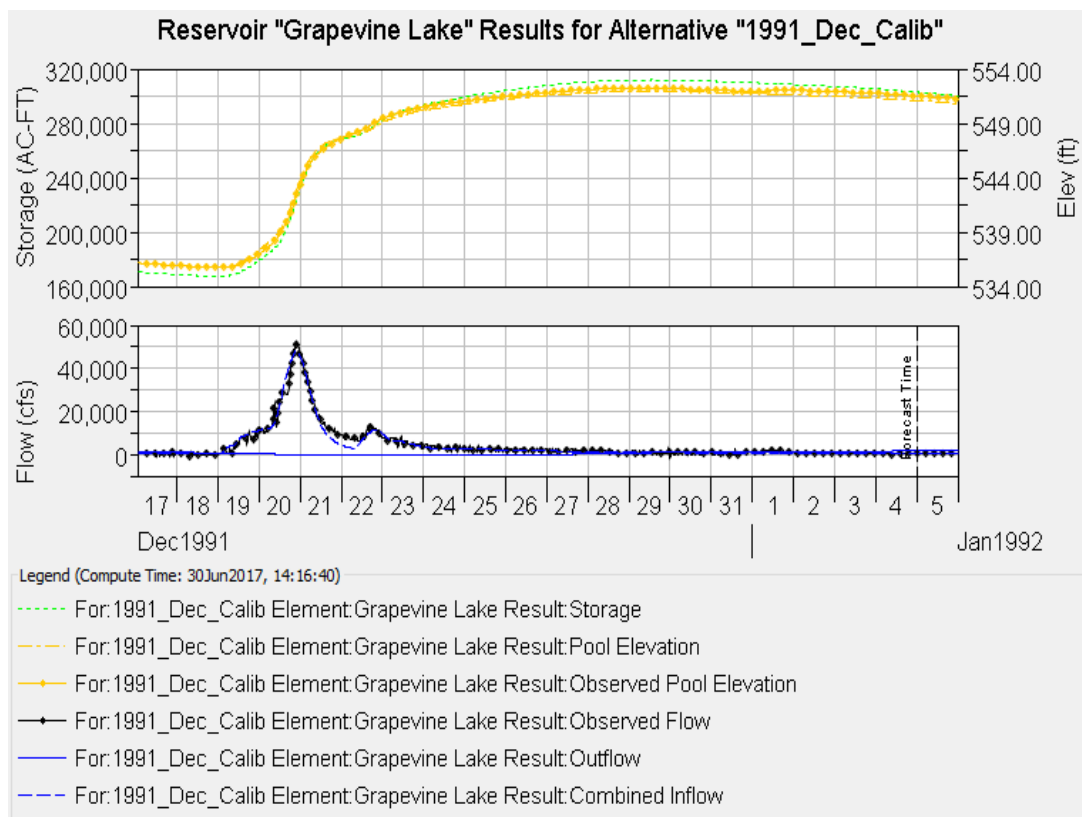


Figure 53a. December 1991 Calibration Results for Grapevine Reservoir

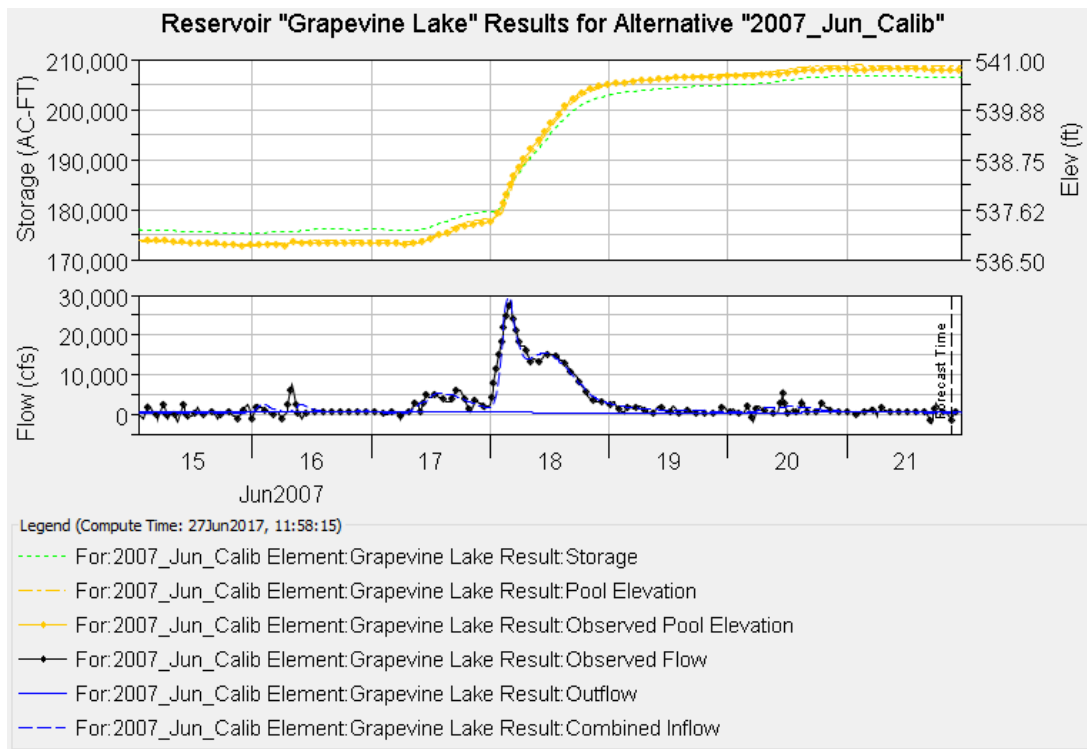


Figure 53b. June 2007 Calibration Results for Grapevine Reservoir

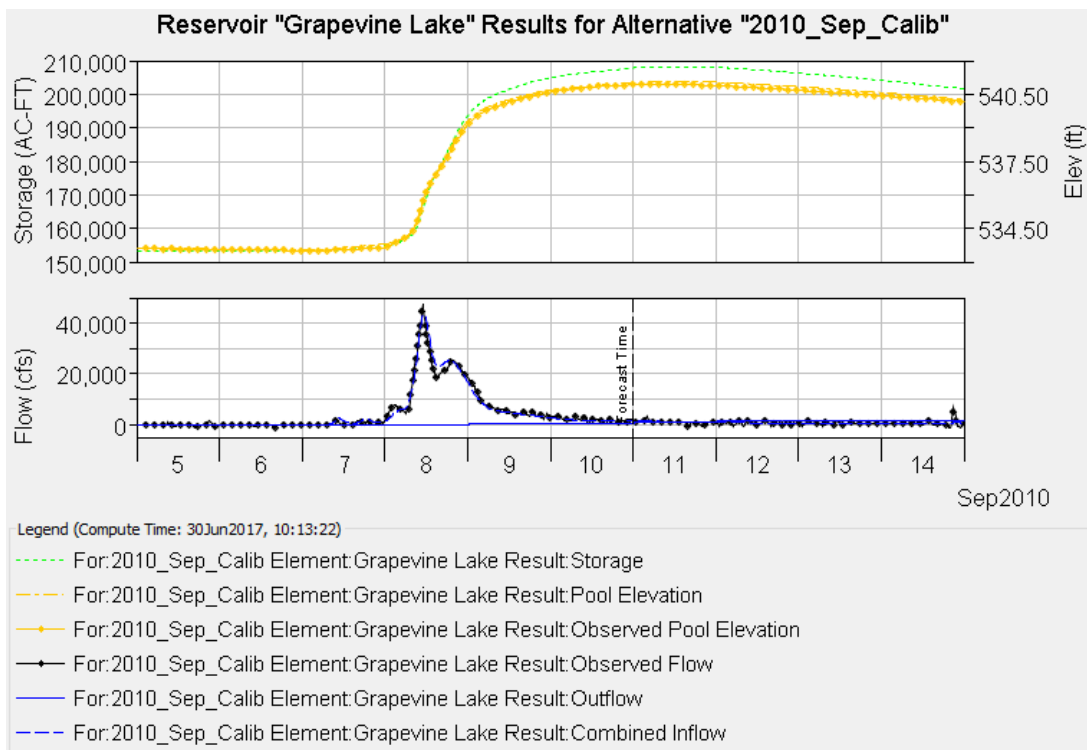


Figure 53c. September 2010 Calibration Results for Grapevine Reservoir

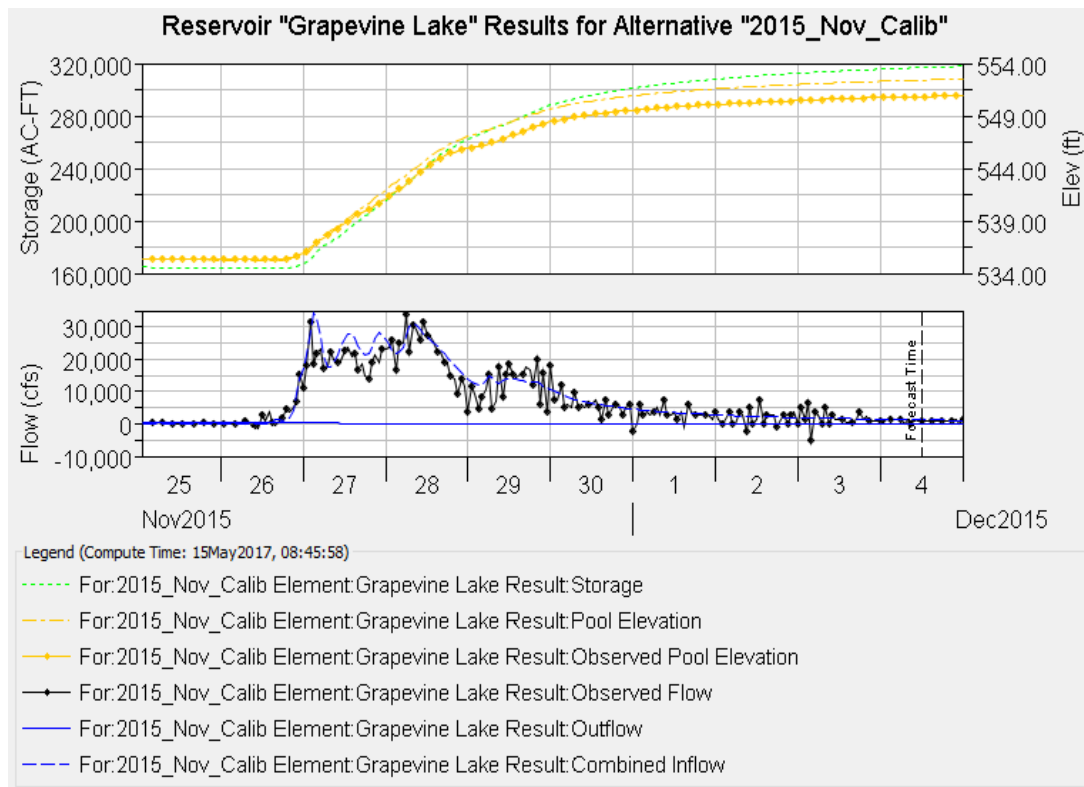


Figure 53d. November 2015 Calibration Results for Grapevine Reservoir

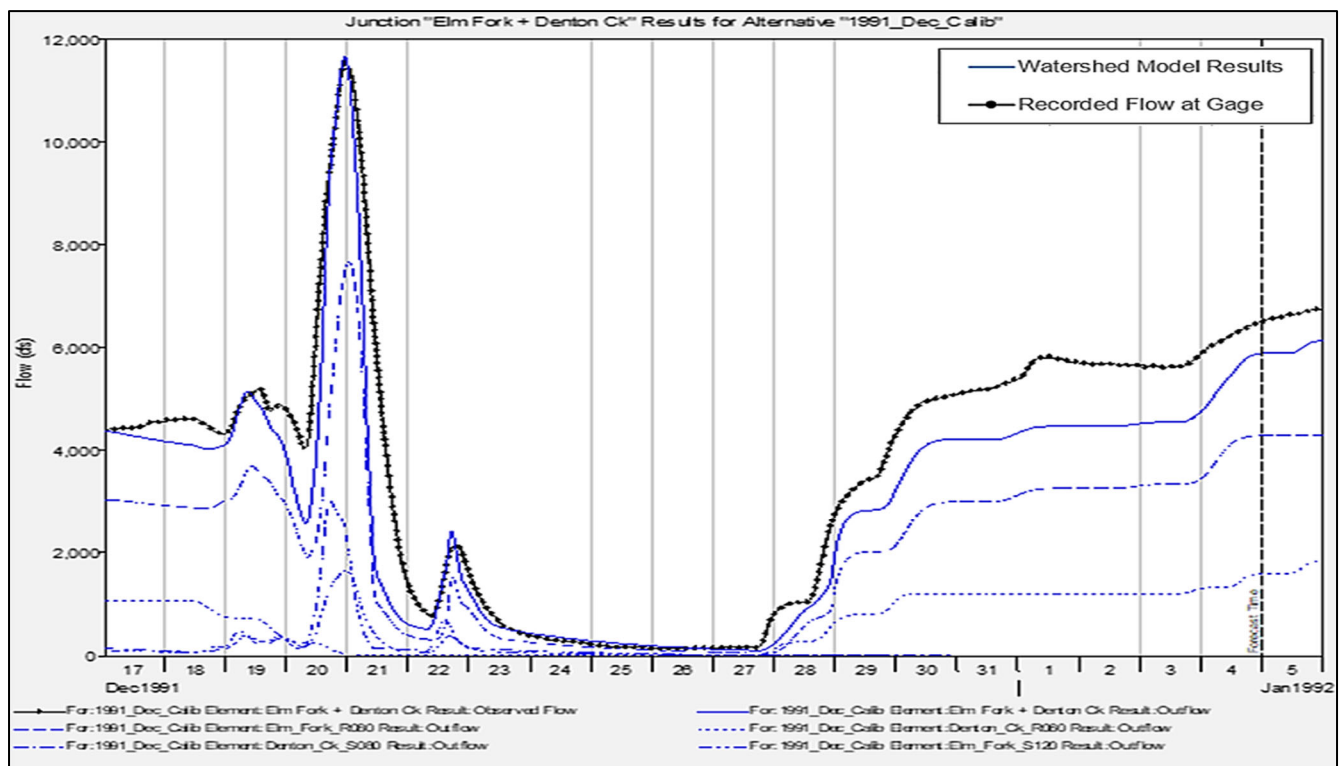


Figure 54a. December 20, 1991 Calibration Results for the Elm Fork near Carrollton, TX Gage

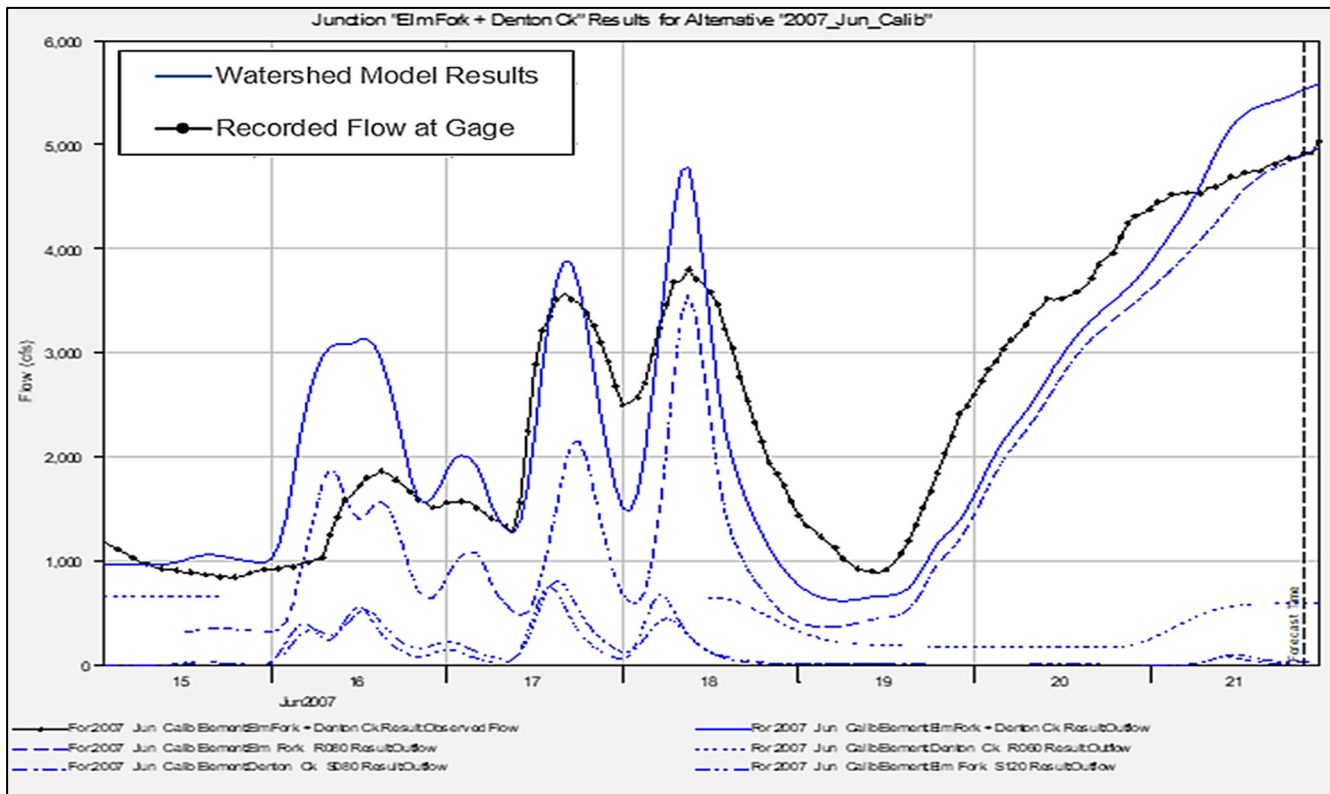


Figure 54b. June 17, 2007 Calibration Results for the Elm Fork near Carrollton, TX Gage

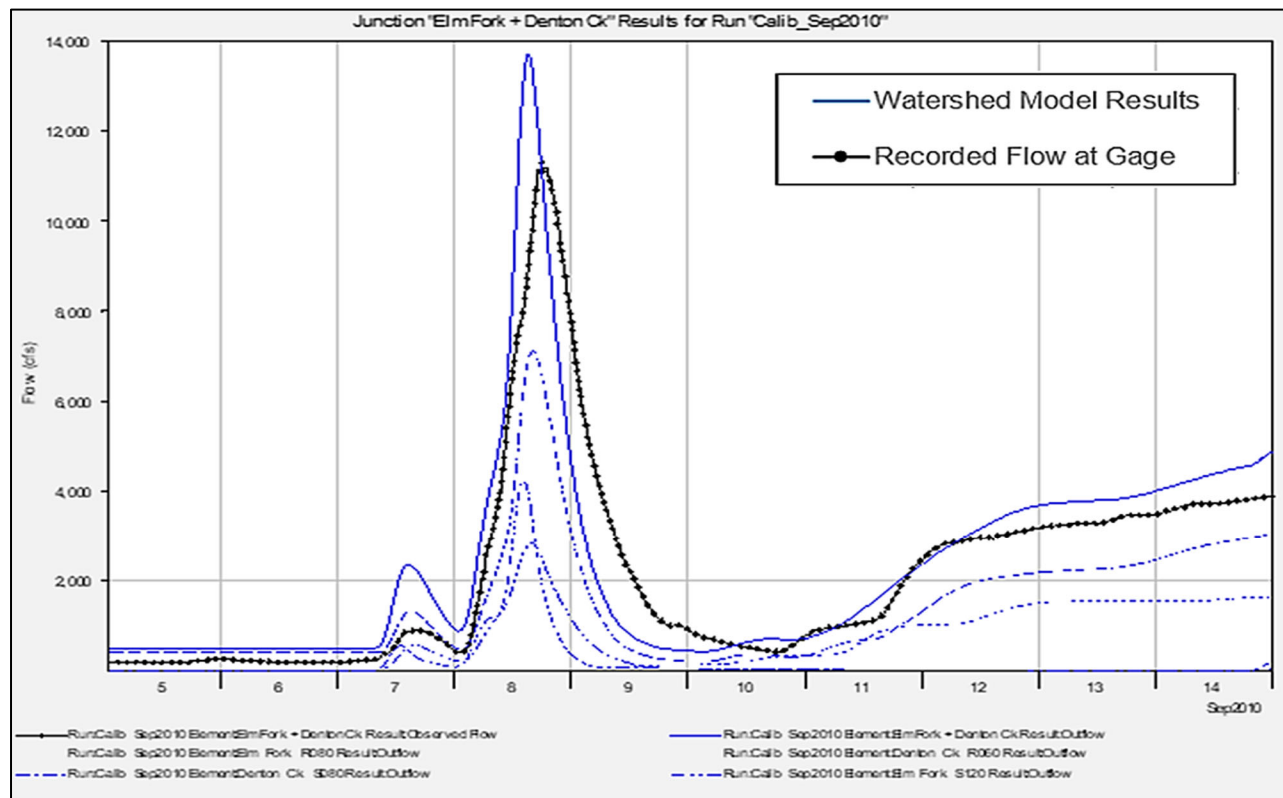


Figure 54c. September 8, 2010 Calibration Results for the Elm Fork near Carrollton, TX Gage

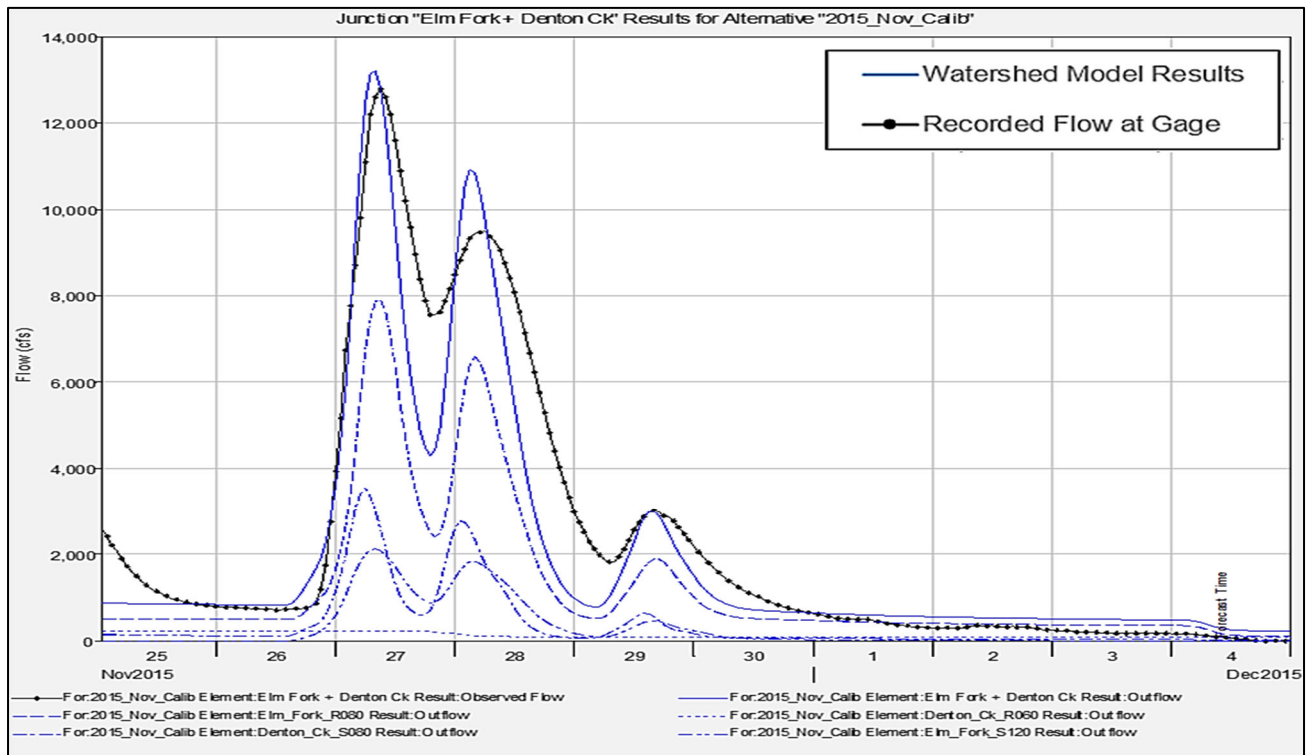


Figure 54d. November 27, 2015 Calibration Results for the Elm Fork near Carrollton, TX Gage

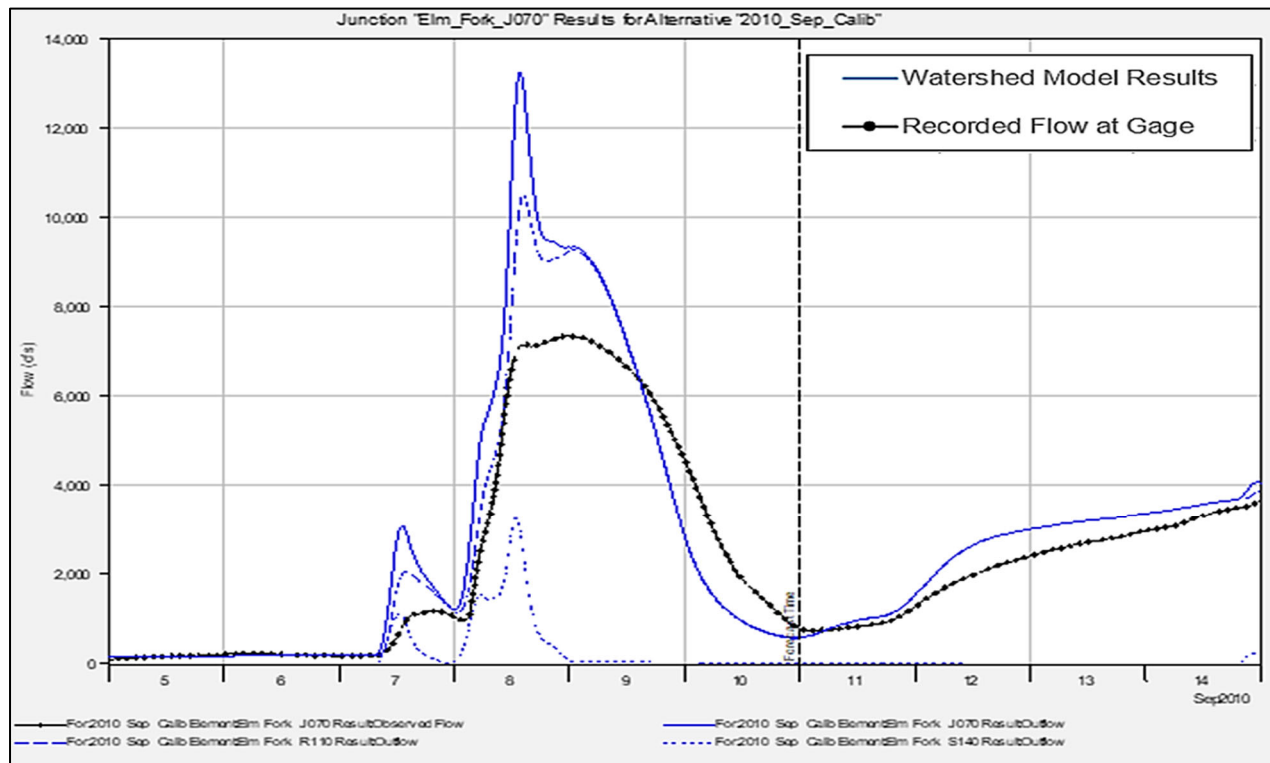


Figure 55a. September 8, 2010 Calibration Results for the Elm Fork at Spur 348, Irving Gage

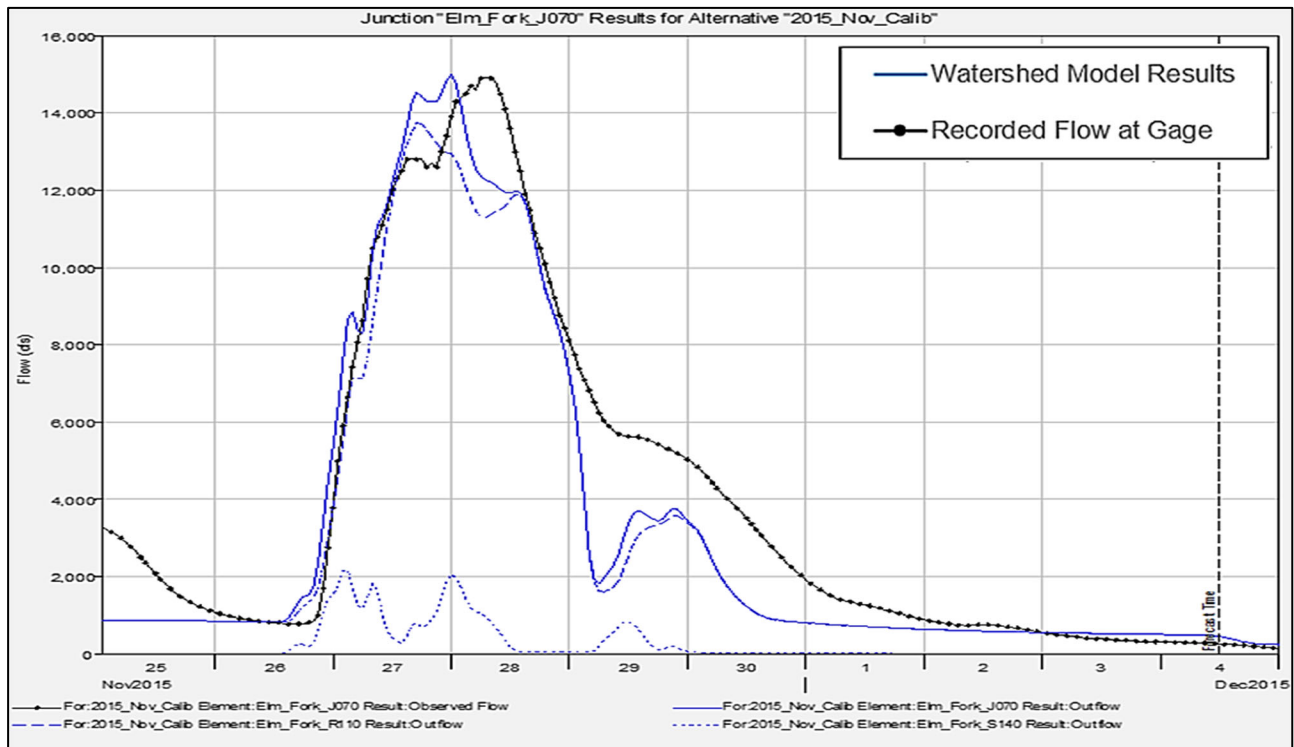


Figure 55b. November 27, 2015 Calibration Results for the Elm Fork at Spur 348, Irving Gage

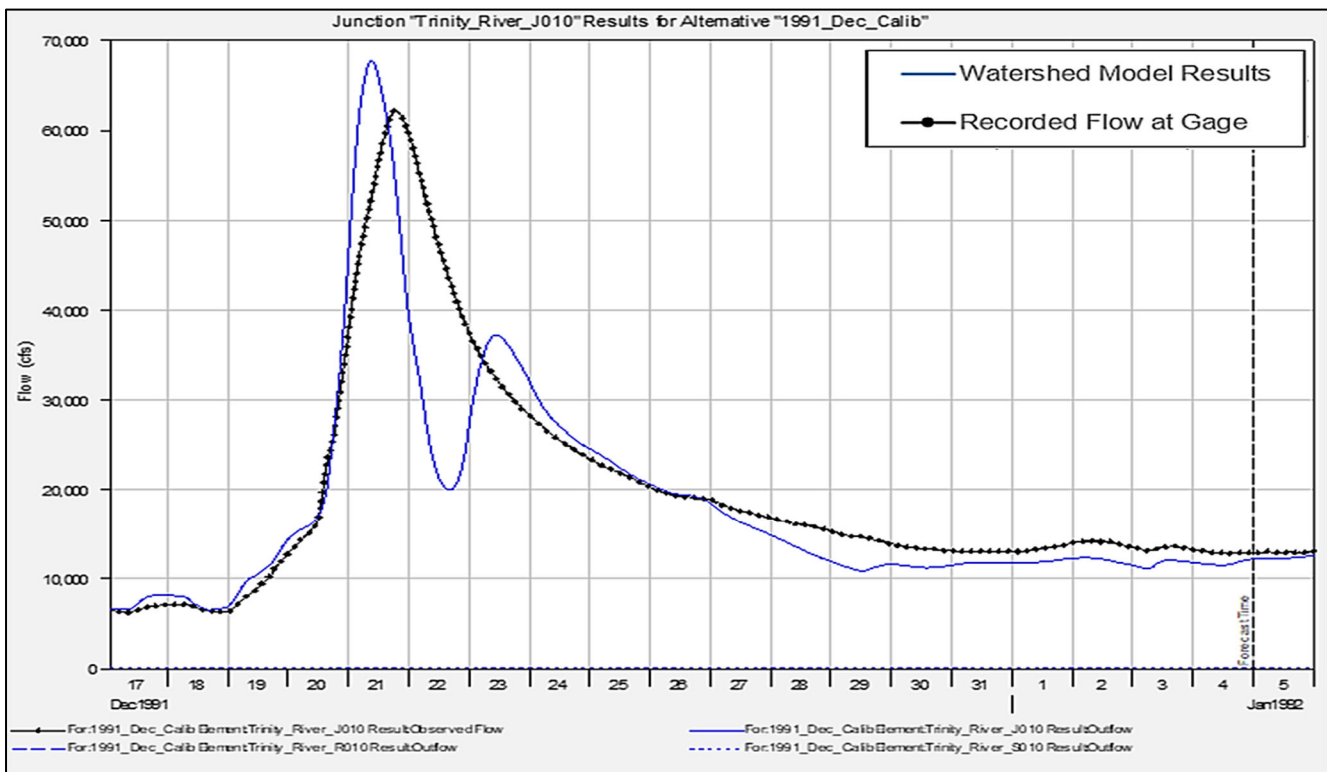


Figure 56a. December 20, 1991 Calibration Results for the Trinity River at Dallas, TX Gage

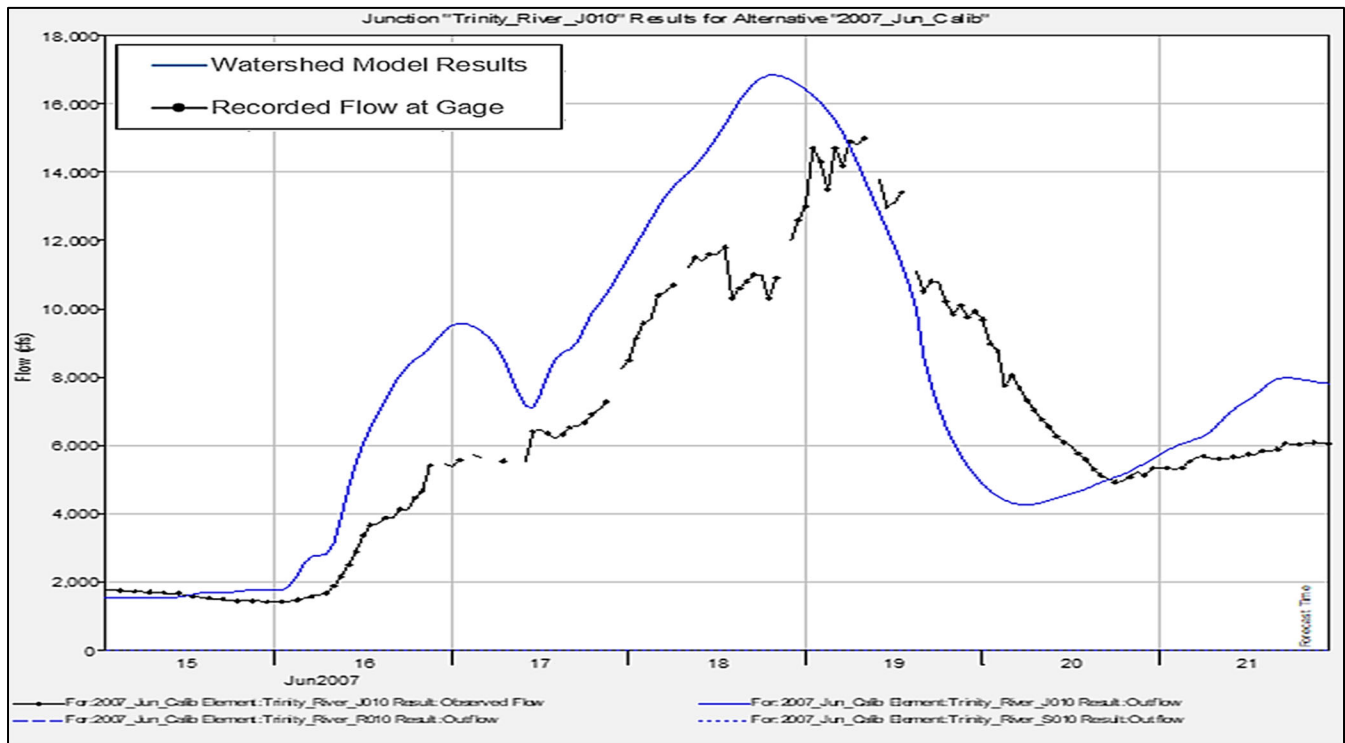


Figure 56b. June 17, 2007 Calibration Results for the Trinity River at Dallas, TX Gage

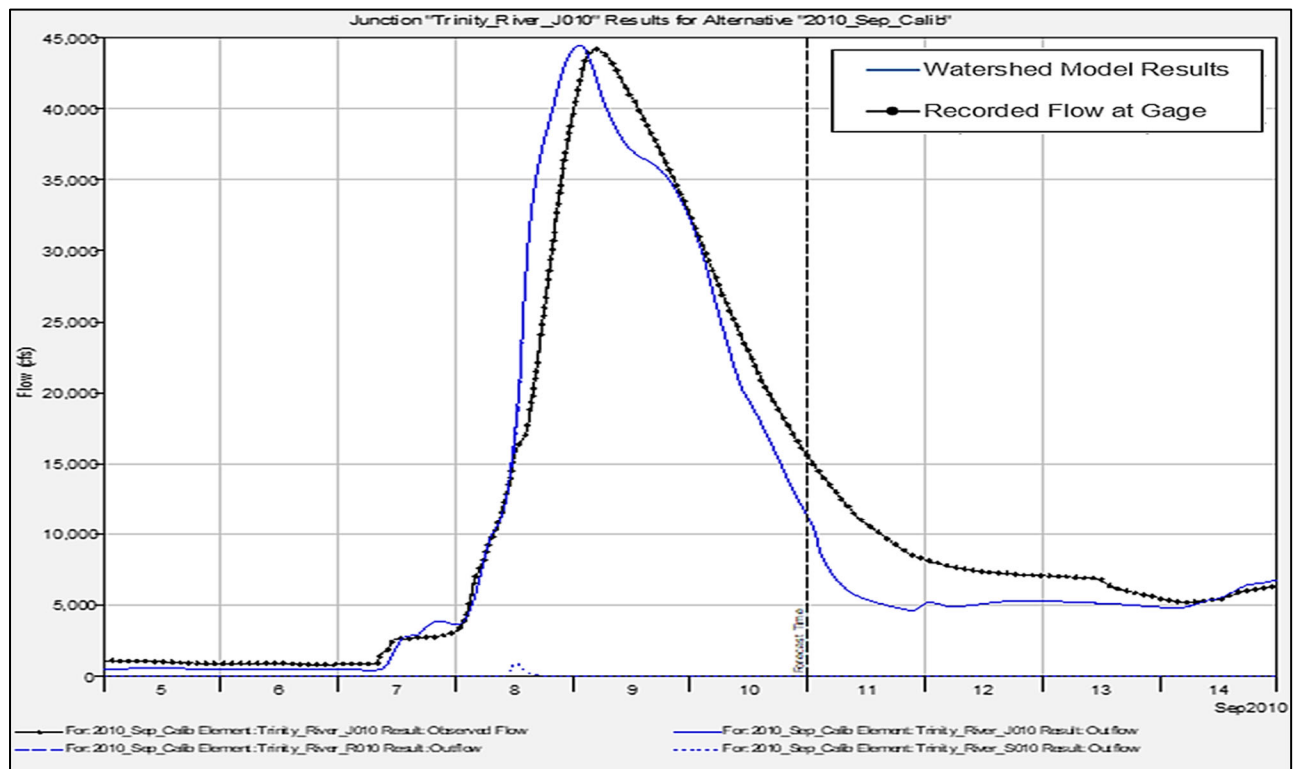


Figure 56c. September 8, 2010 Calibration Results for the Trinity River at Dallas, TX Gage

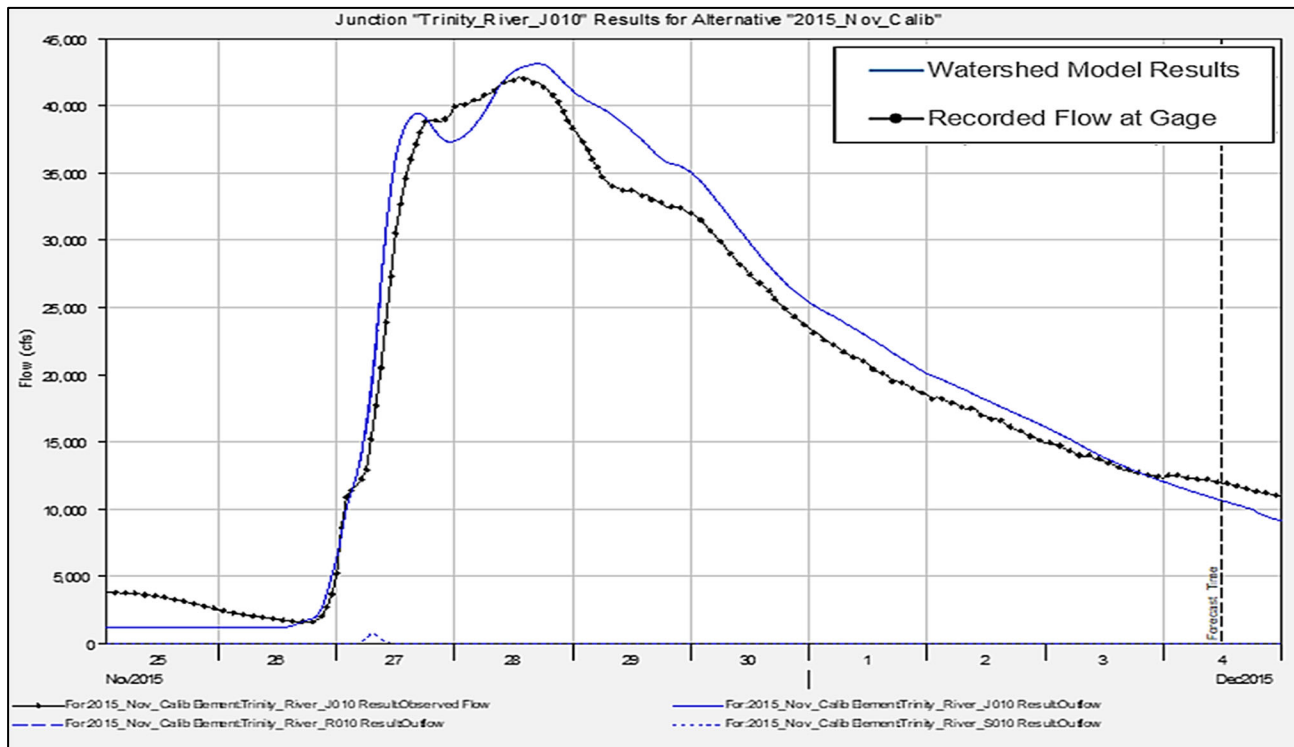


Figure 56d. November 27, 2015 Calibration Results for the Trinity River at Dallas Gage

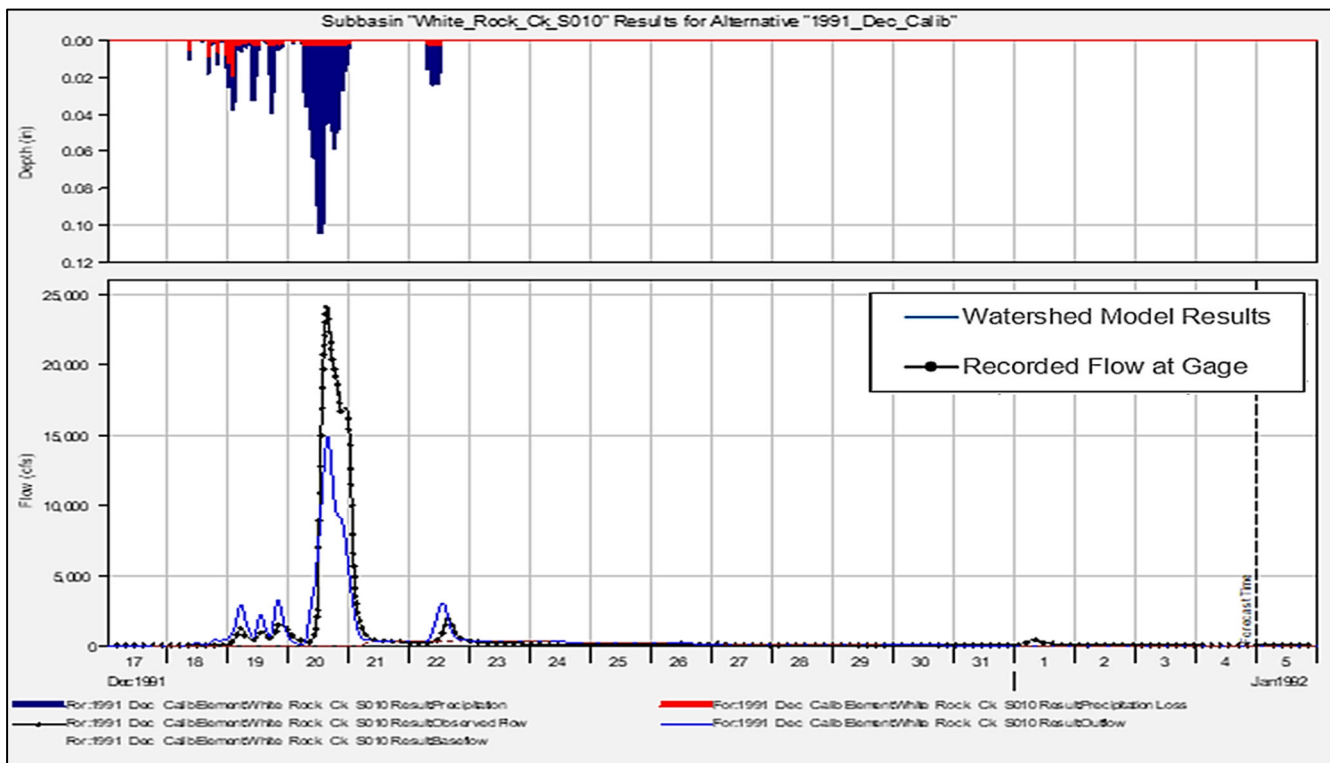


Figure 57a. December 20, 1991 Calibration Results for the White Rock Creek at Greenville Avenue Gage

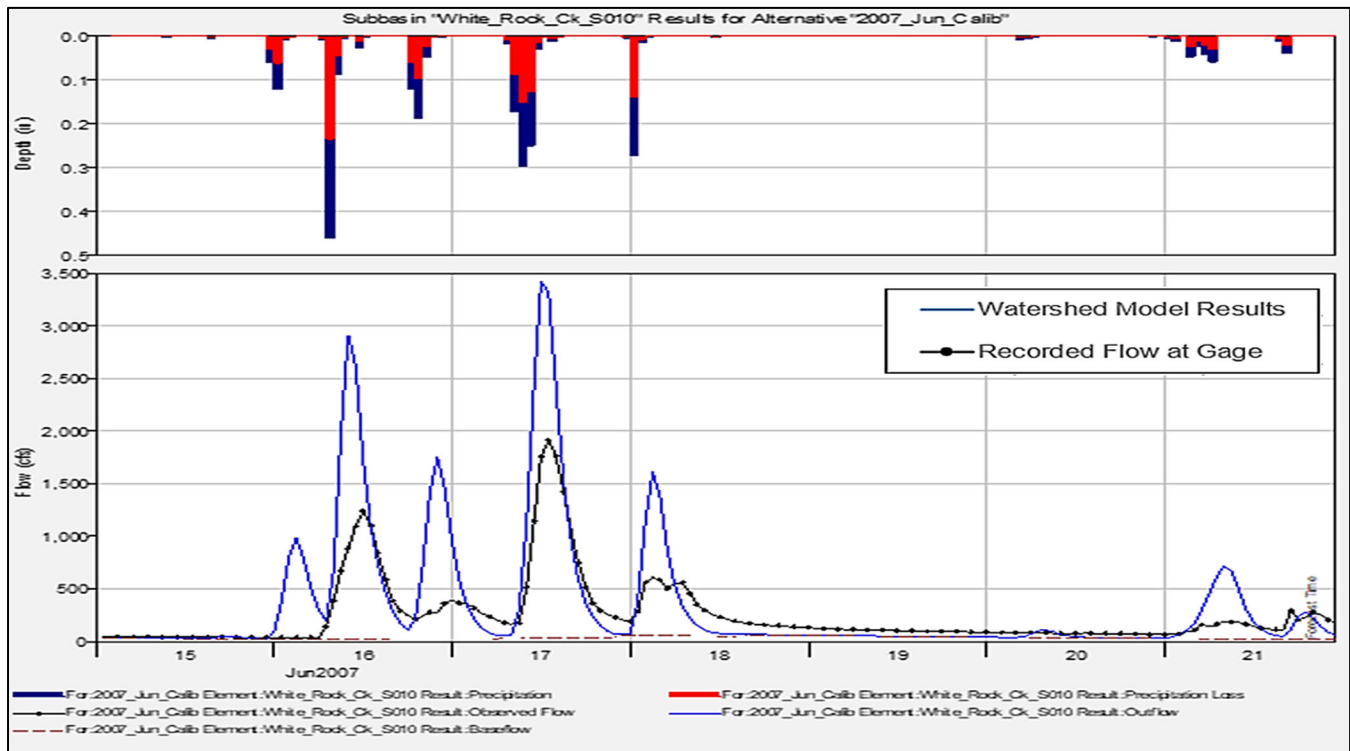


Figure 57b. June 17, 2007 Calibration Results for the White Rock Creek at Greenville Avenue Gage

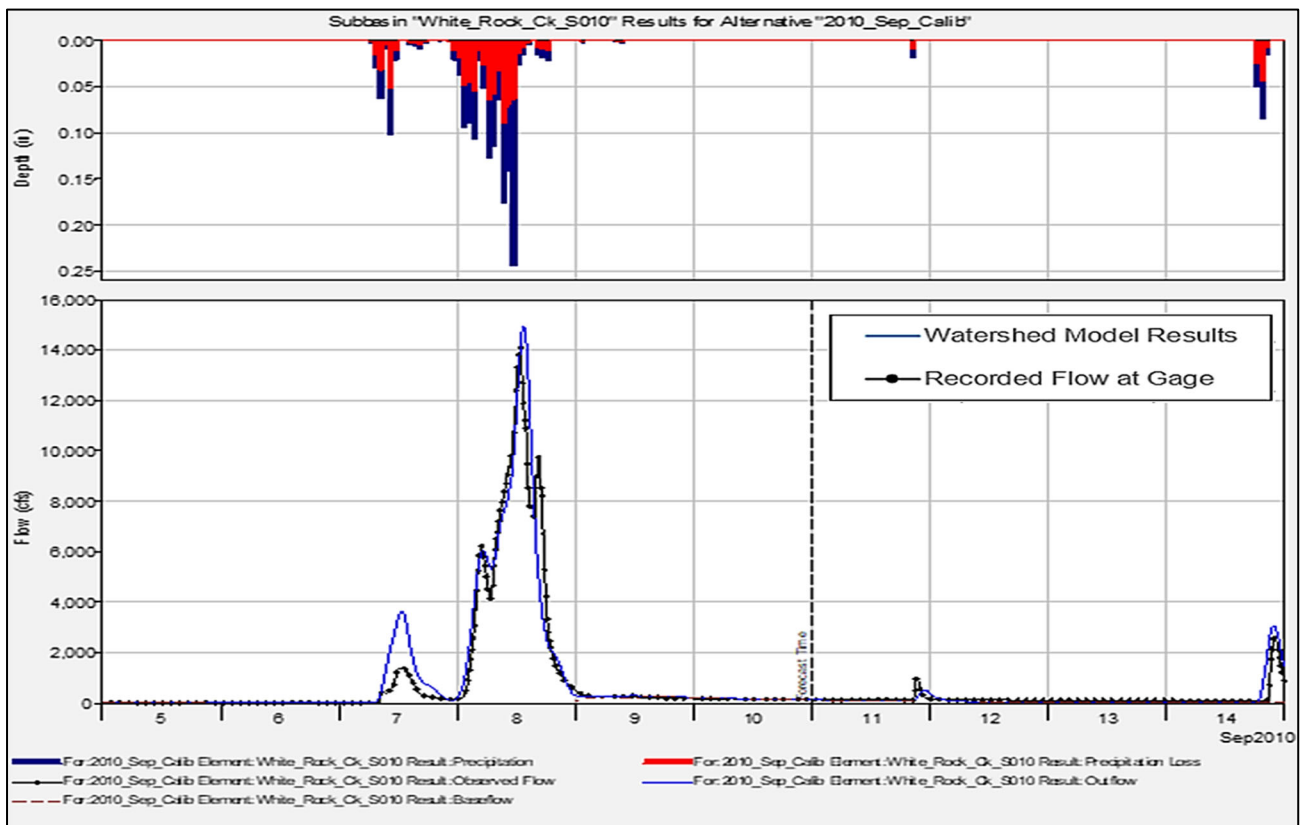


Figure 57c. September 8, 2010 Calibration Results for the White Rock Creek at Greenville, TX Gage

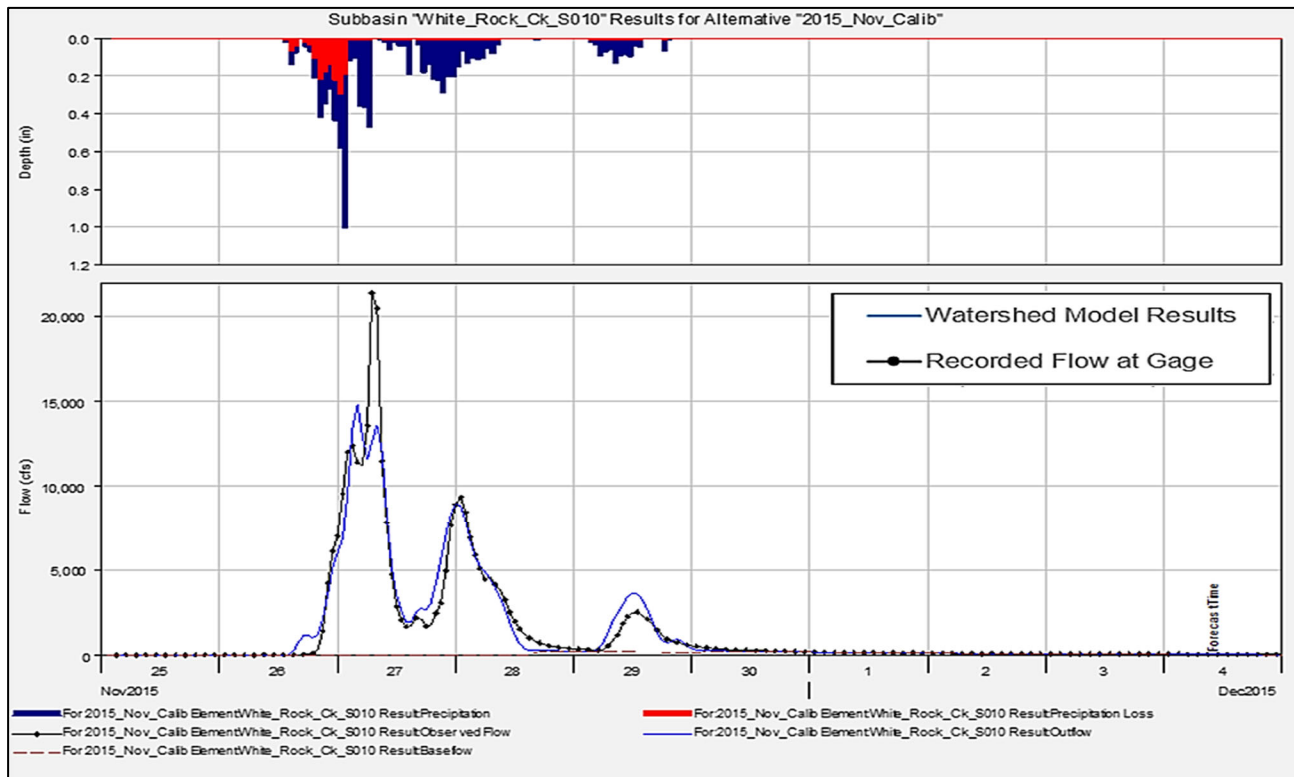


Figure 57d. November 27, 2015 Calibration Results for the White Rock Creek at Greenville Avenue Gage

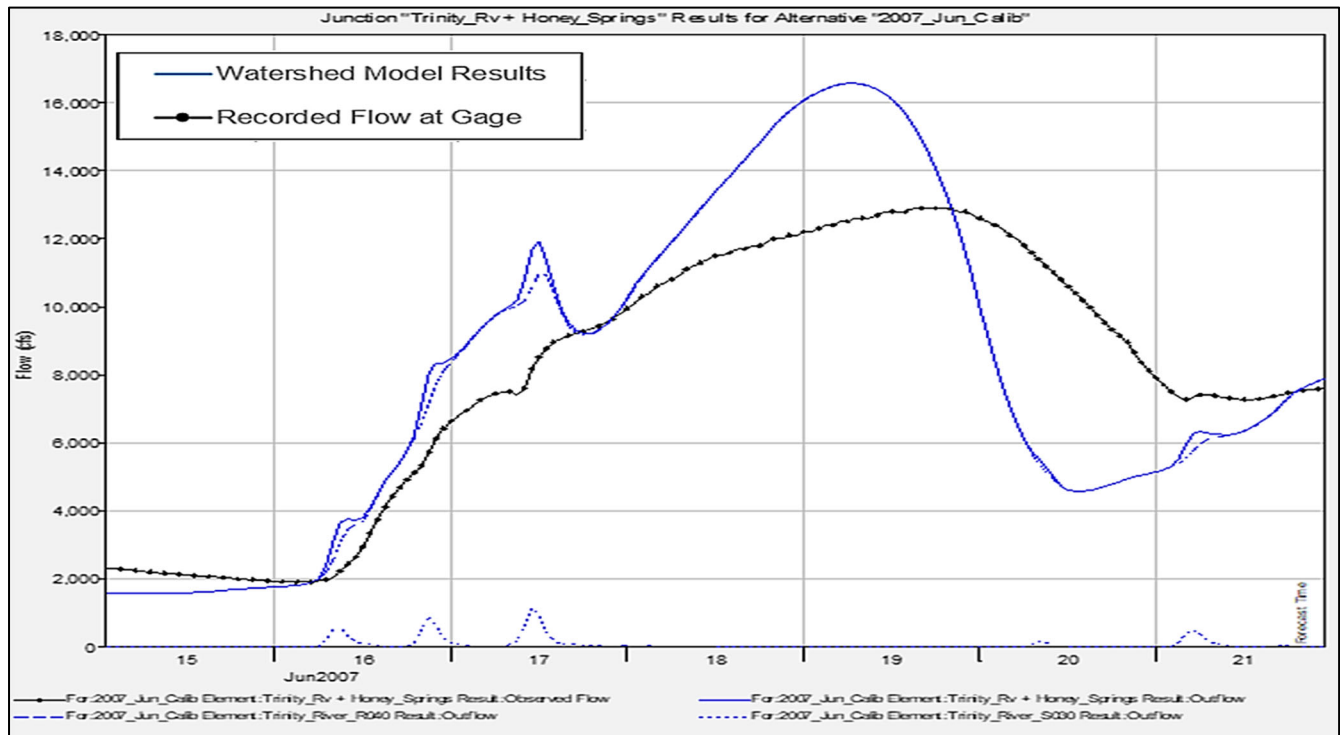


Figure 58a. June 17, 2007 Calibration Results for the Trinity River below Dallas, TX Gage

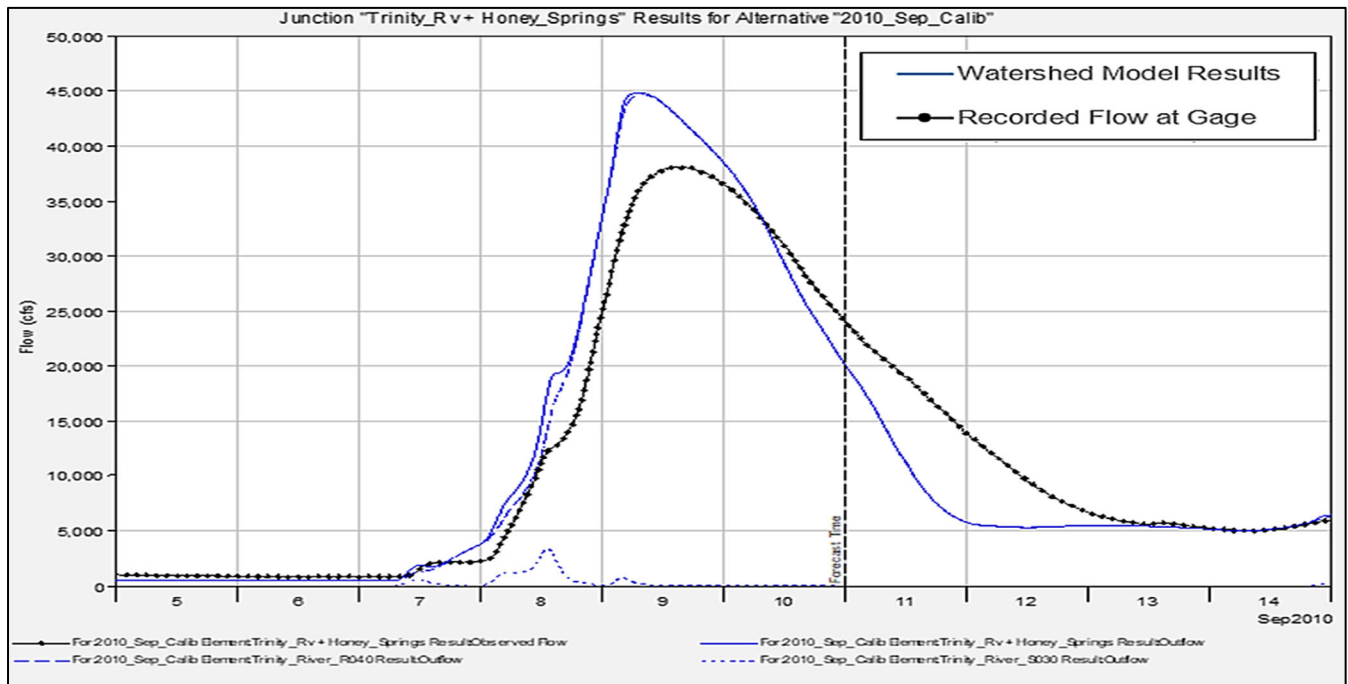


Figure 58b. September 8, 2010 Calibration Results for the Trinity River below Dallas, TX Gage

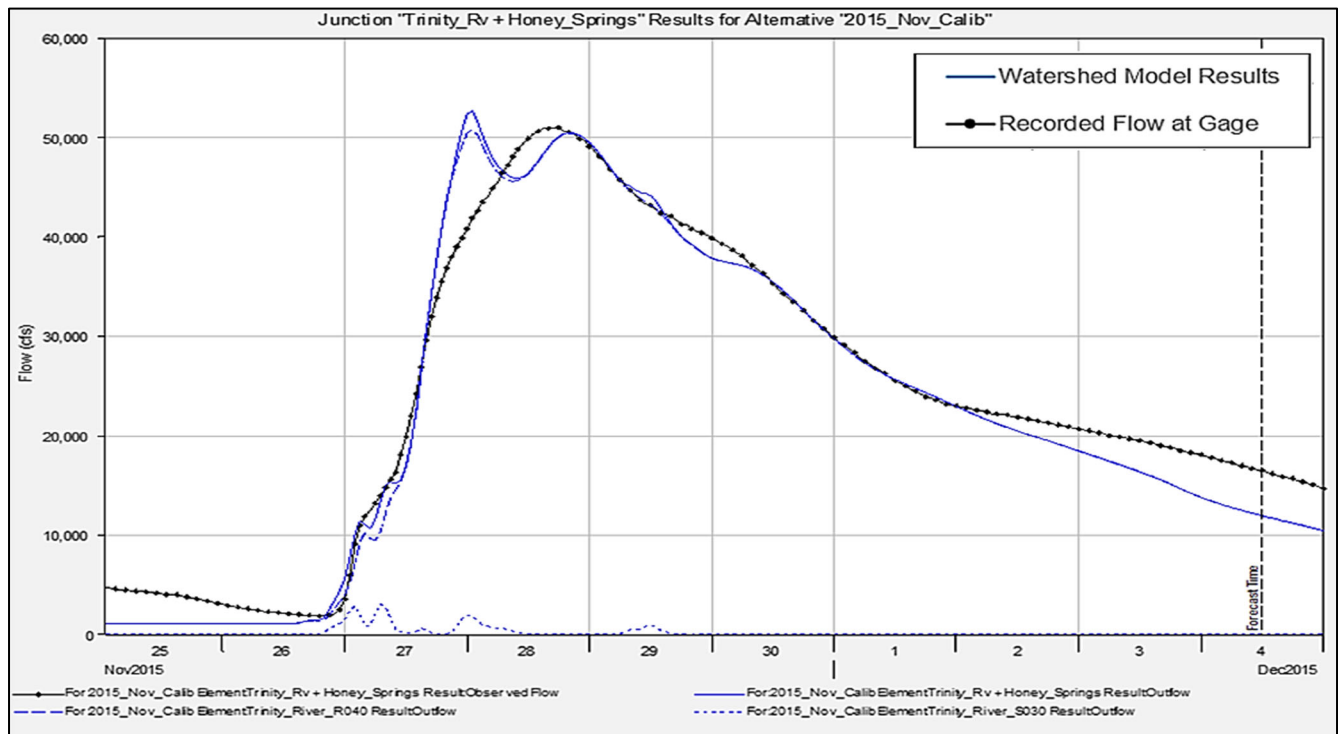


Figure 58c. November 27, 2015 Calibration Results for the Trinity River below Dallas, TX Gage

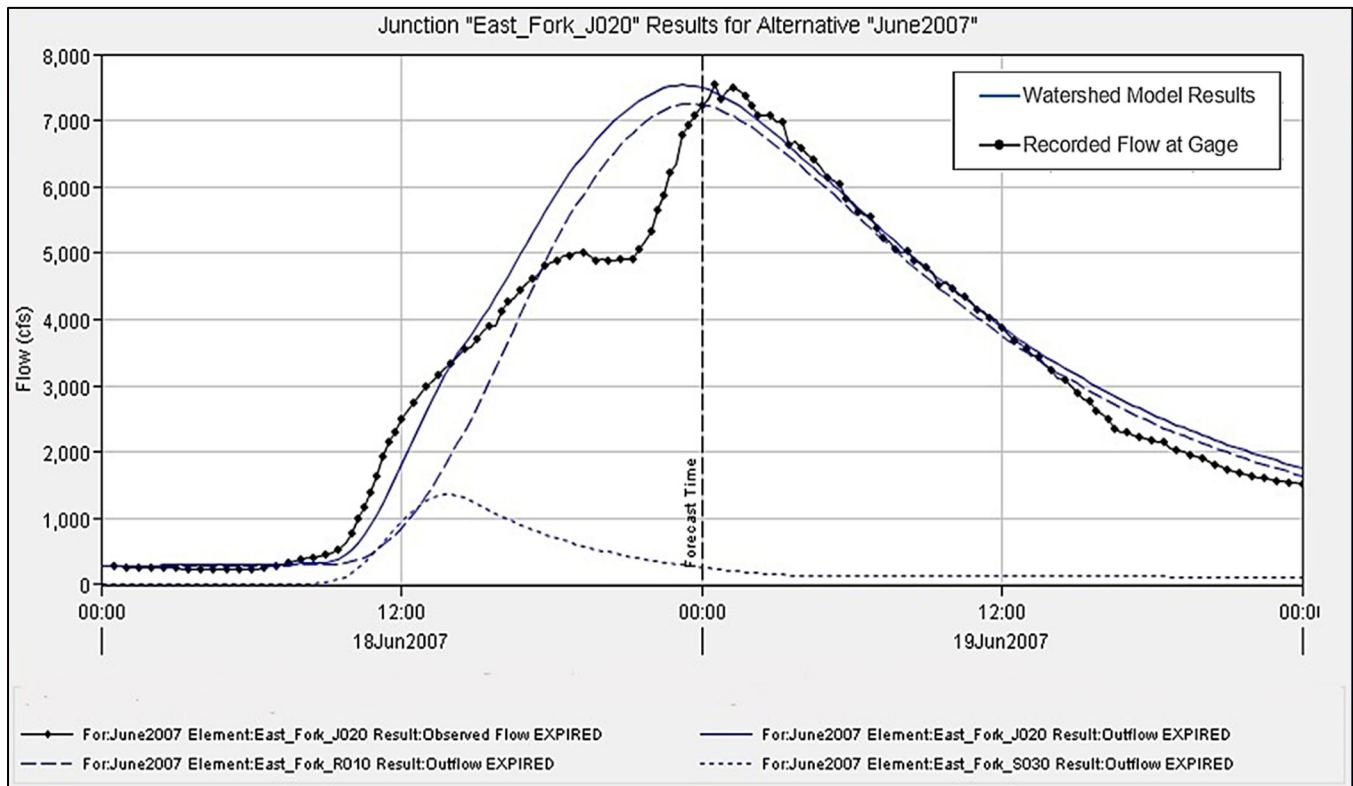


Figure 59a. June 19, 2007 Calibration for the East Fork Trinity River near McKinney, TX Gage

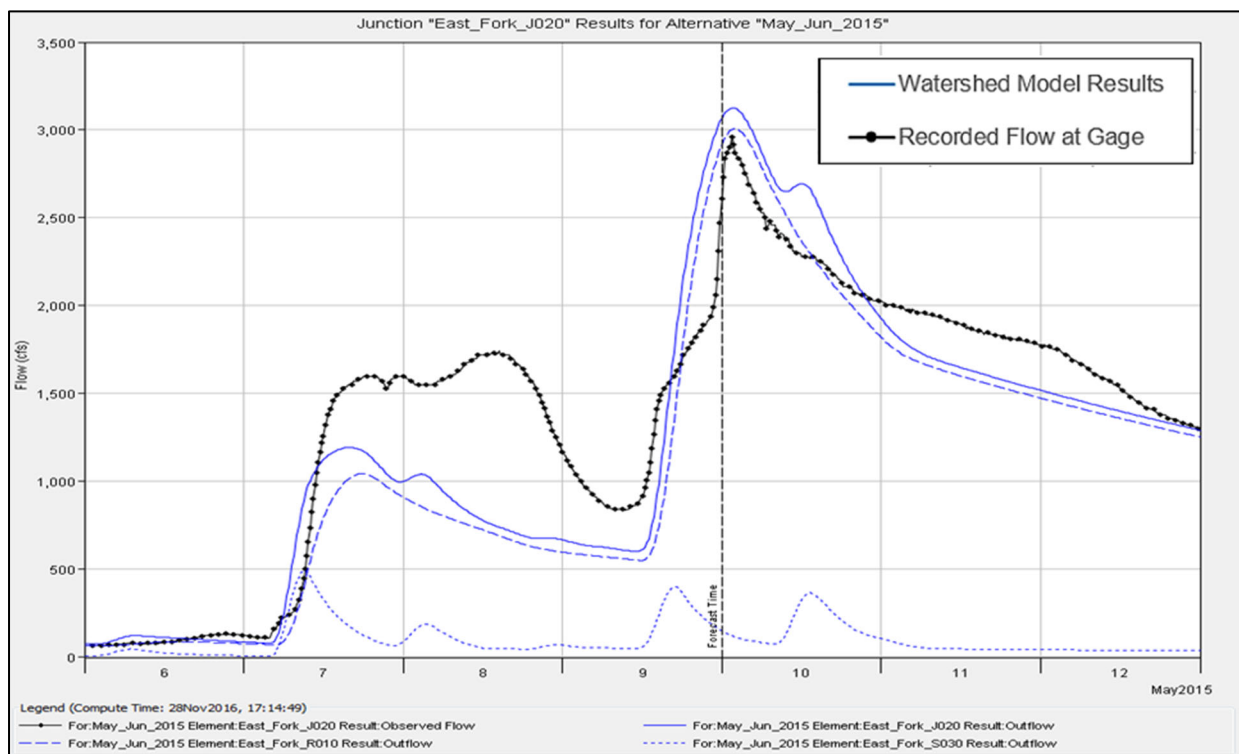


Figure 59b. May 9, 2015 Calibration for the East Fork Trinity River near McKinney, TX Gage

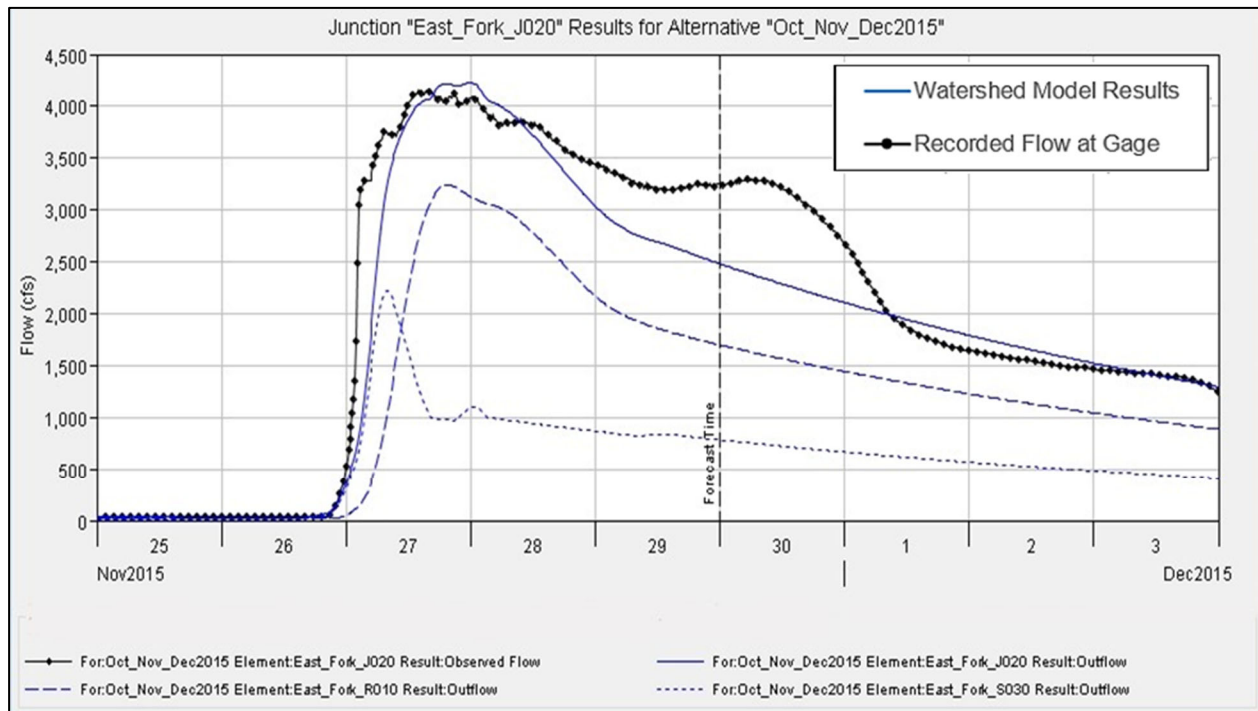


Figure 59c. November 27, 2015 Calibration for the East Fork Trinity River near McKinney, TX Gage

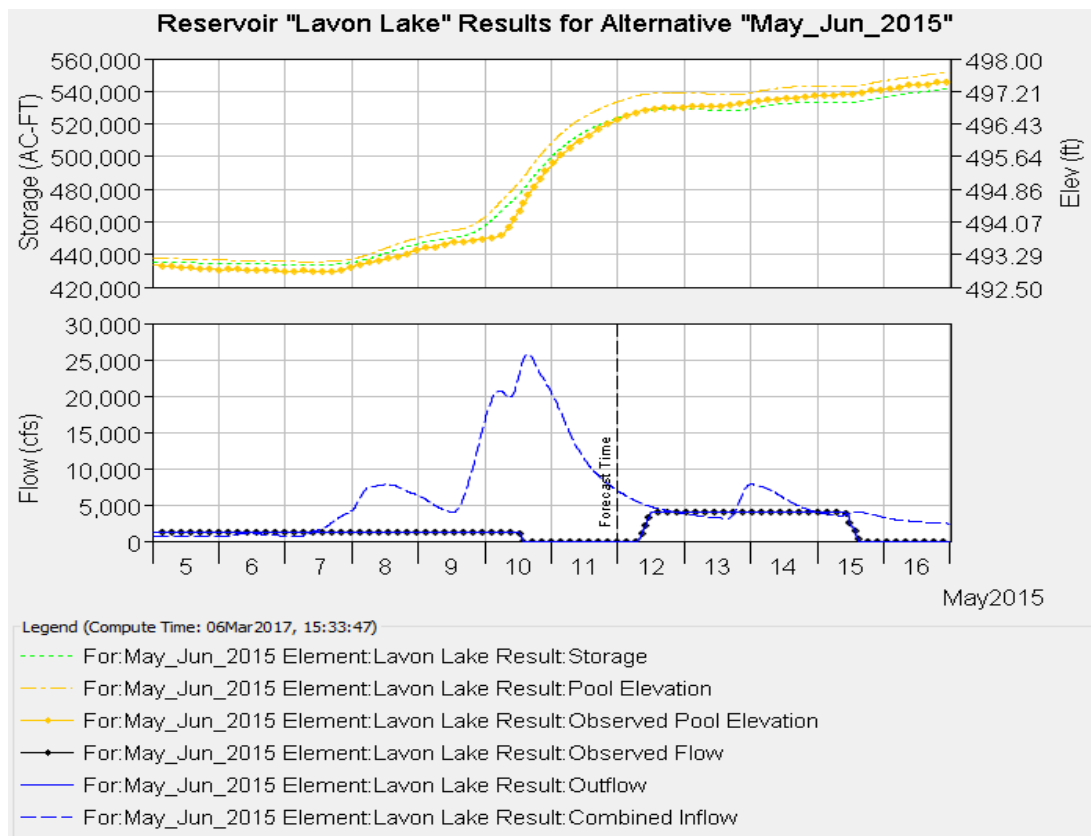


Figure 60a. May 2015 Calibration Results for Lavon Reservoir

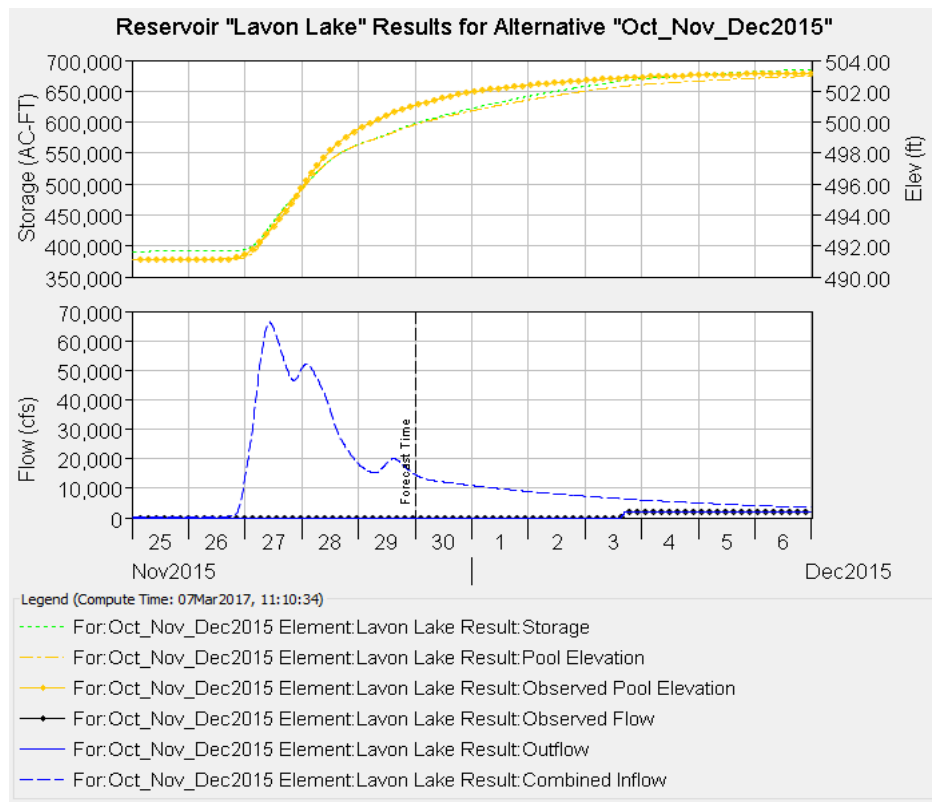


Figure 60b. November 2015 Calibration Results for Lavon Reservoir

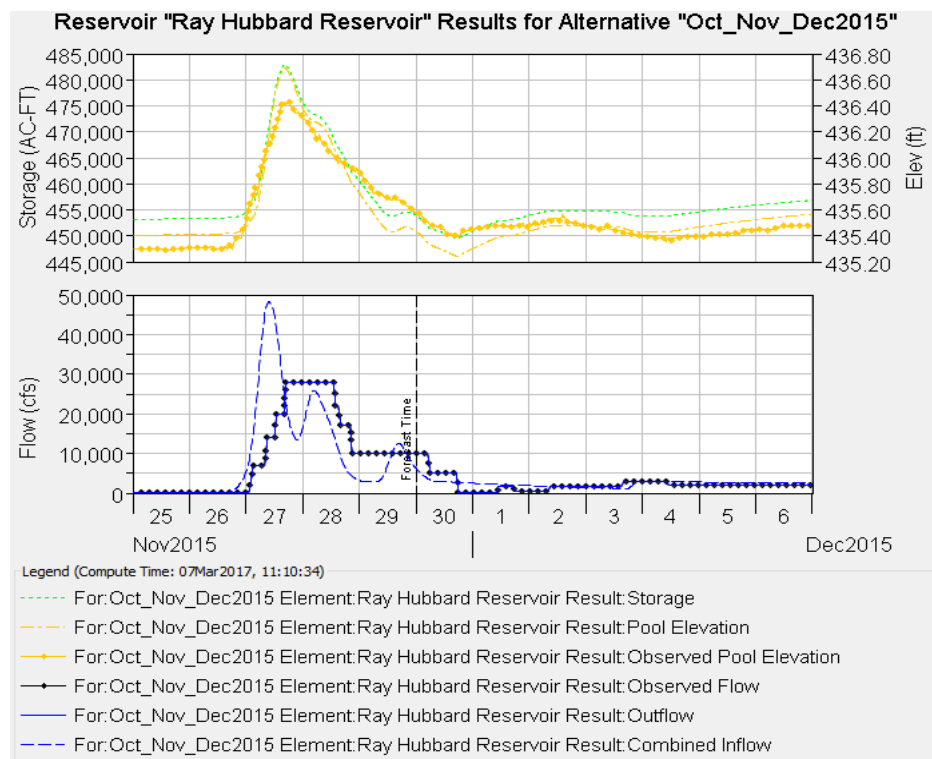


Figure 61a. November 2015 Calibration Results for Ray Hubbard Reservoir

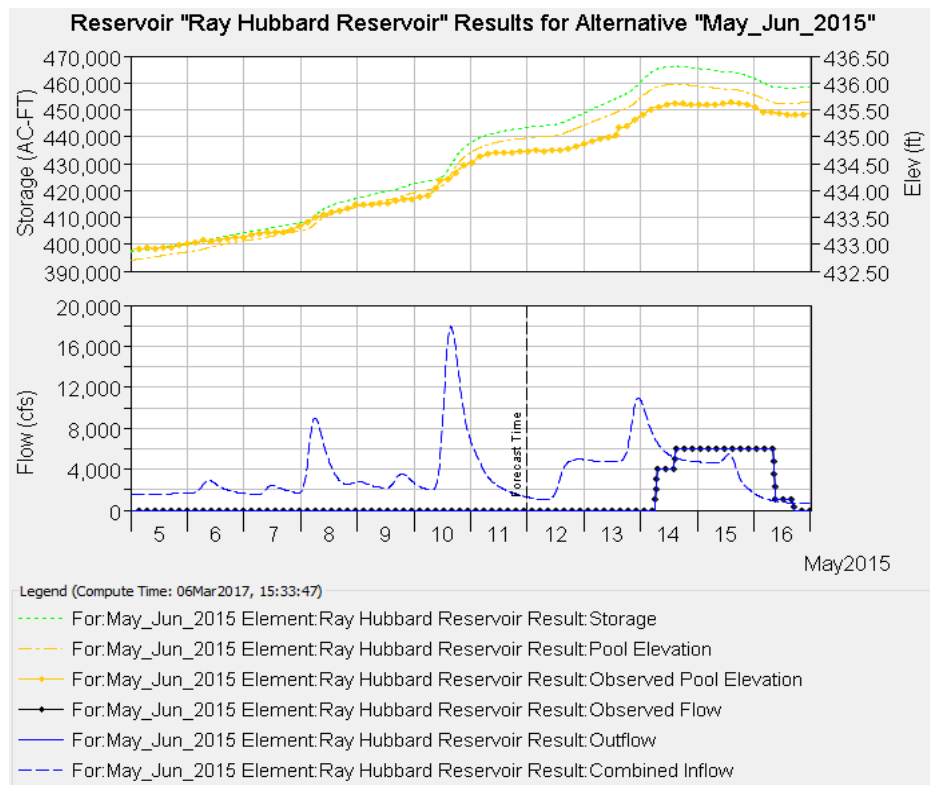


Figure 61b. May 2015 Calibration Results for Ray Hubbard Reservoir

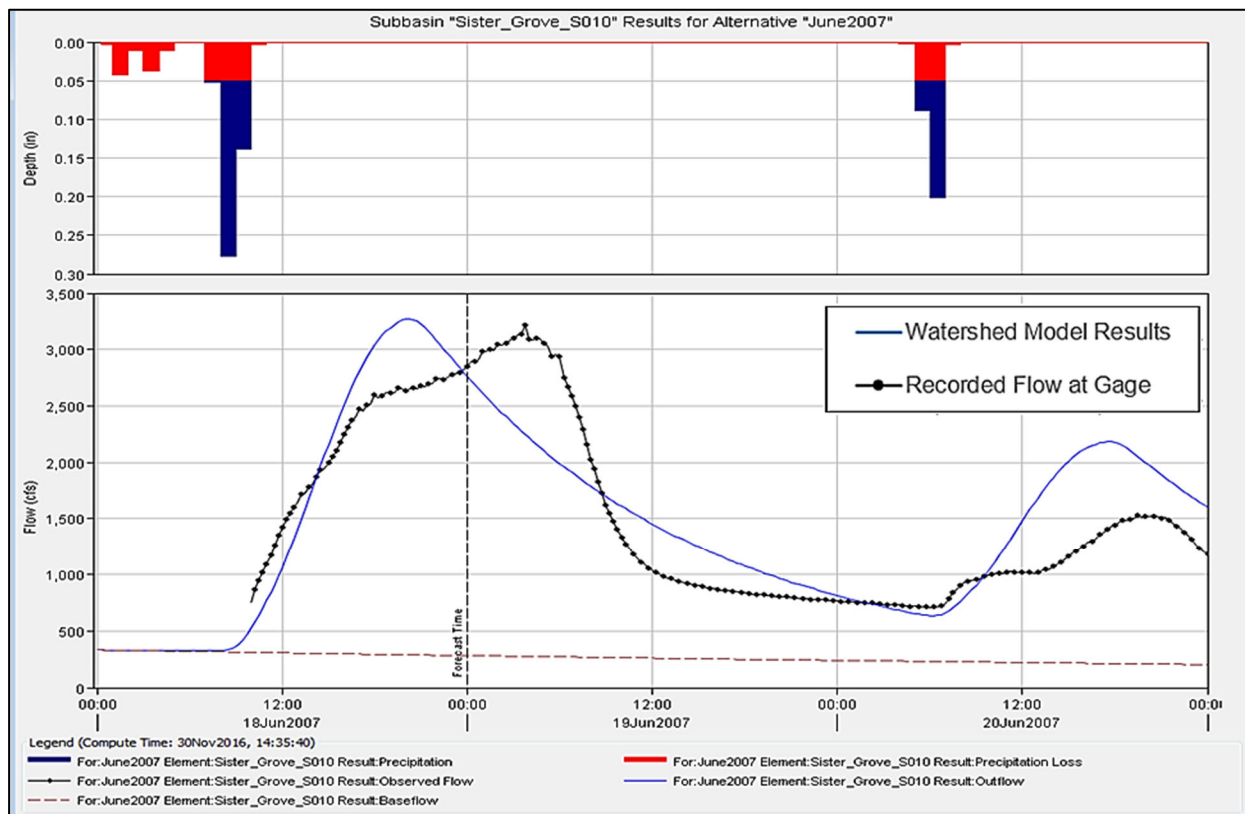


Figure 62a. June 19, 2007 Calibration for the Sister Grove near Blue Ridge, TX Gage

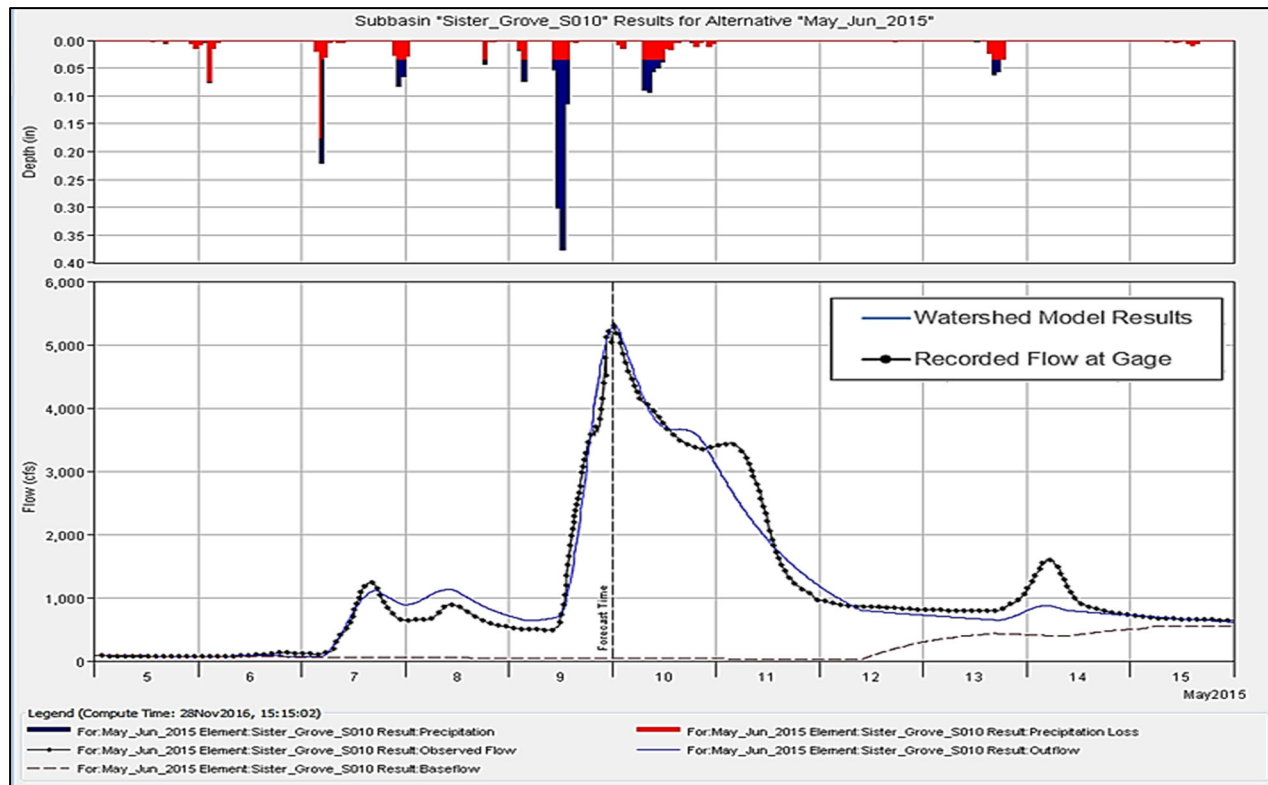


Figure 62b. May 10, 2015 Calibration for the Sister Grove near Blue Ridge, TX Gage

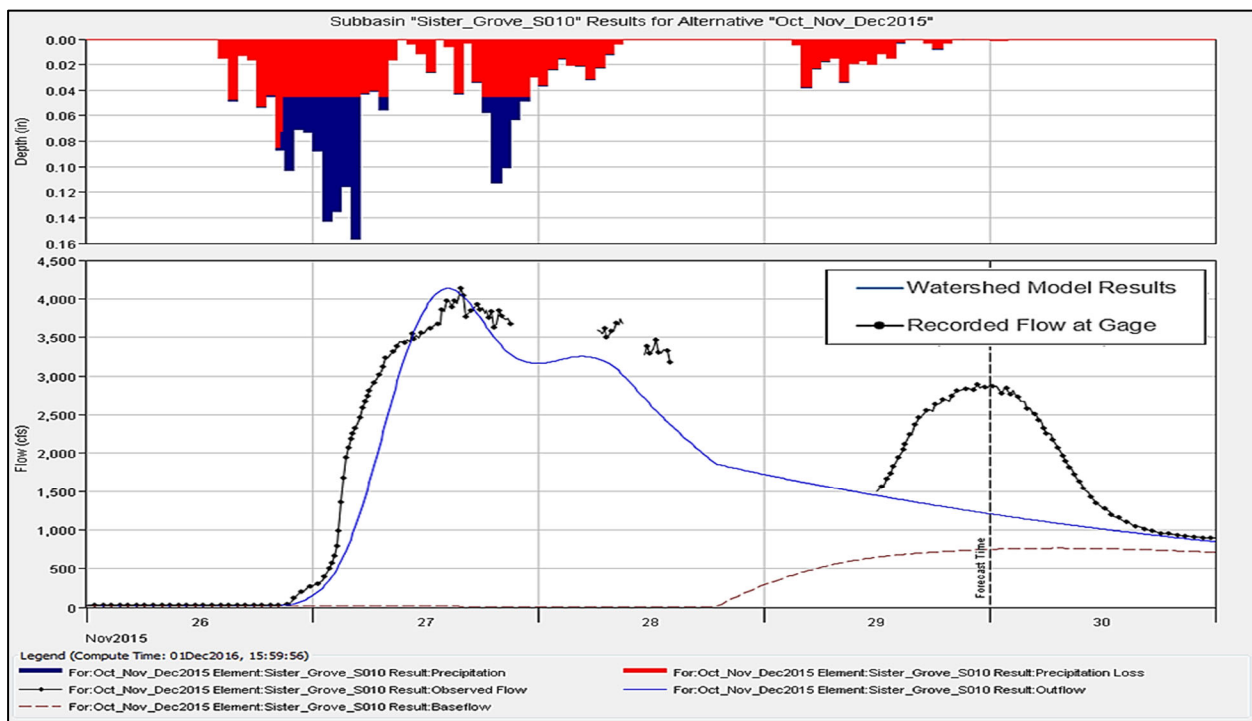


Figure 62c. November 27, 2015 Calibration for the Sister Grove near Blue Ridge, TX Gage

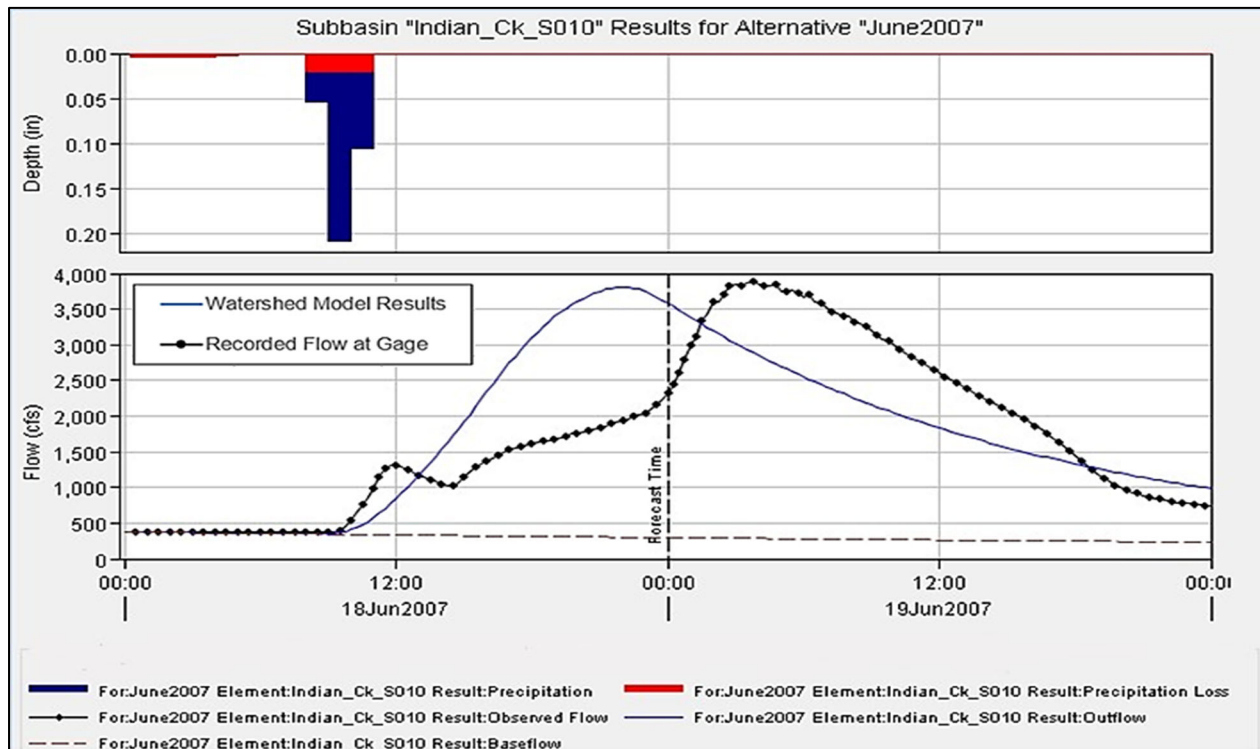


Figure 63a. June 19, 2007 Calibration for the Indian Creek at SH 78 near Farmersville, TX Gage

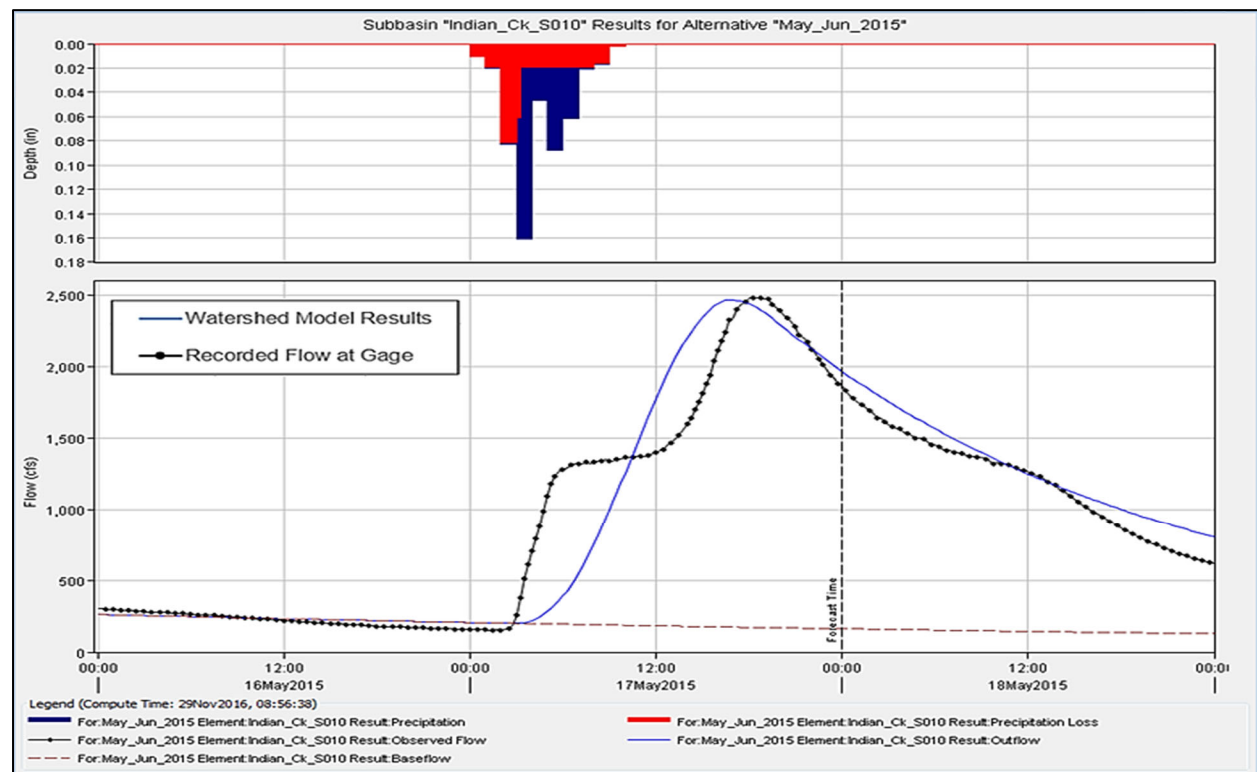


Figure 63b. May 17, 2015 Calibration for the Indian Creek at SH 78 near Farmersville, TX Gage

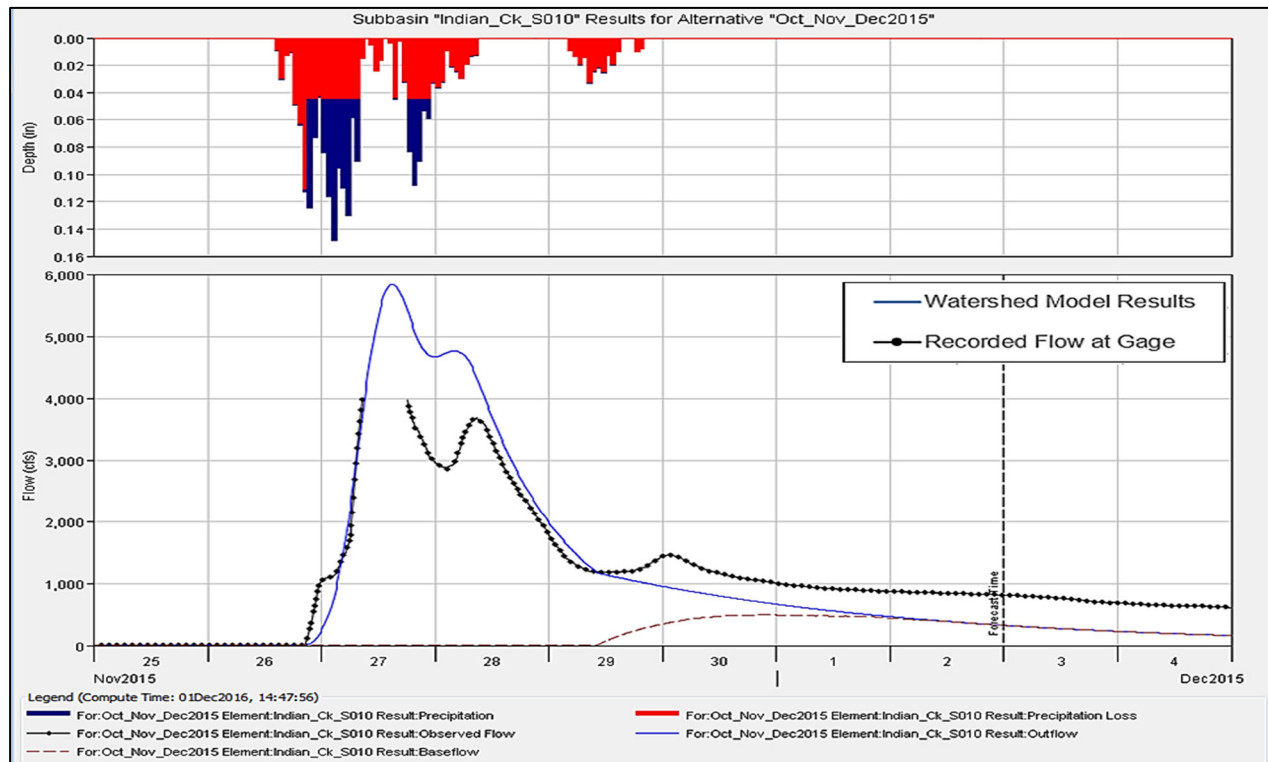


Figure 63c. November 27, 2015 Calibration for the Indian Creek at SH 78 near Farmersville, TX Gage

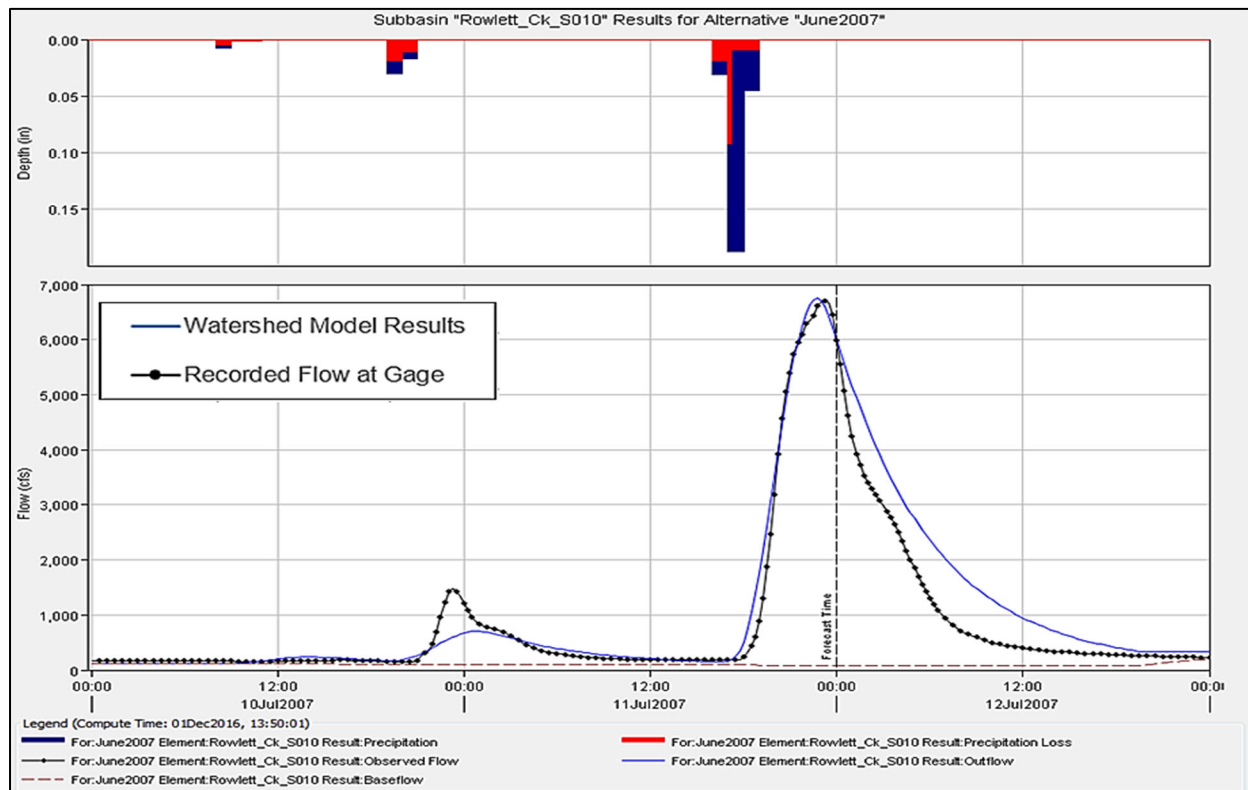


Figure 64a. July 11, 2007 Calibration for the Rowlett Creek near Sachse, TX Gage

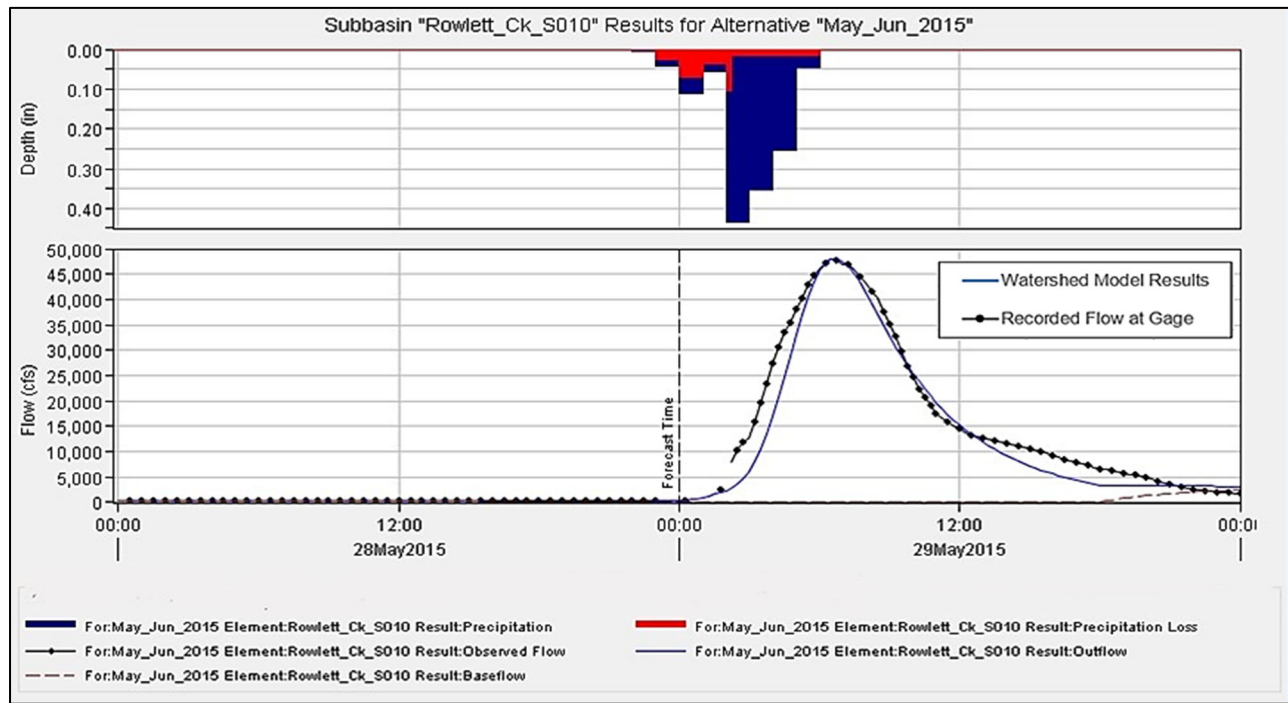


Figure 64b. May 29, 2015 Calibration for the Rowlett Creek near Sachse, TX Gage

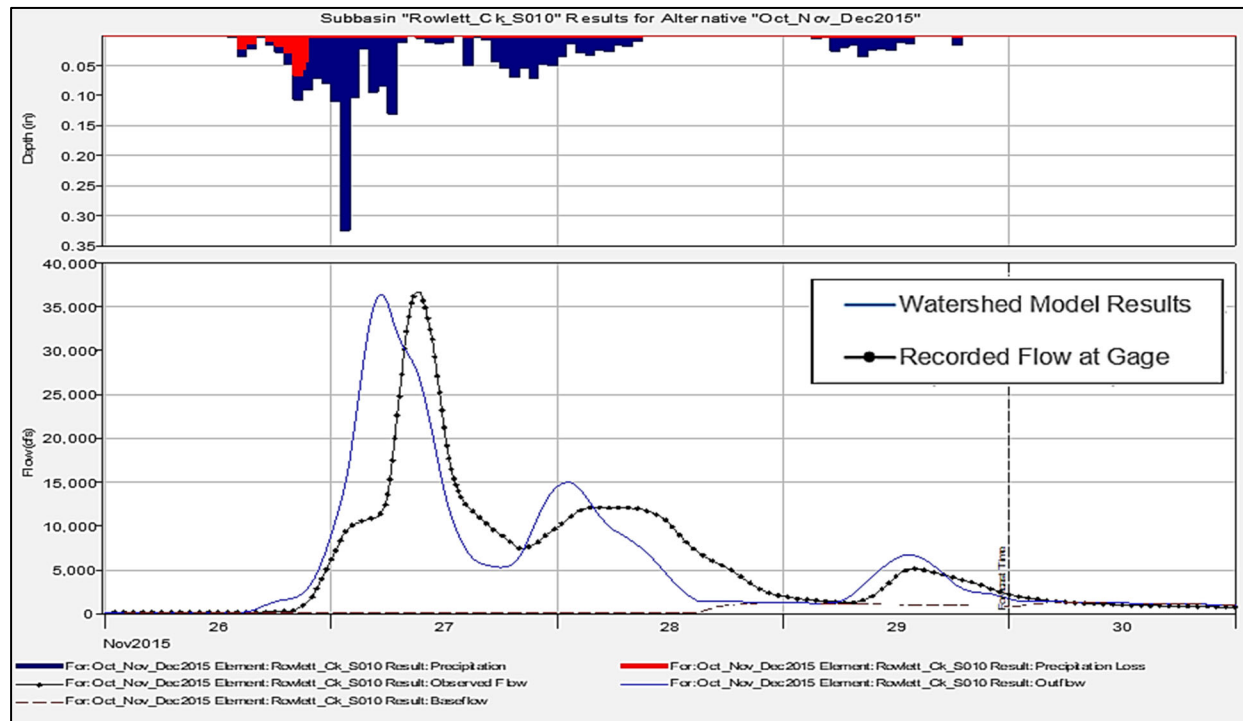


Figure 64c. November 27, 2015 Calibration for the Rowlett Creek near Sachse, TX Gage

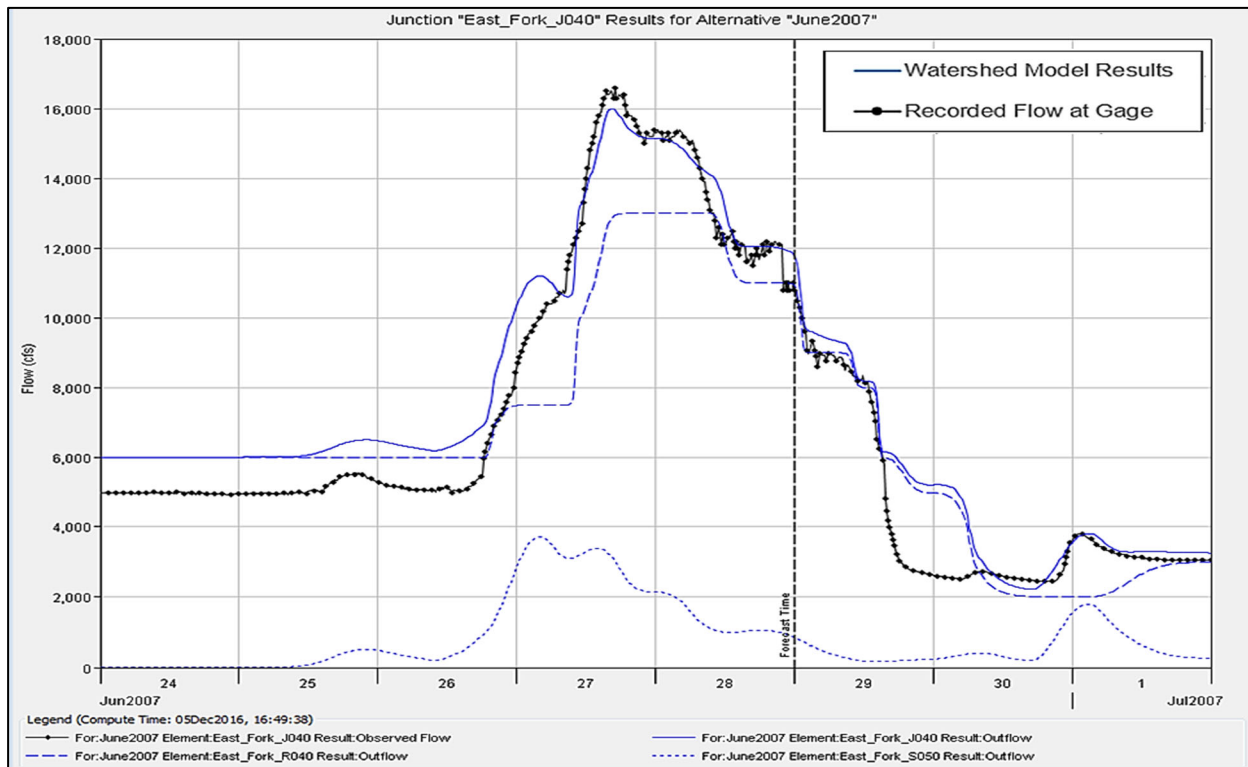


Figure 65a. June 27, 2007 Calibration for the East Fork Trinity River near Forney, TX Gage

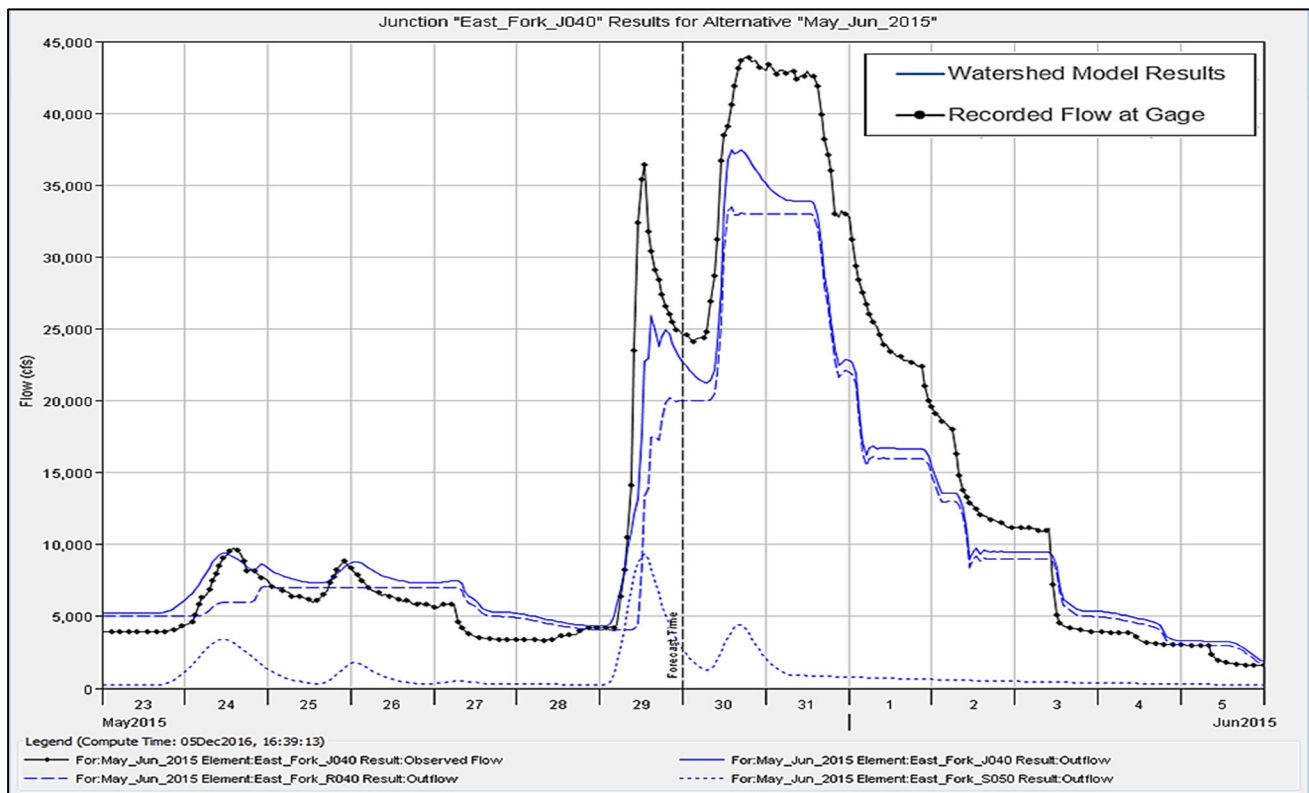


Figure 65b. May 30, 2015 Calibration for the East Fork Trinity River near Forney, TX Gage

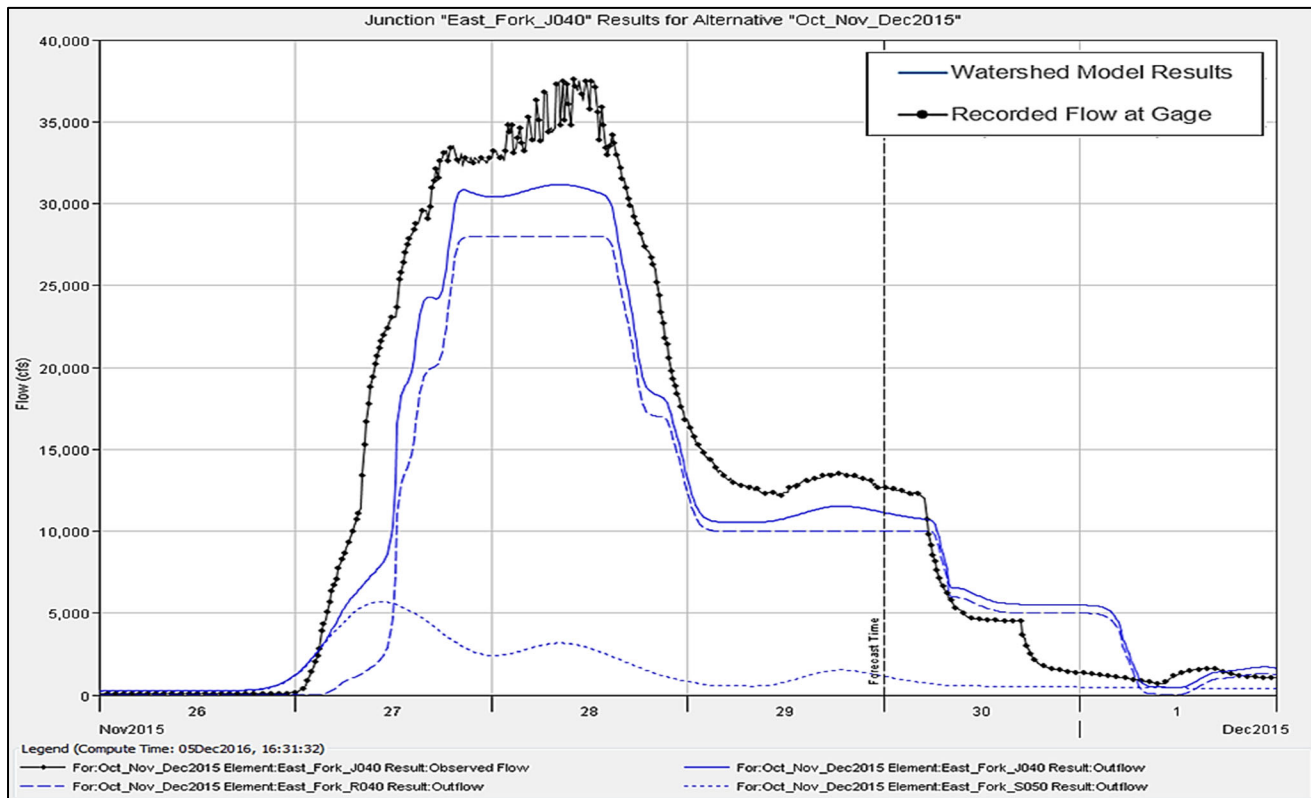


Figure 65c. November 28, 2015 Calibration for the East Fork Trinity River near Forney, TX Gage

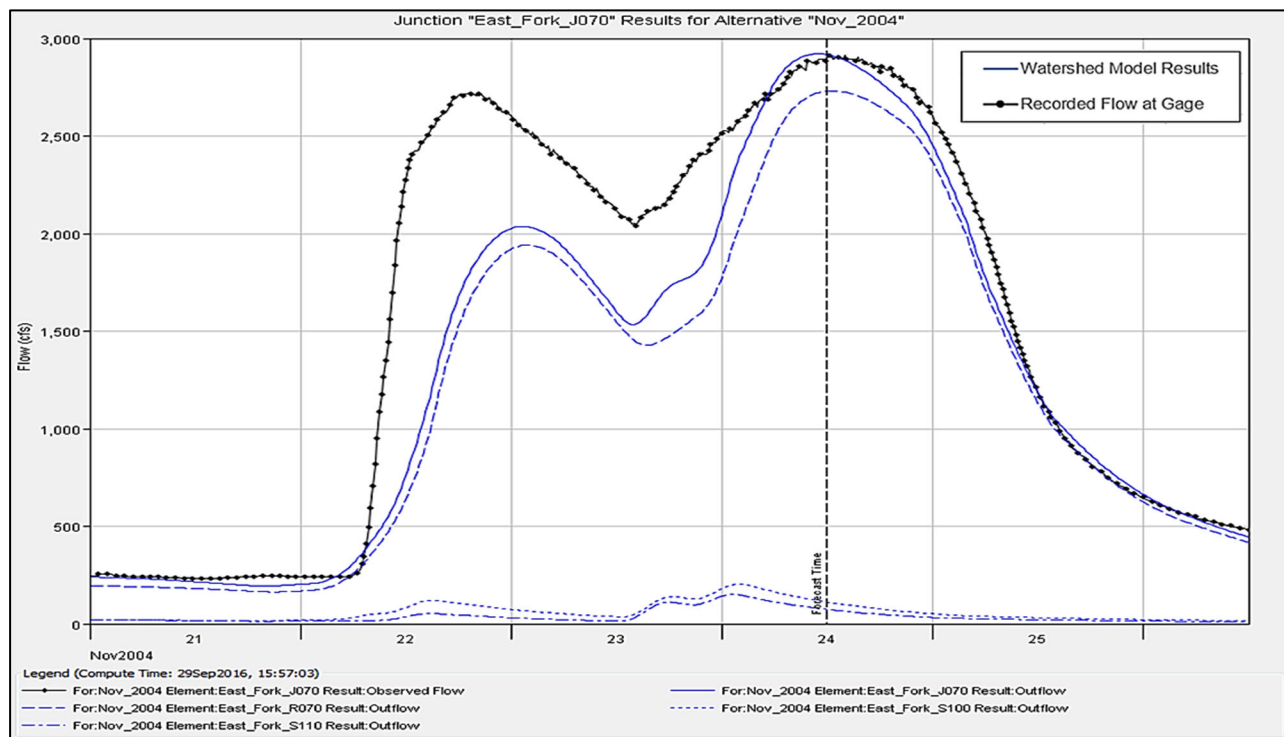


Figure 66a. November 24, 2004 Calibration for the East Fork Trinity River near Crandall, TX Gage

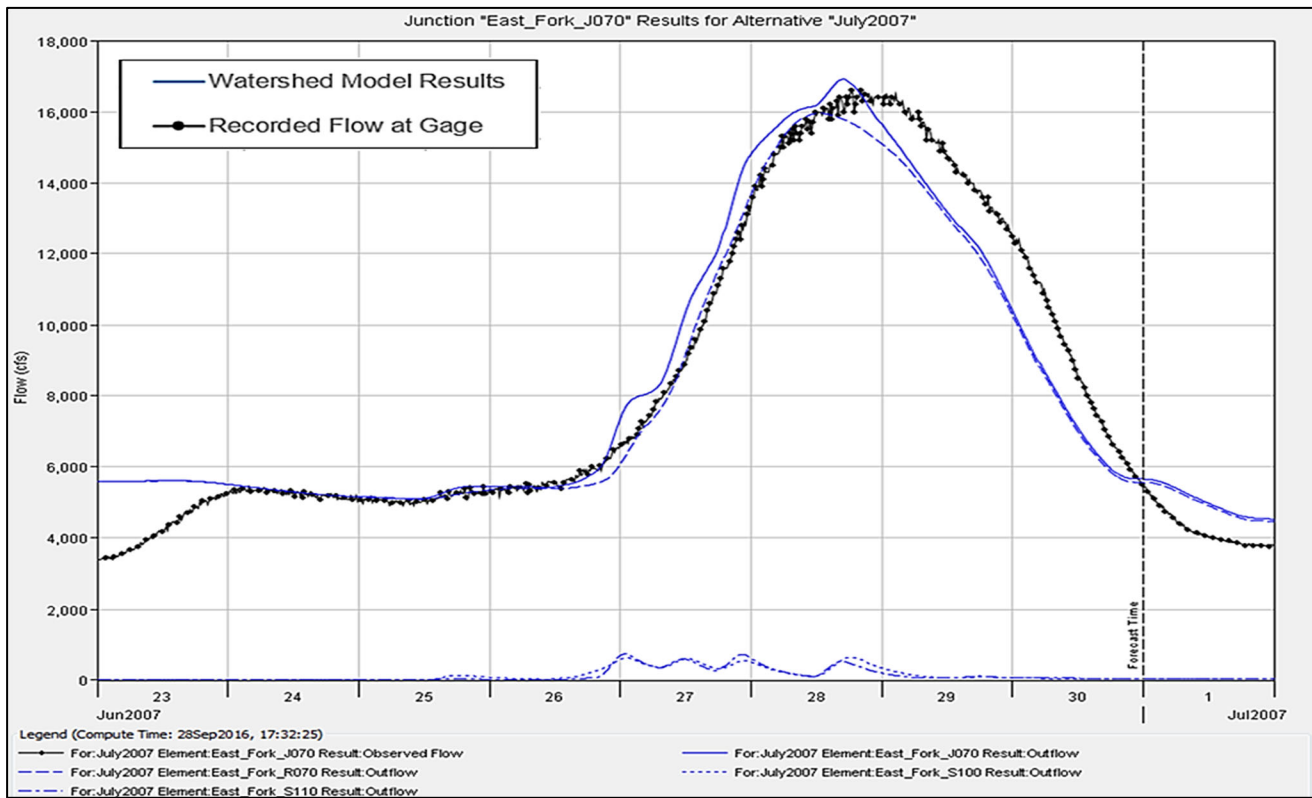


Figure 66b. June 28, 2007 Calibration for the East Fork Trinity River near Crandall, TX Gage

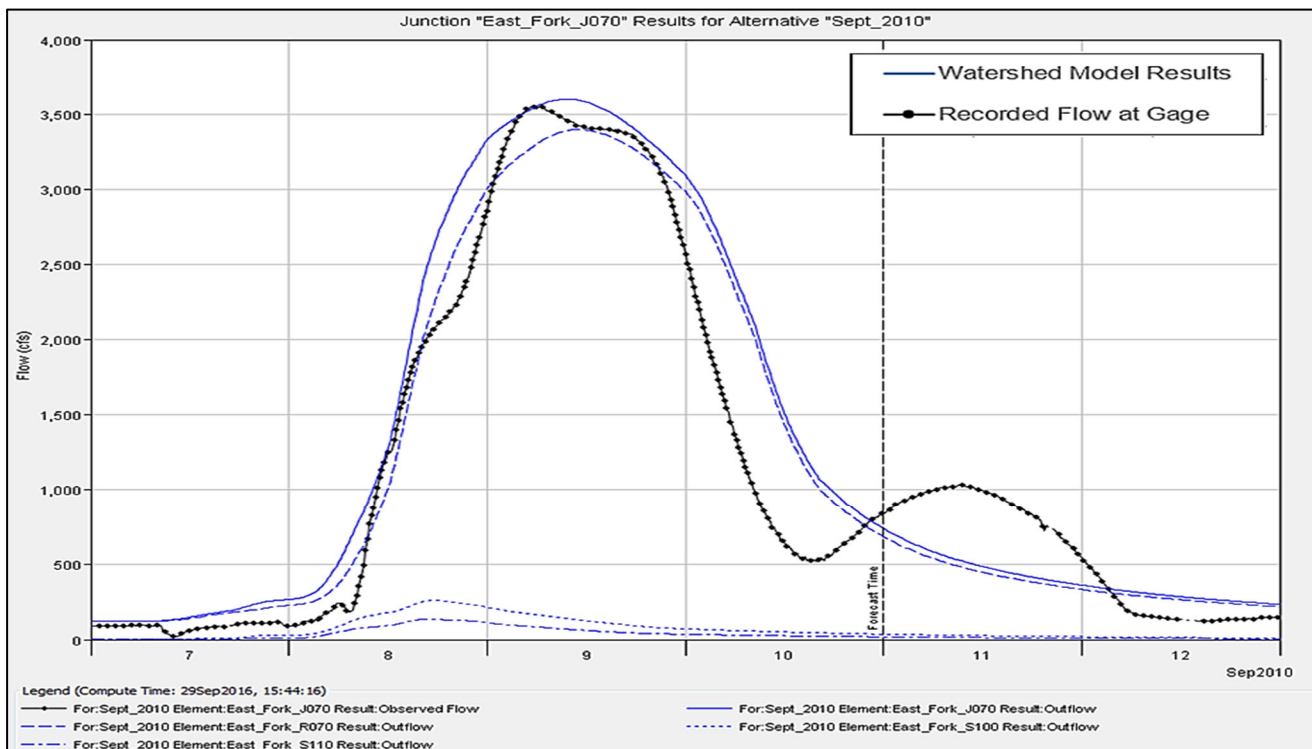


Figure 66c. September 9, 2010 Calibration for the East Fork Trinity River near Crandall, TX Gage

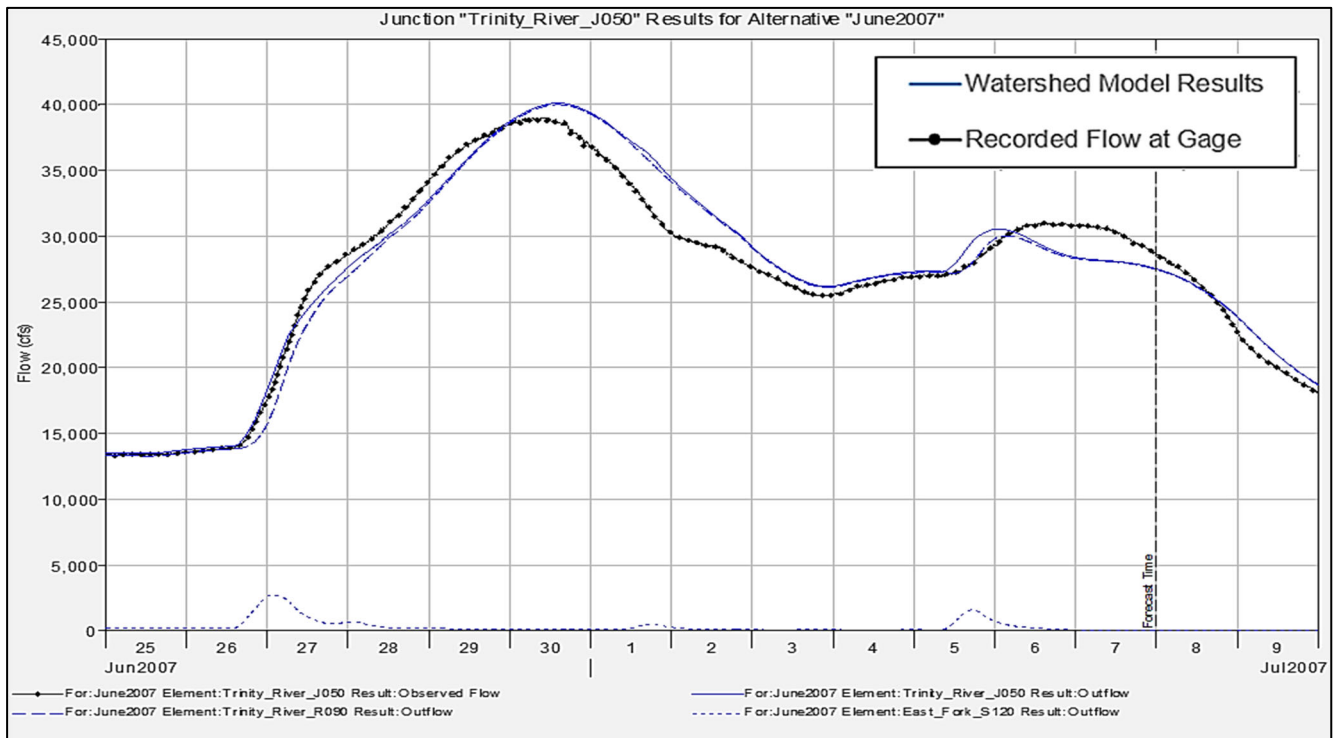


Figure 67a. June 29, 2007 Calibration for the Trinity River near Rosser, TX Gage

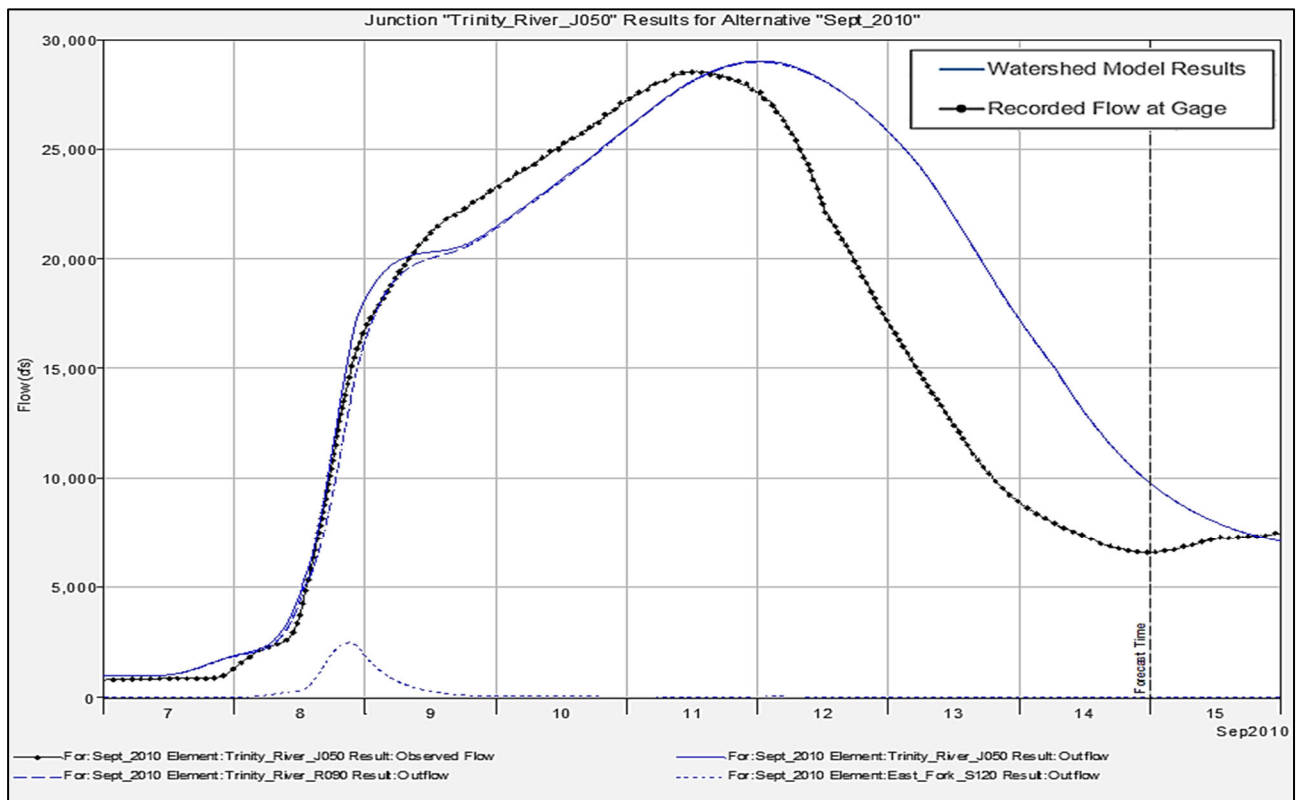


Figure 67b. September 11, 2010 Calibration for the Trinity River near Rosser, TX Gage

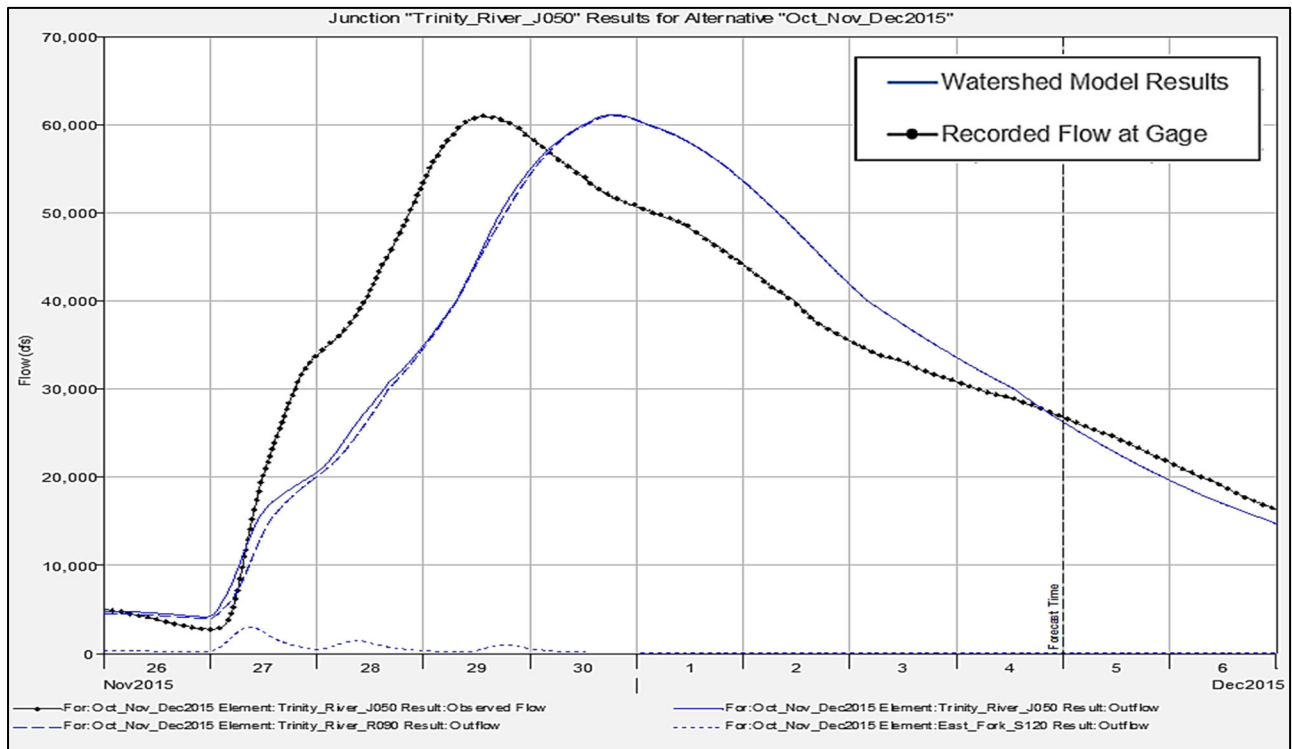


Figure 67c. November 29, 2015 Calibration for the Trinity River near Rosser, TX Gage

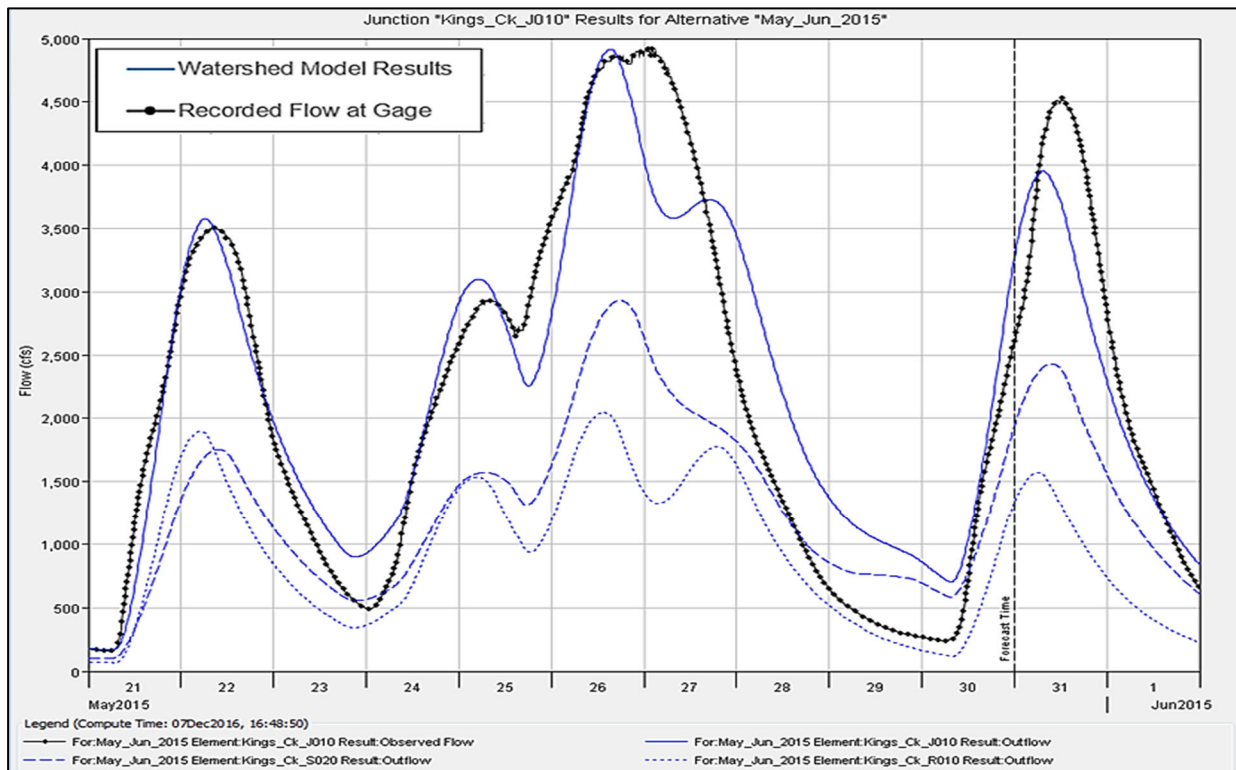


Figure 68a. May 26, 2015 Calibration for the Kings Creek at SH 34 near Kaufman Gage

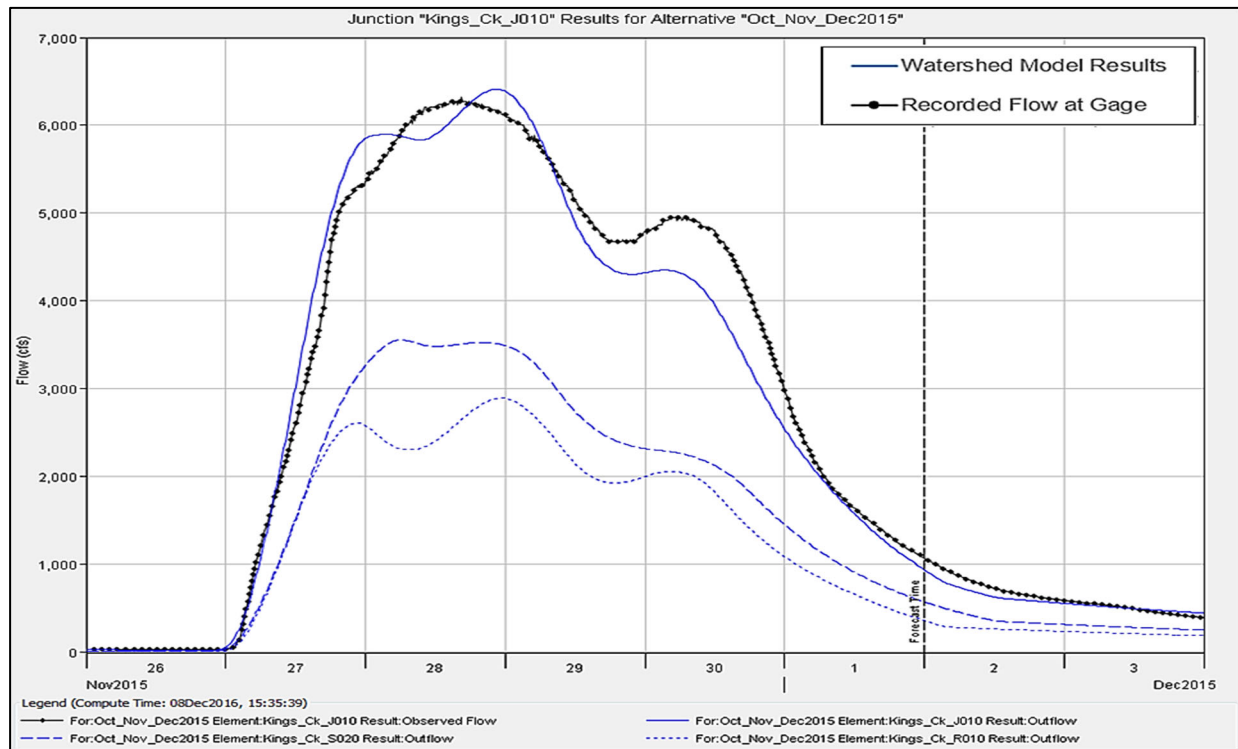


Figure 68b. November 27, 2015 Calibration for the Kings Creek at SH 34 near Kaufman Gage

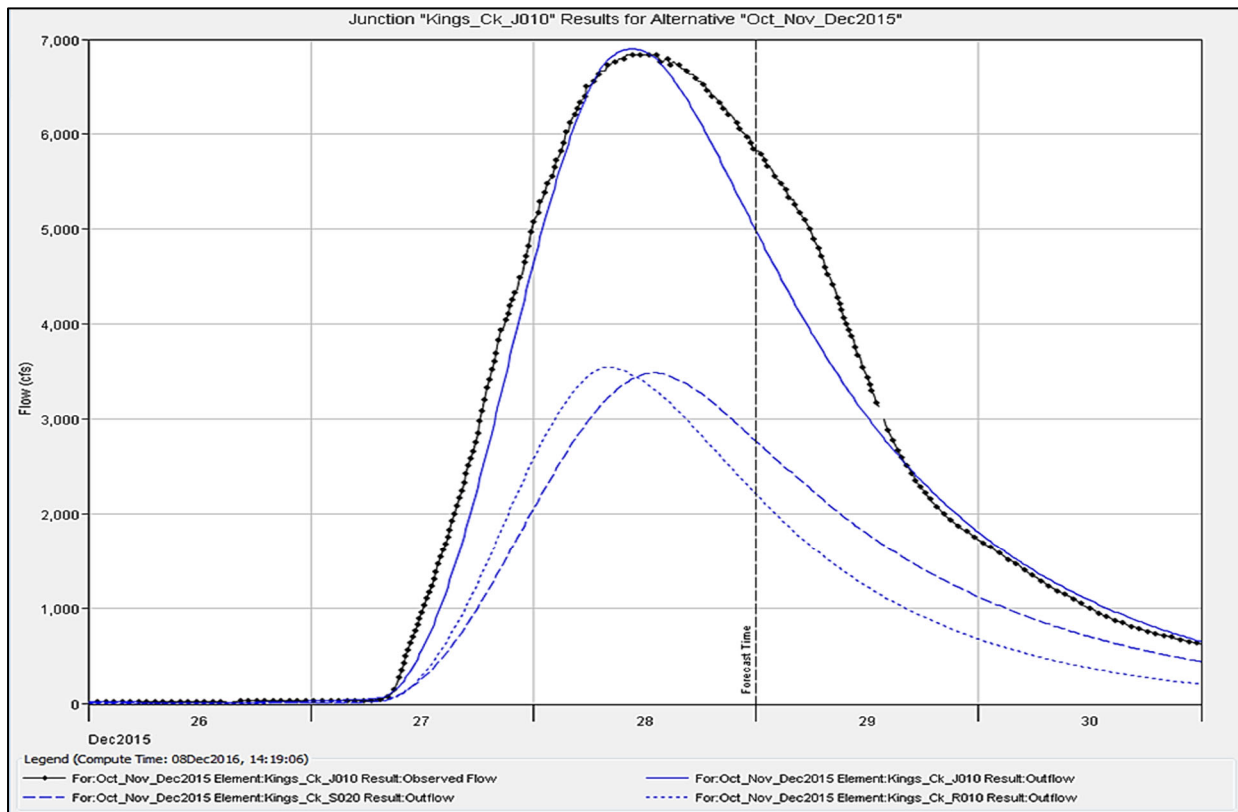


Figure 68c. December 28, 2015 Calibration for the Kings Creek at SH 34 near Kaufman Gage

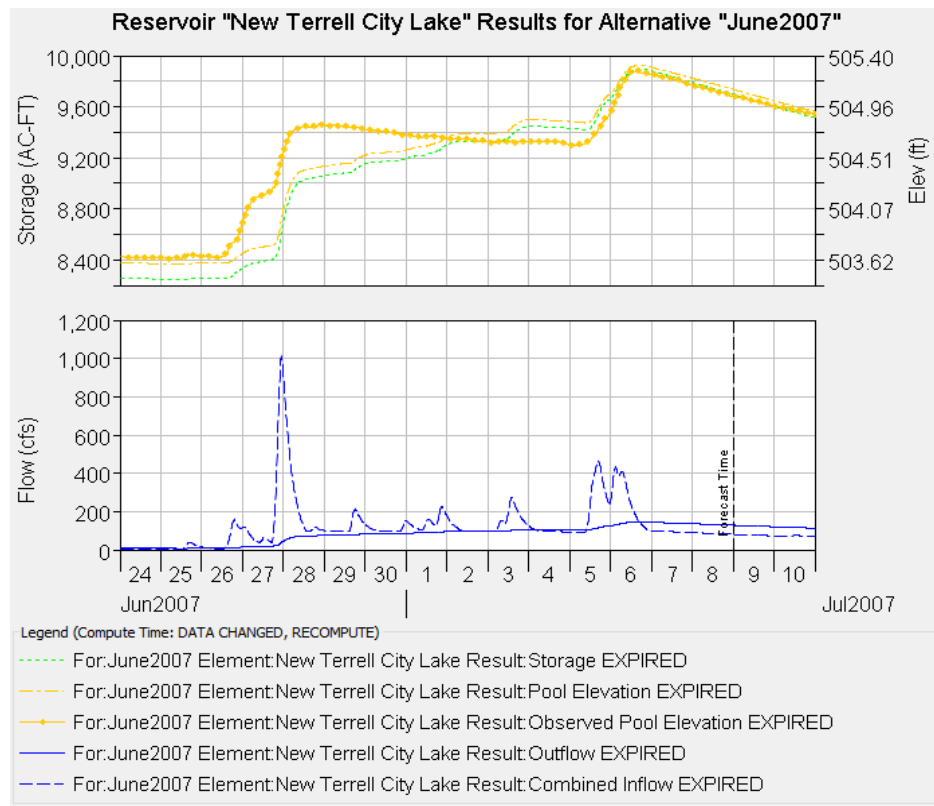


Figure 69a. June 2007 Calibration Results for New Terrell City Lake

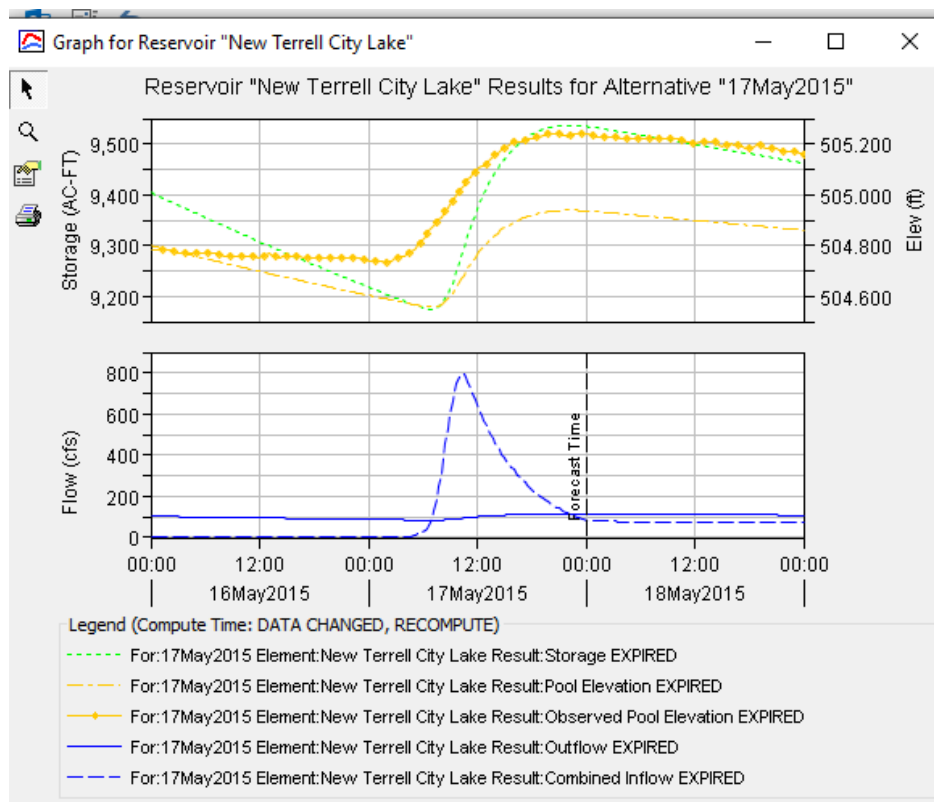


Figure 69b. May 2015 Calibration Results for New Terrell City Lake

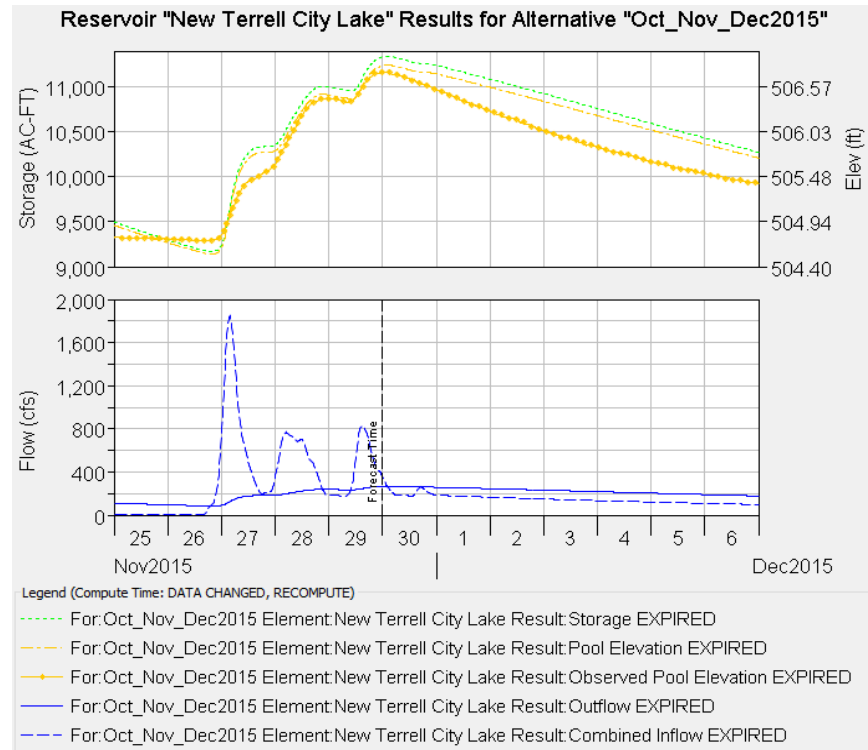


Figure 69c. November 2015 Calibration Results for New Terrell City Lake

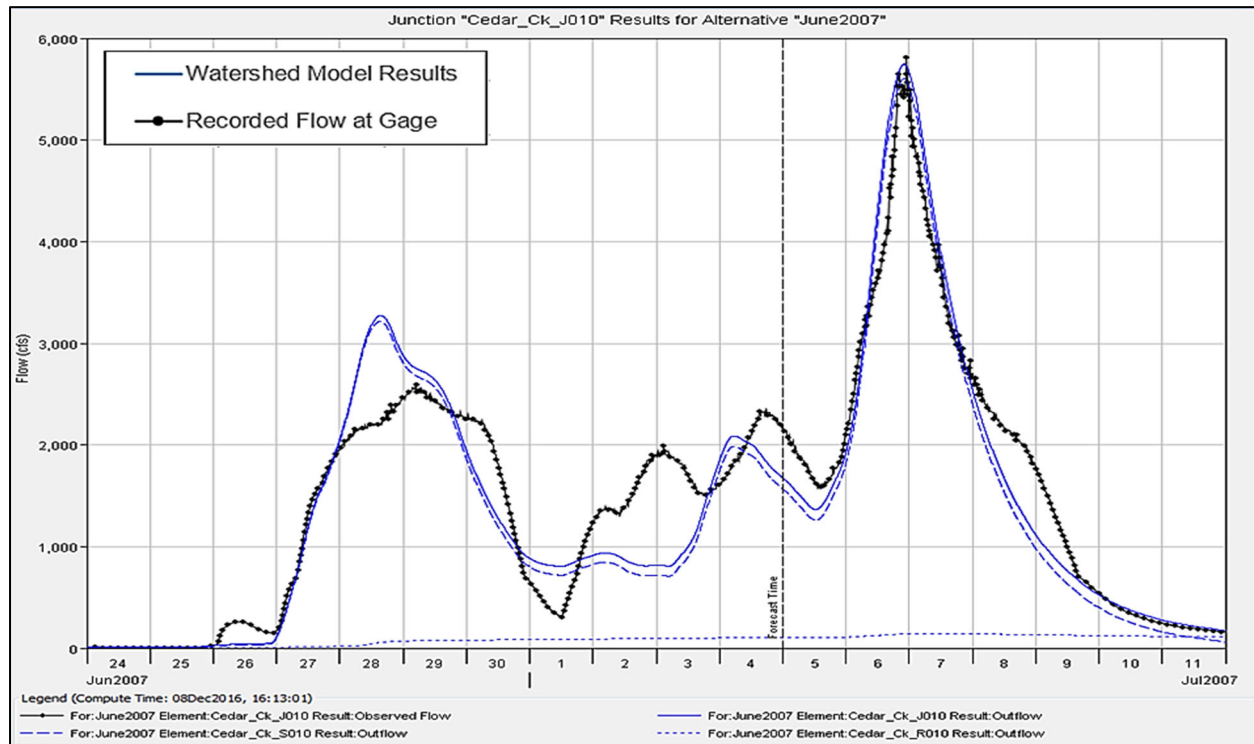


Figure 70a. July 6, 2007 Calibration for the Cedar Creek near Kemp, TX Gage

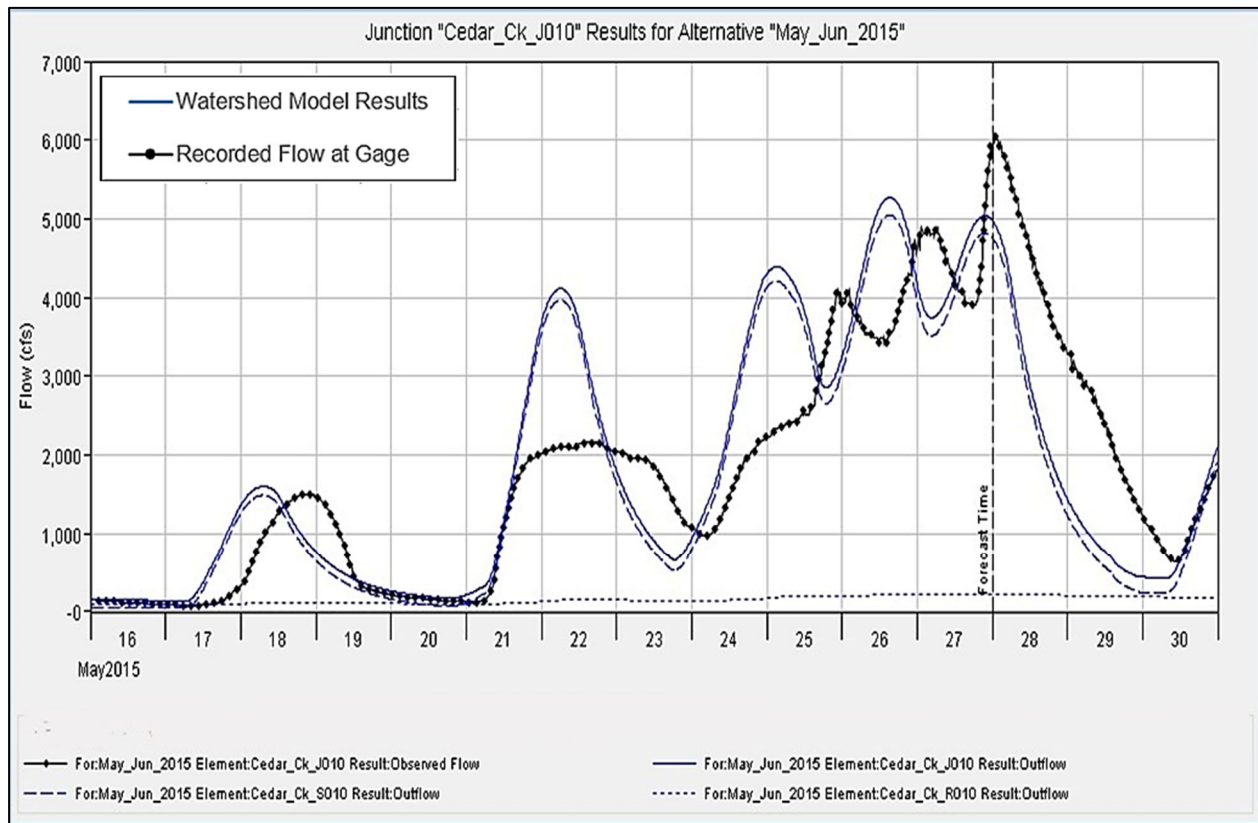


Figure 70b. May 27, 2015 Calibration for the Cedar Creek near Kemp, TX Gage

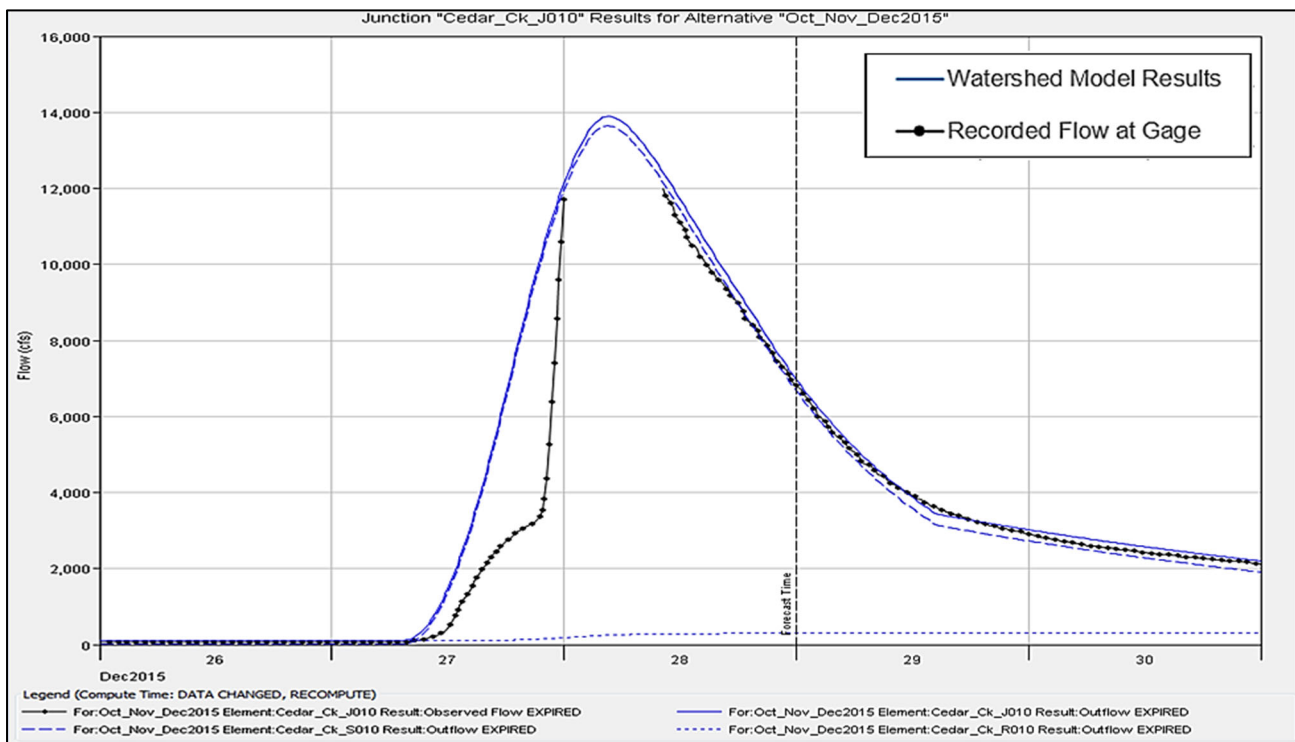


Figure 70c. December 28, 2015 Calibration for the Cedar Creek near Kemp, TX Gage

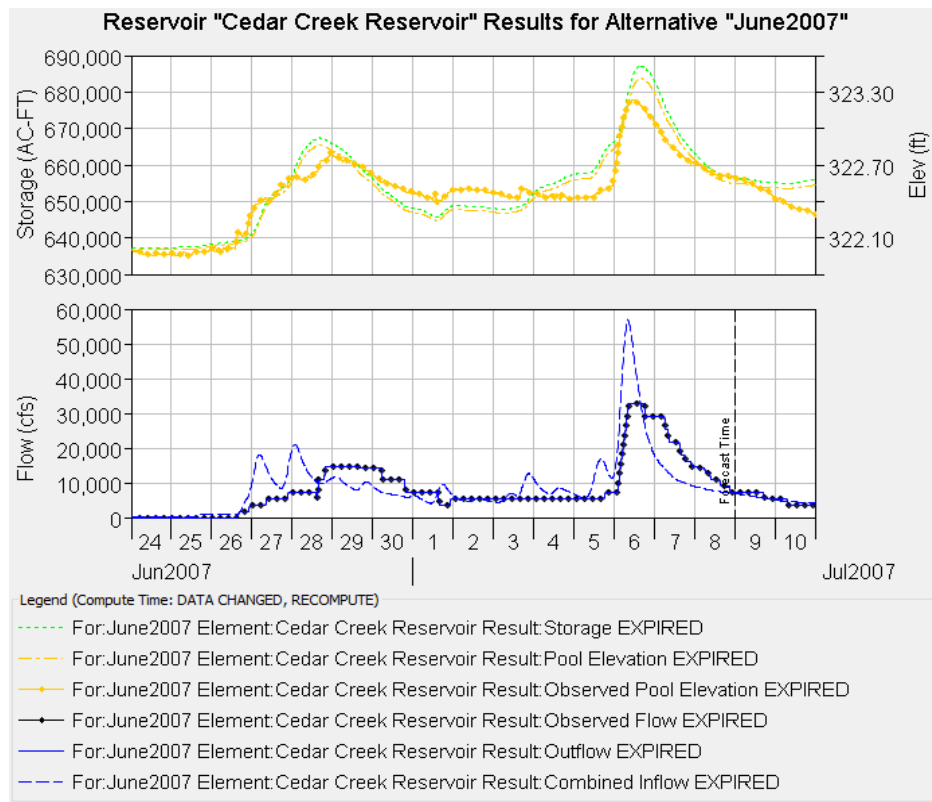


Figure 71a. June 2007 Calibration Results for Cedar Creek Reservoir

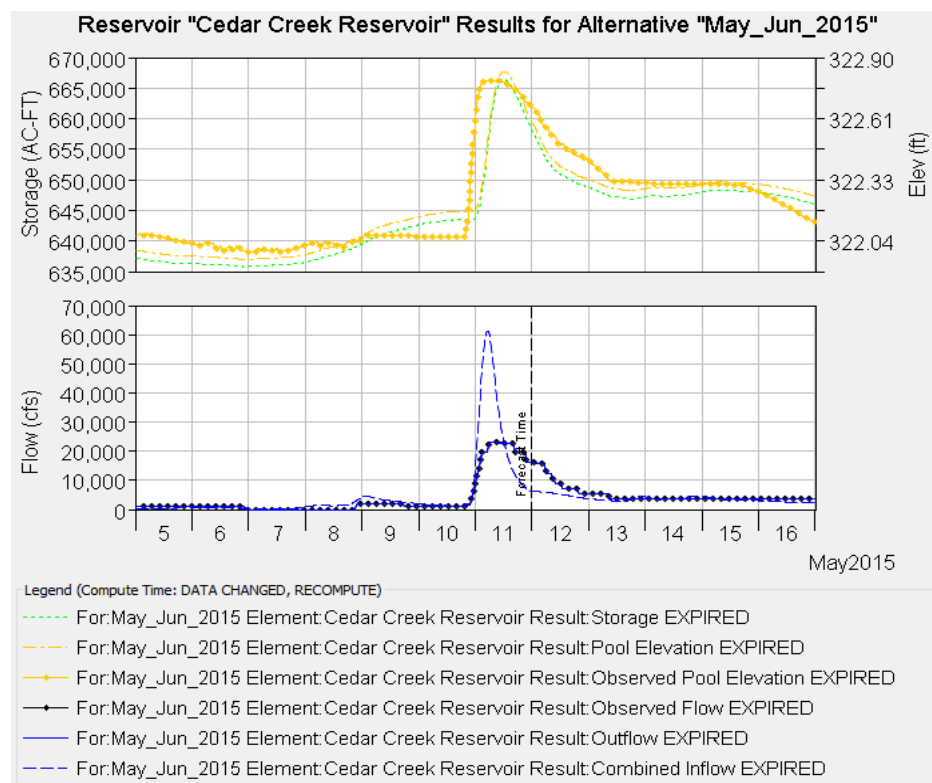


Figure 71b. May 2015 Calibration Results for Cedar Creek Reservoir

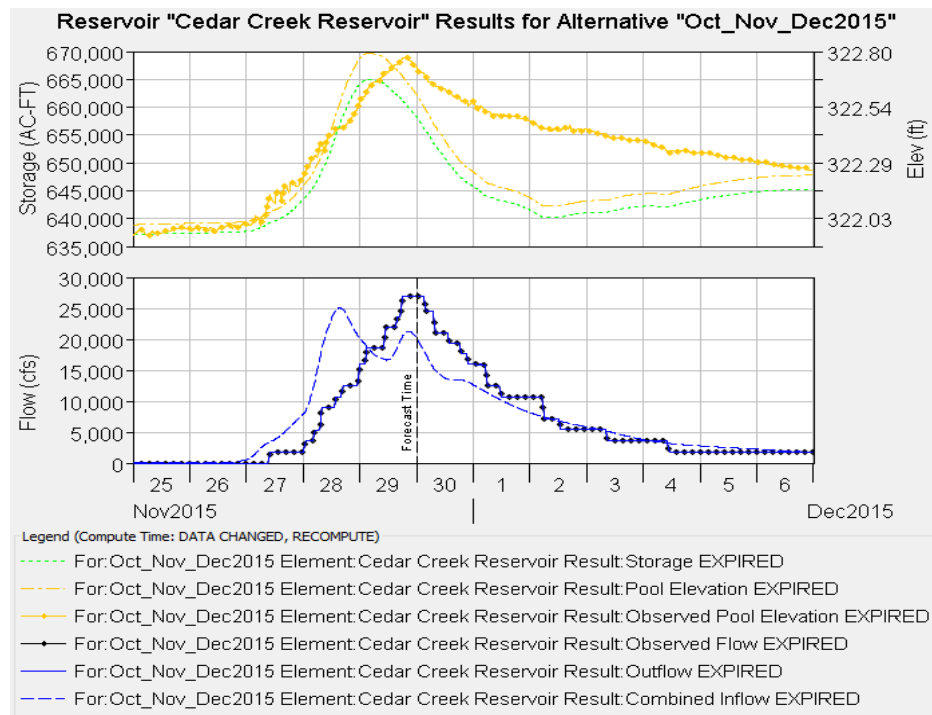


Figure 71c. November 2015 Calibration Results for Cedar Creek Reservoir

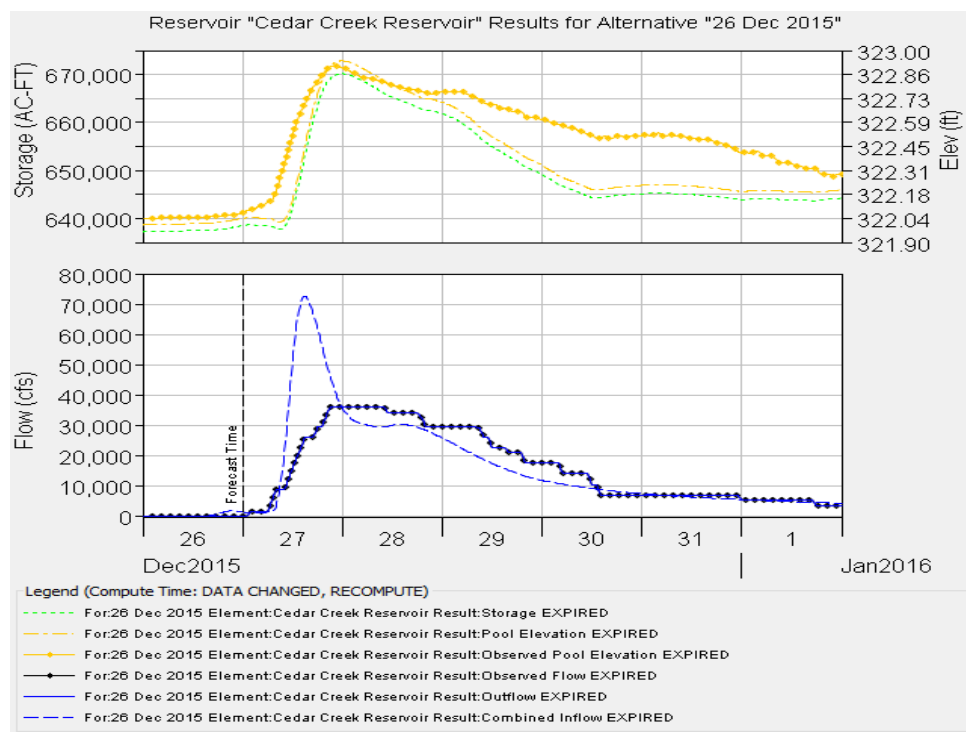


Figure 71d. December 2015 Calibration Results for Cedar Creek Reservoir

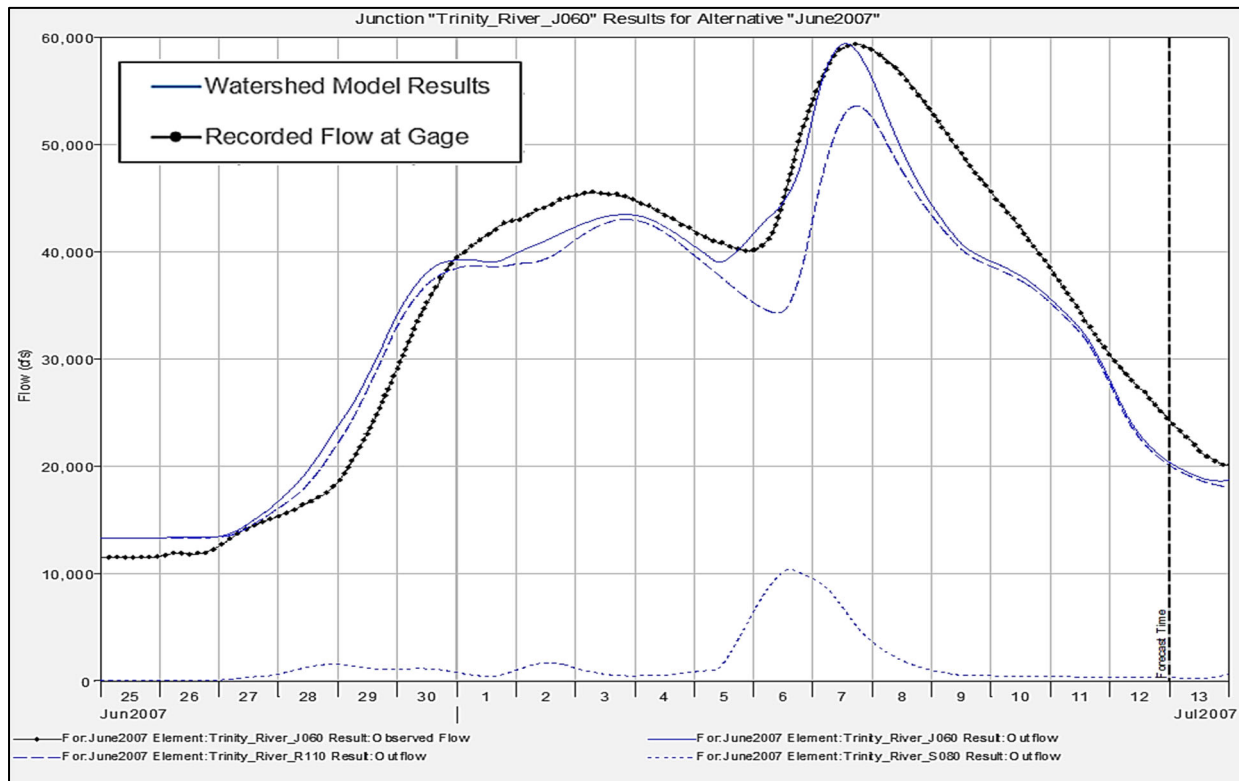


Figure 72a. July 7, 2007 Calibration for the Trinity River at Trinidad, TX Gage

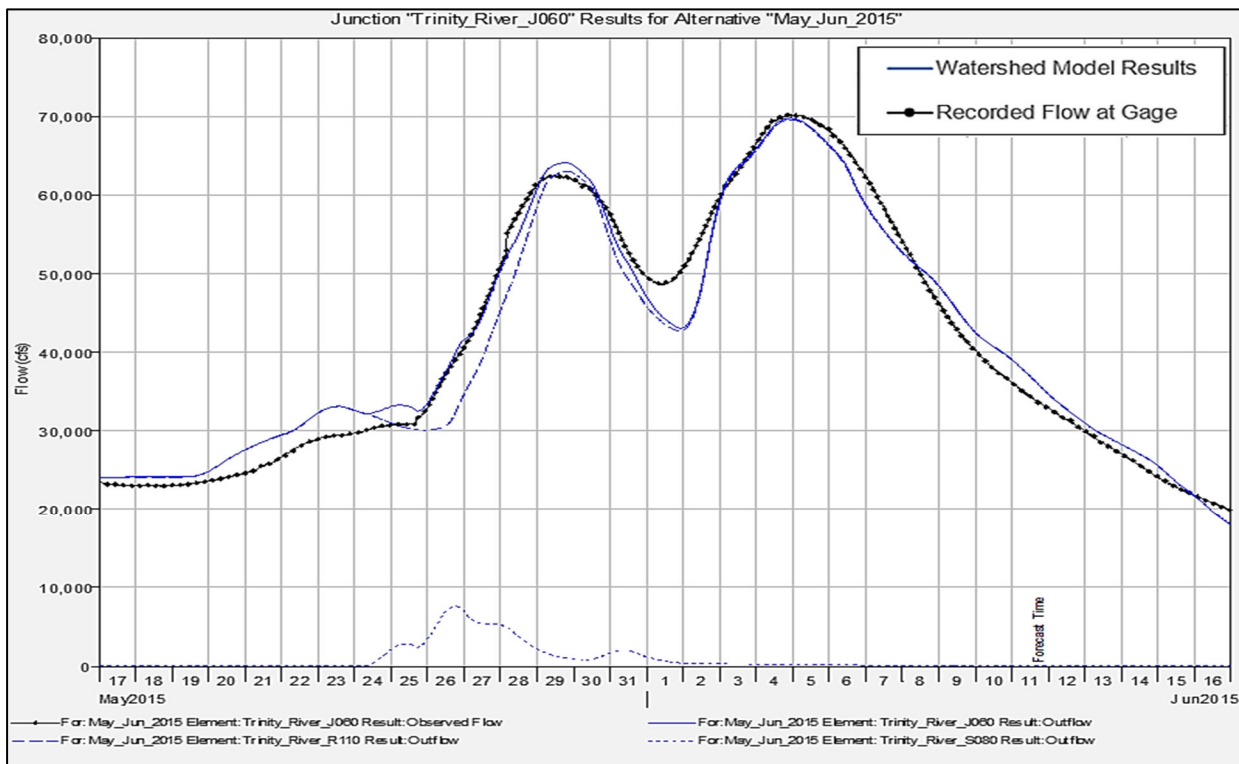


Figure 72b. June 4, 2015 Calibration for the Trinity River at Trinidad, TX Gage

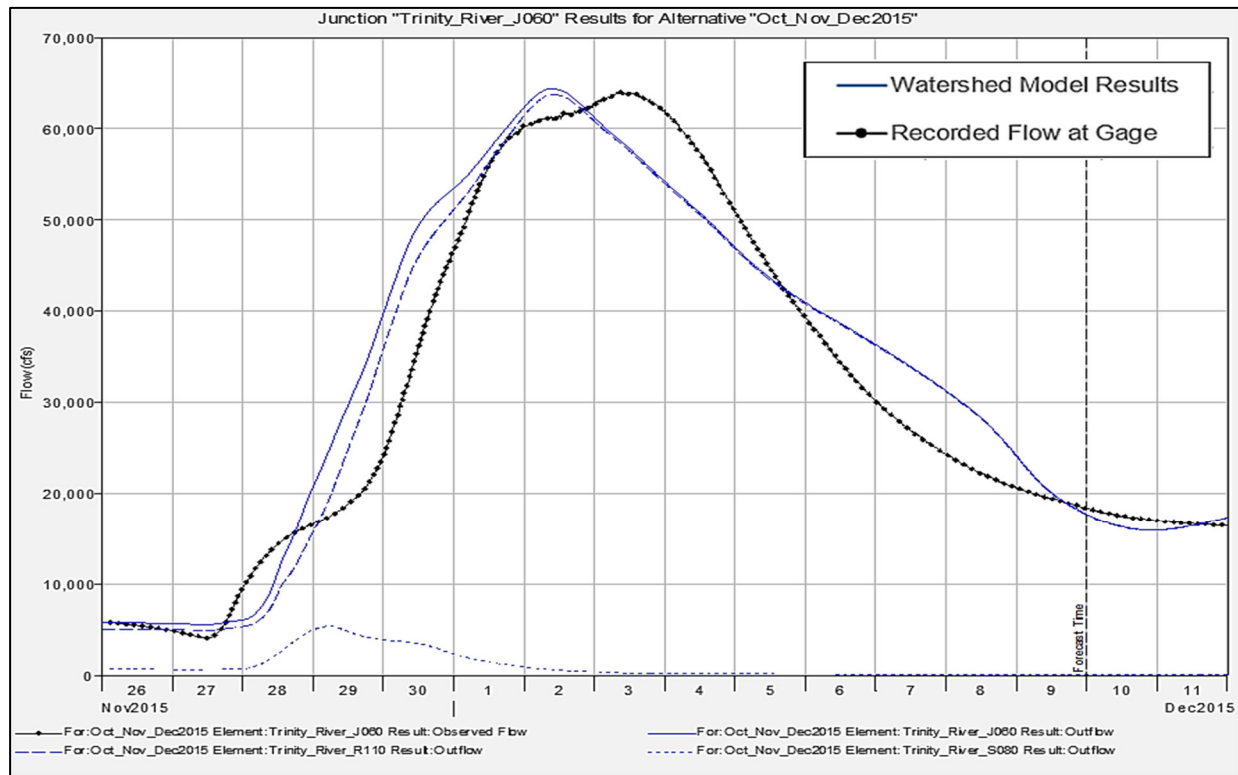


Figure 72c. December 3, 2015 Calibration for the Trinity River at Trinidad, TX Gage

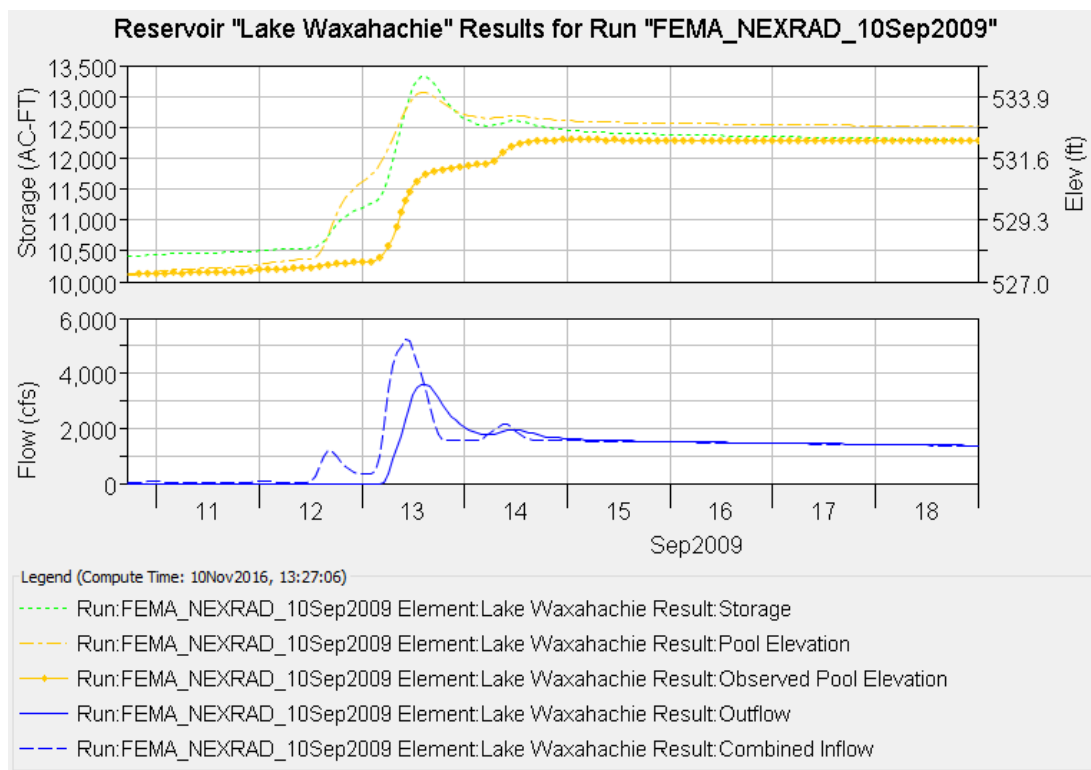


Figure 73a. September 2009 Calibration Results for Lake Waxahachie

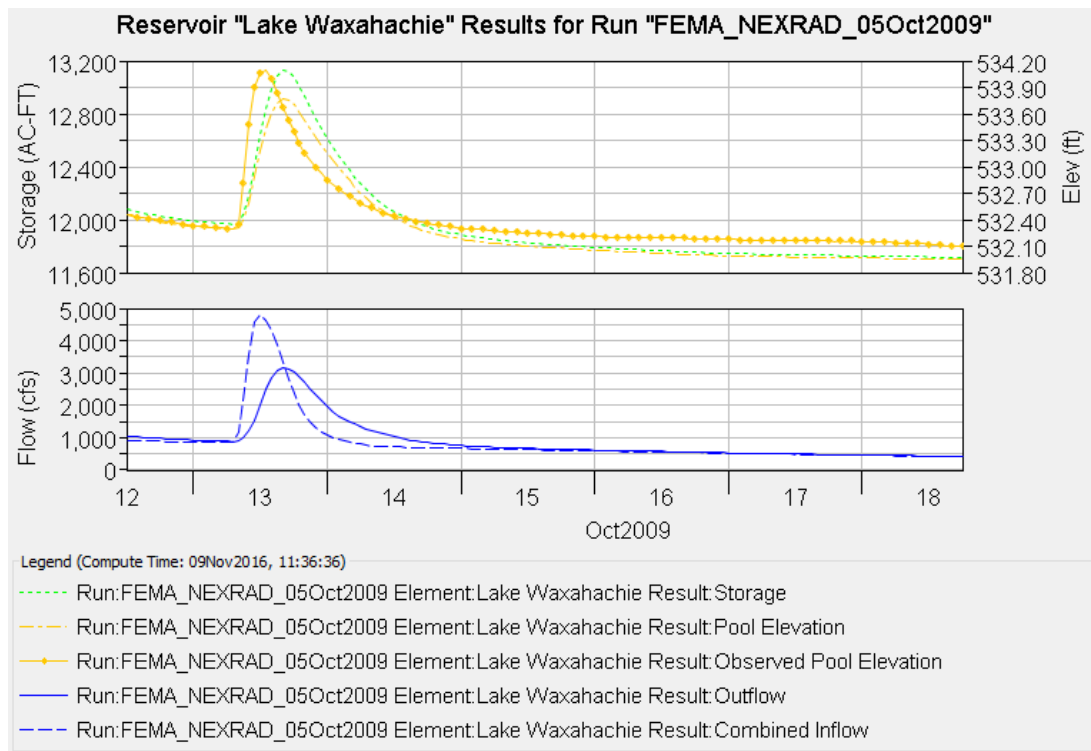


Figure 73b. October 2009 Calibration Results for Lake Waxahachie

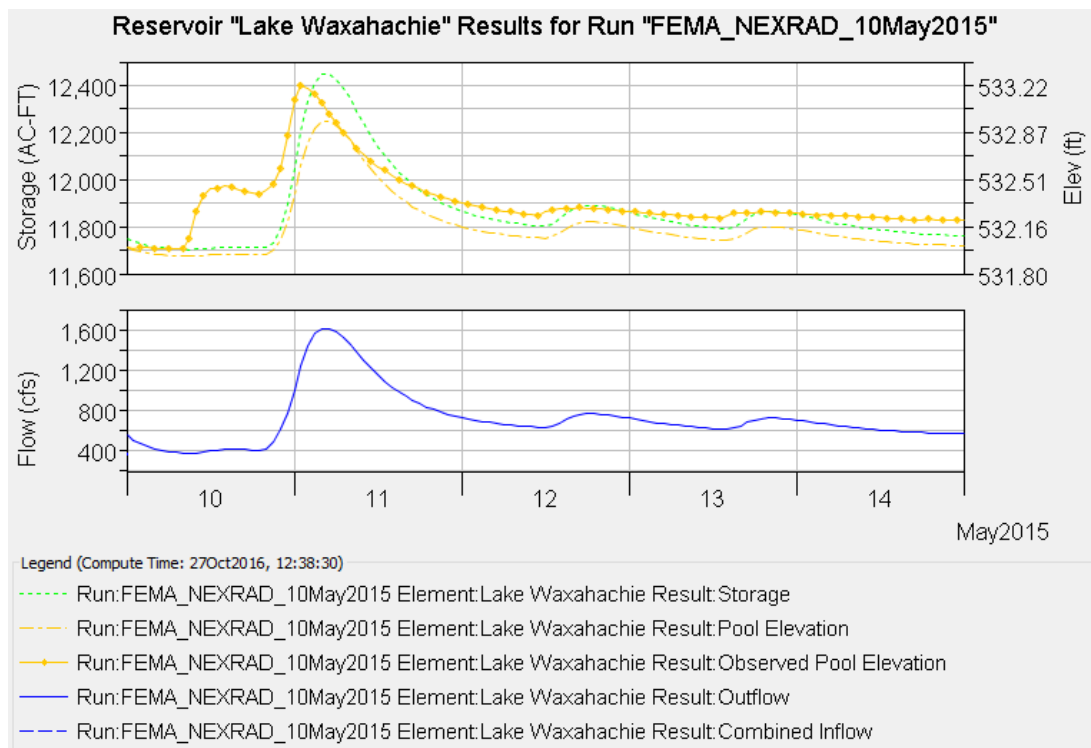


Figure 73c. May 2015 Calibration Results for Lake Waxahachie

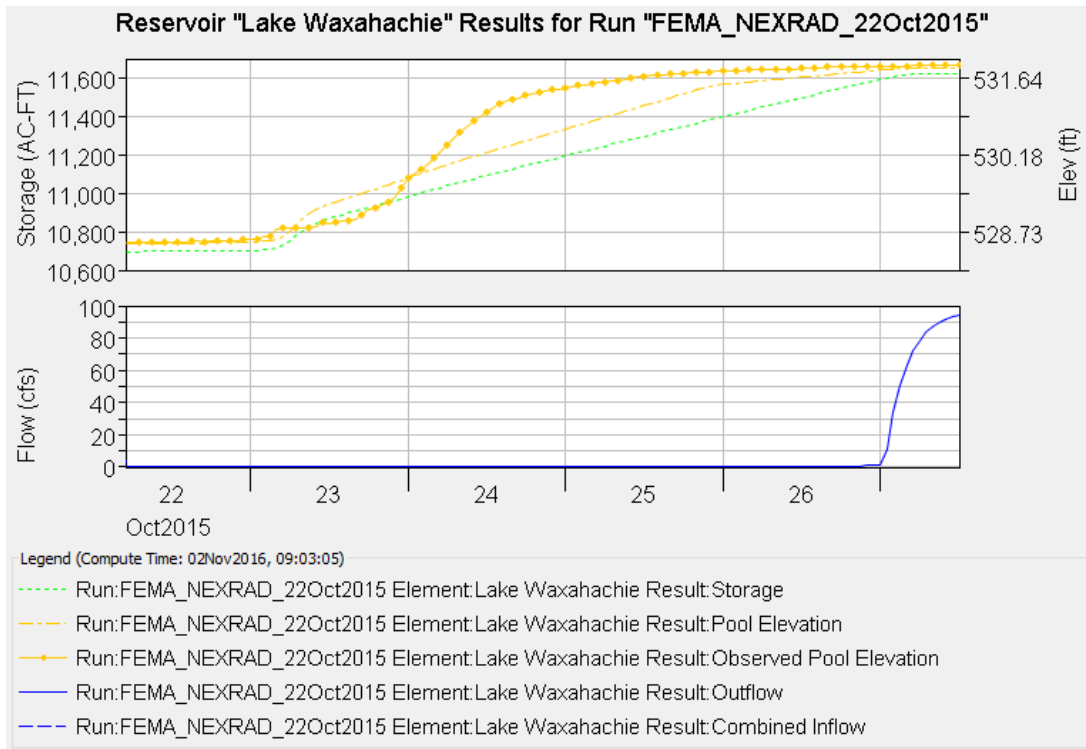


Figure 73d. October 2015 Calibration Results for Lake Waxahachie

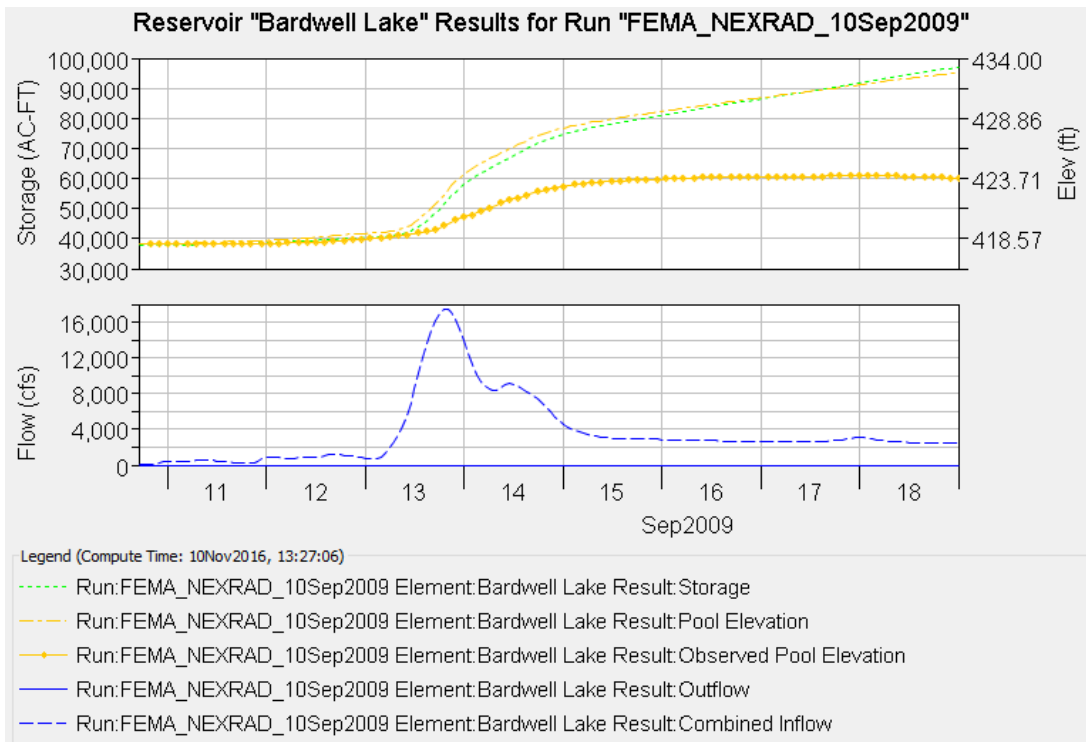


Figure 74a. September 2009 Calibration Results for Bardwell Lake

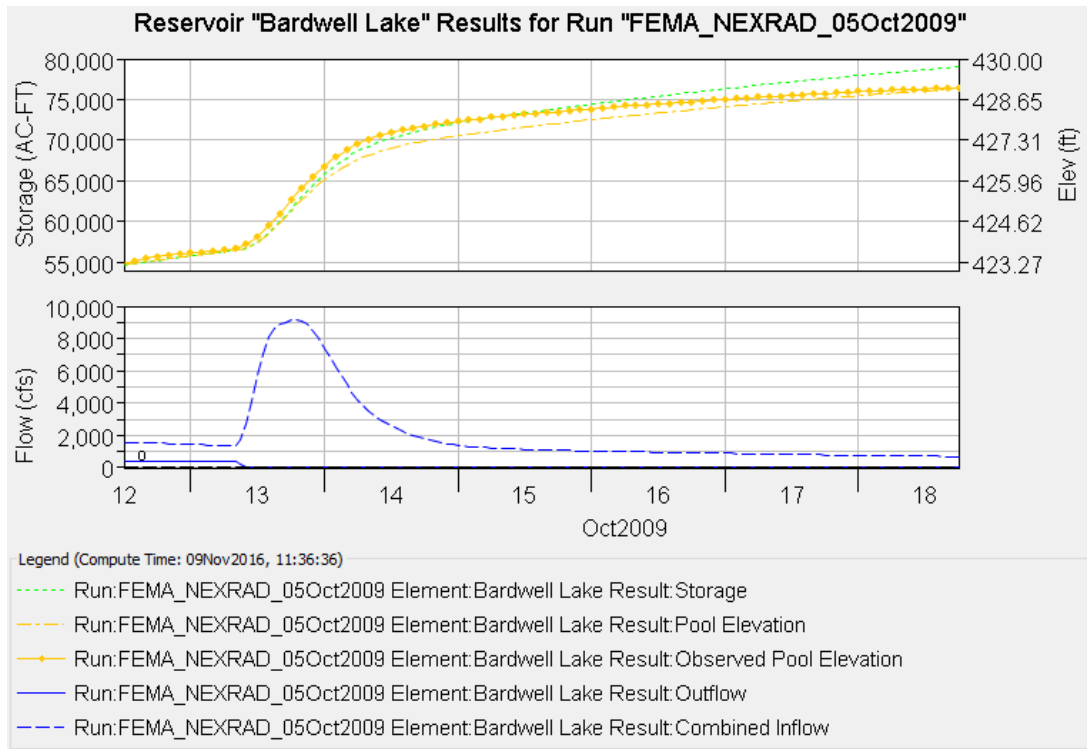


Figure 74b. October 2009 Calibration Results for Bardwell Lake

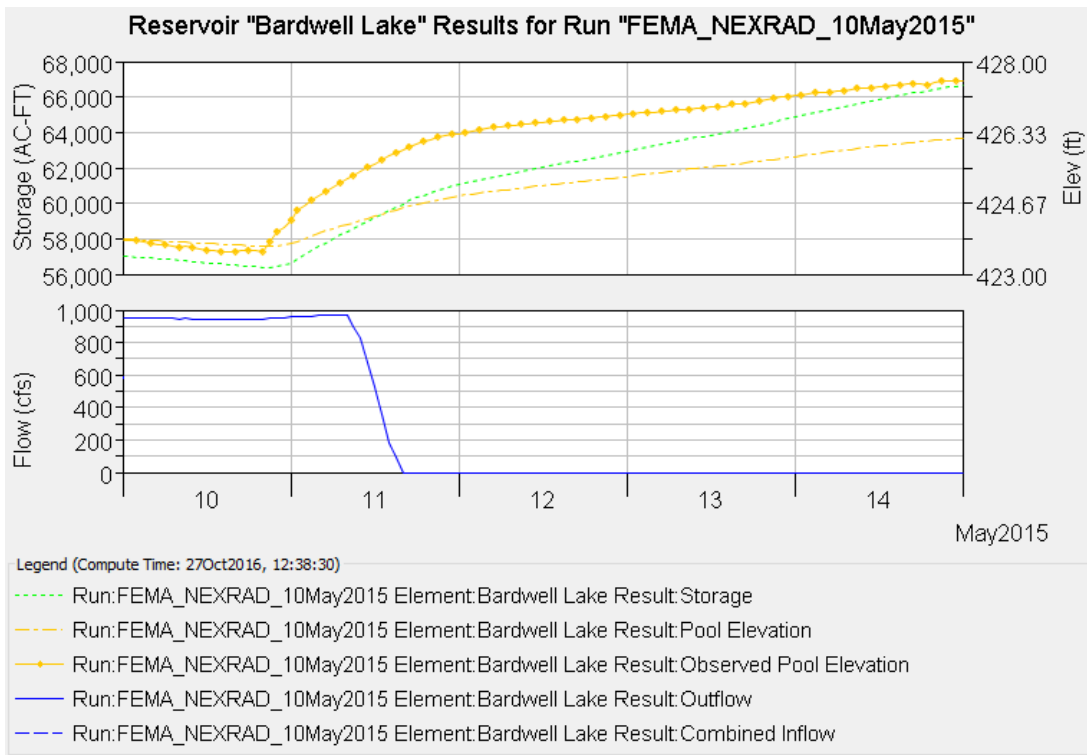


Figure 74c. May 2015 Calibration Results for Bardwell Lake

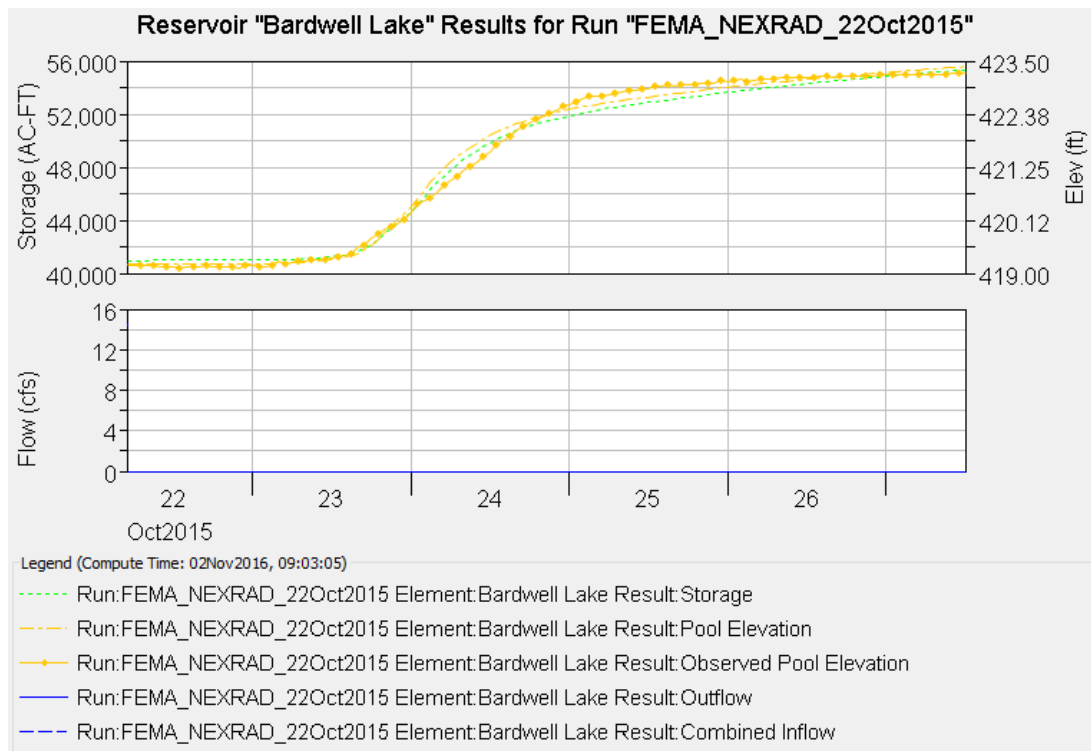


Figure 74d. October 2015 Calibration Results for Bardwell Lake

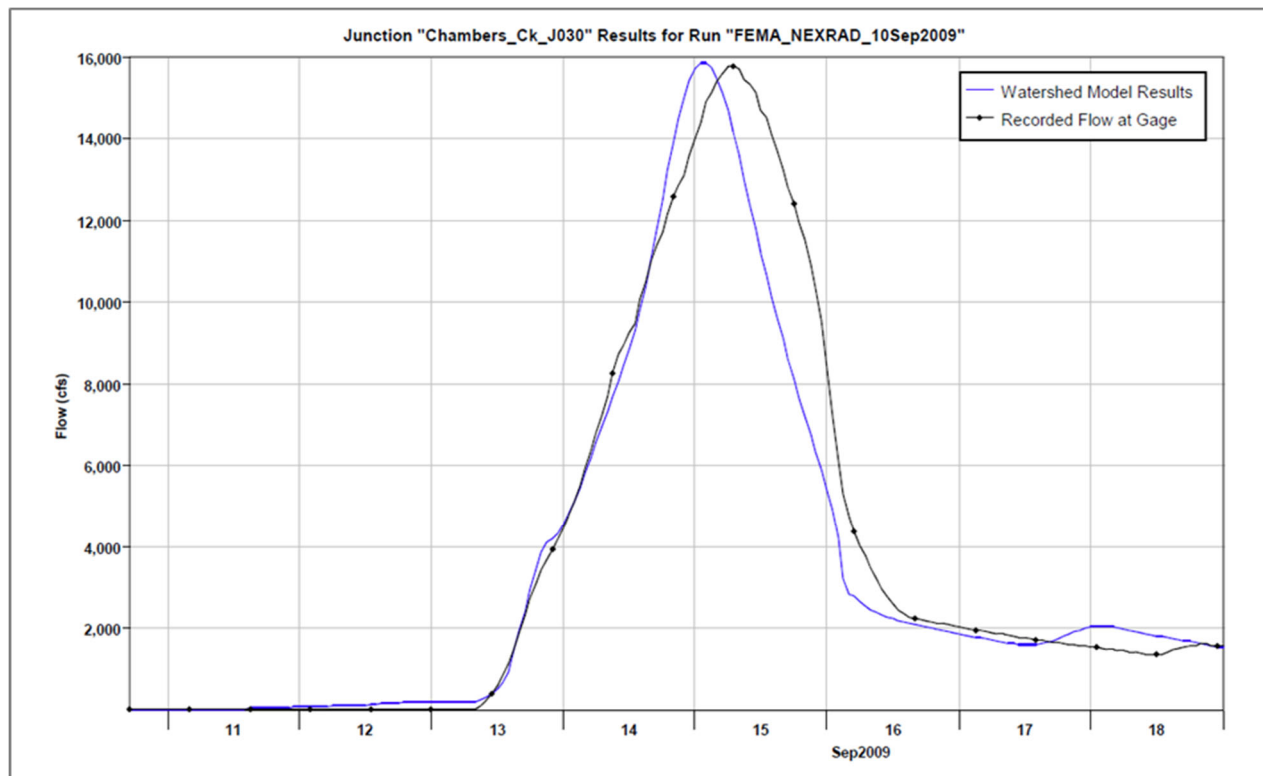


Figure 75a. September 10, 2009 Calibration Results for Chambers Creek near Rice, TX Gage

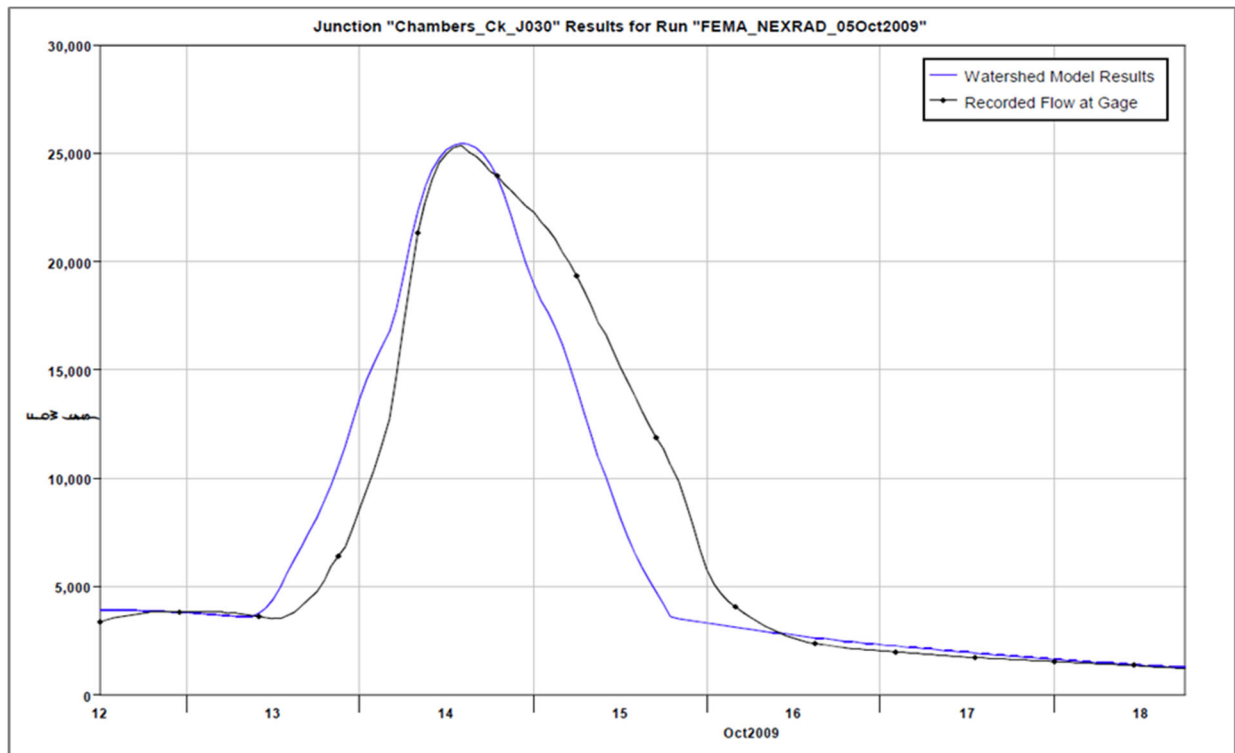


Figure 75b. October 5, 2009 Calibration Results for Chambers Creek near Rice, TX Gage

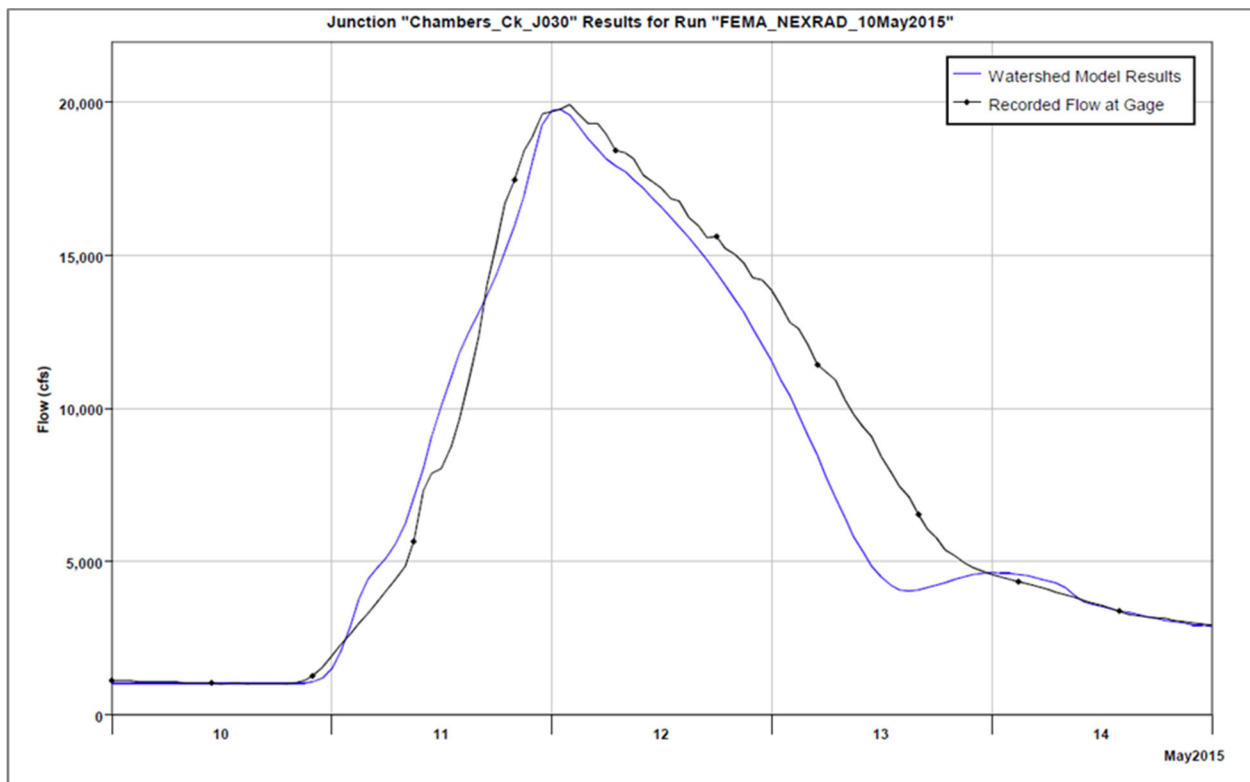


Figure 75c. May 10, 2015 Calibration Results for Chambers Creek near Rice, TX Gage

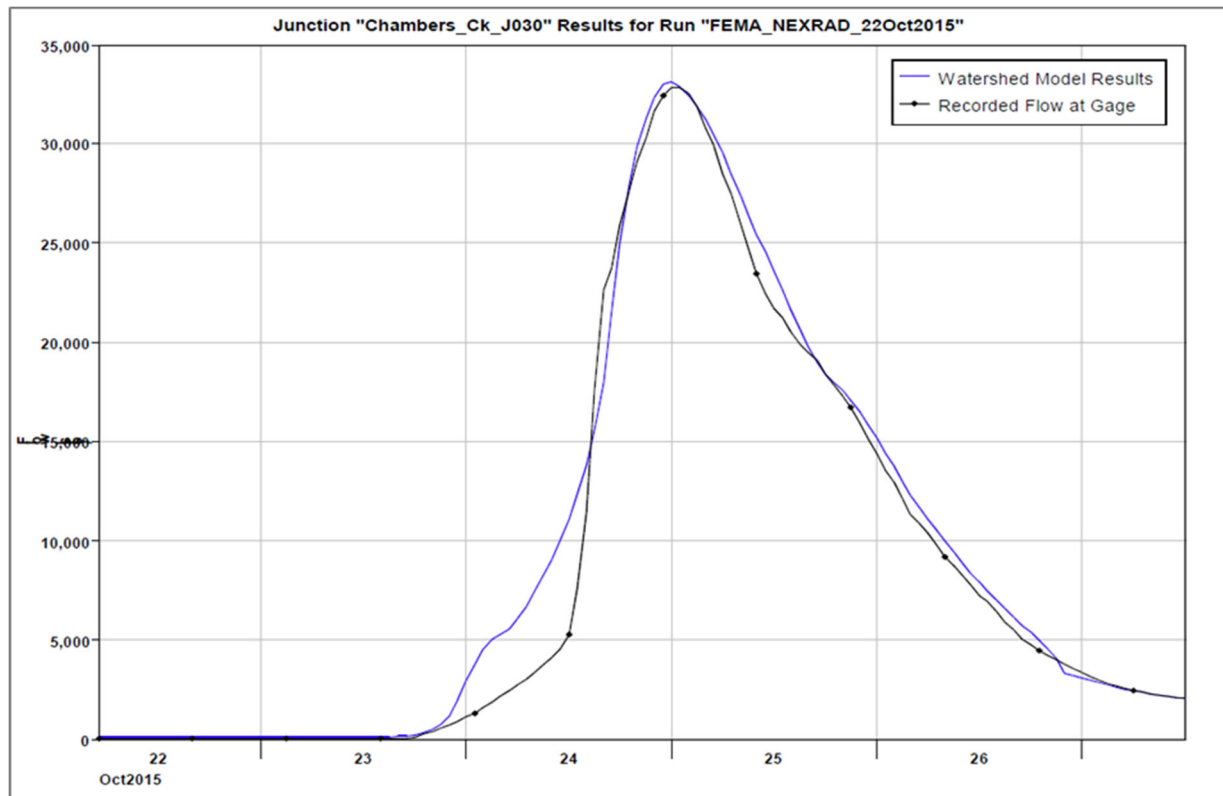


Figure 75d. October 22, 2015 Calibration Results for Chambers Creek near Rice, TX Gage

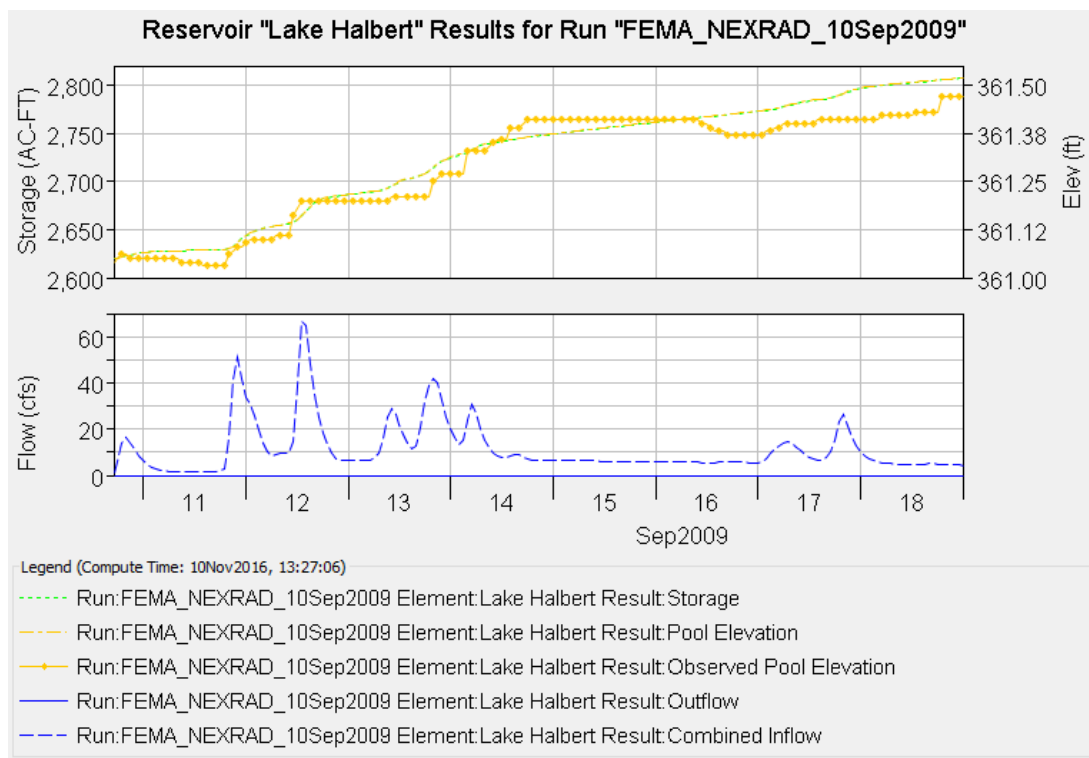


Figure 76a. September 2009 Calibration Results for Lake Halbert

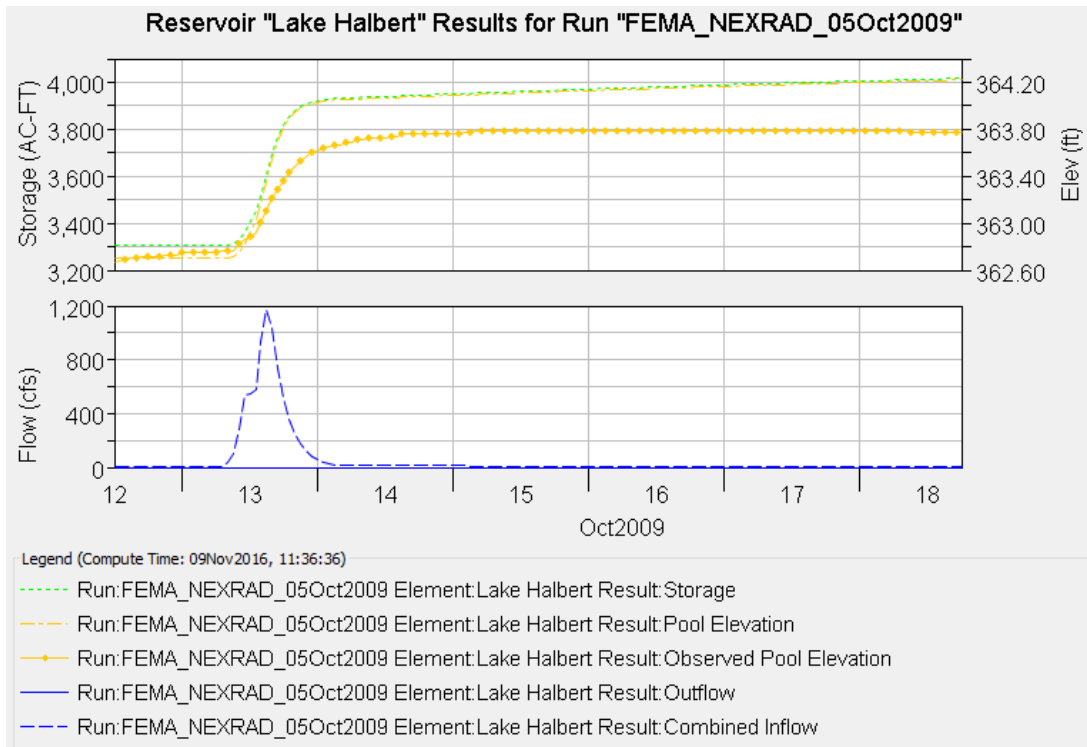


Figure 76b. October 2009 Calibration Results for Lake Halbert

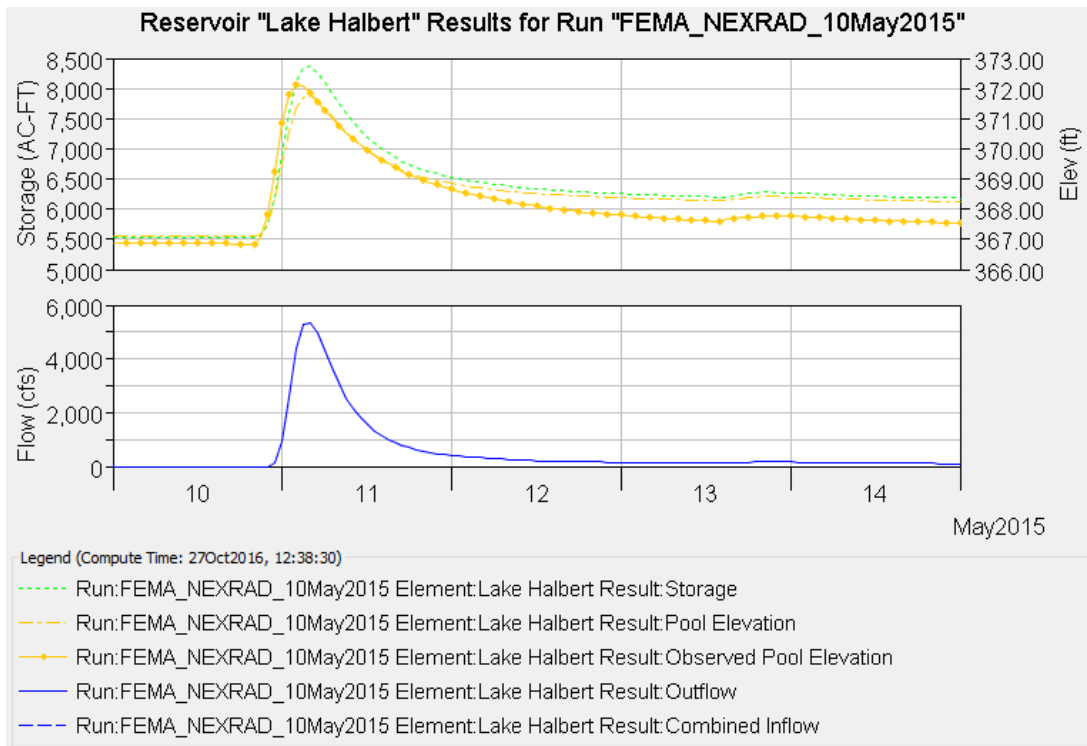


Figure 76c. May 2015 Calibration Results for Lake Halbert

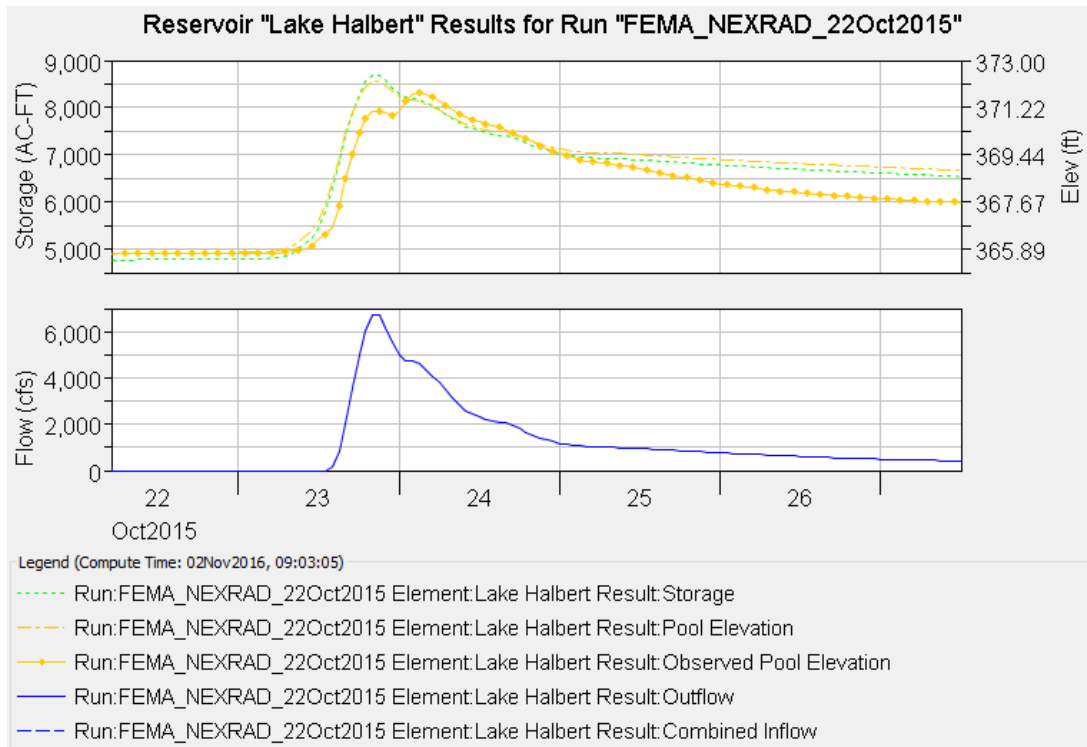


Figure 76d. October 2015 Calibration Results for Lake Halbert

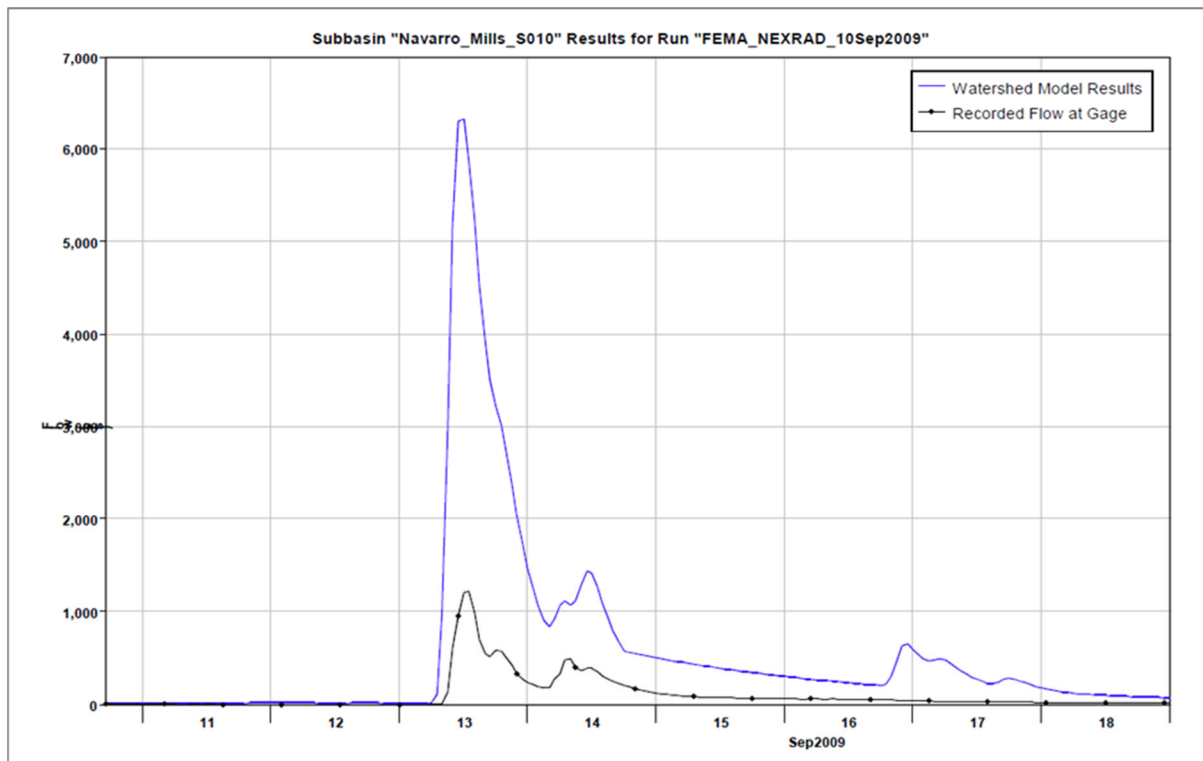


Figure 77a. September 10, 2009 Calibration Results for White Rock Creek near Irene, TX Gage

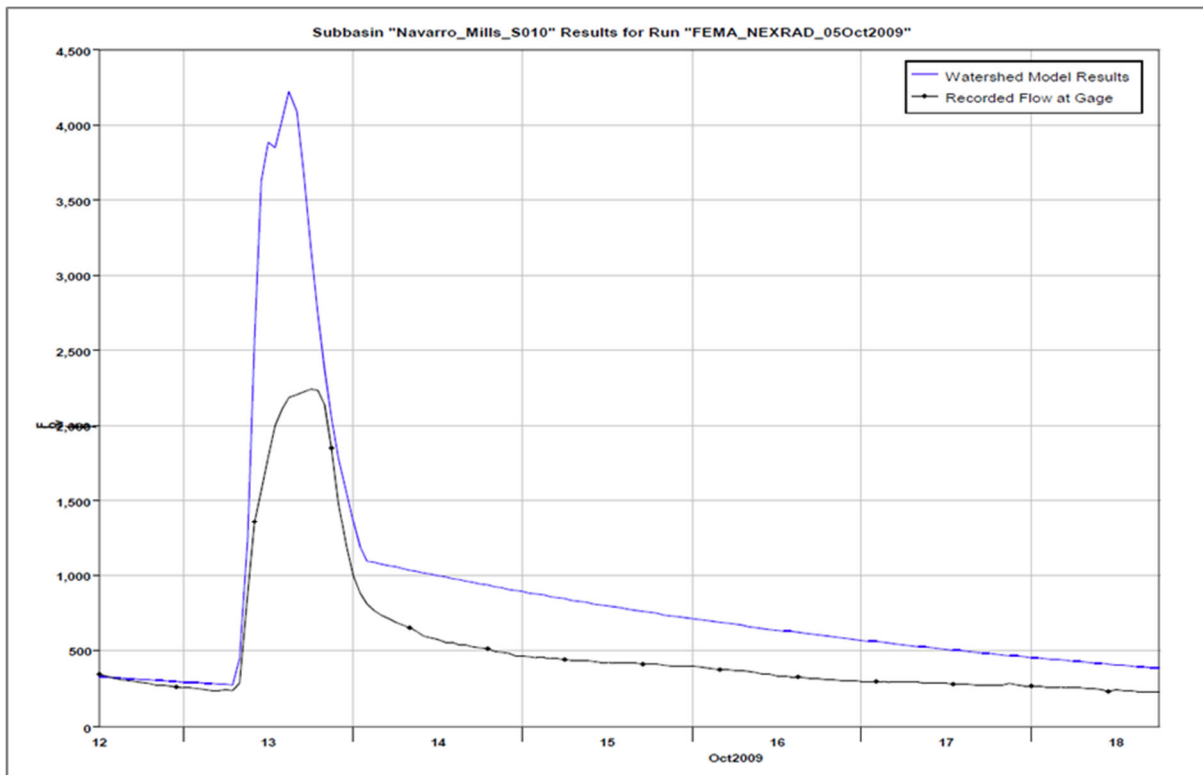


Figure 77b. October 5, 2009 Calibration Results for White Rock Creek near Irene, TX Gage

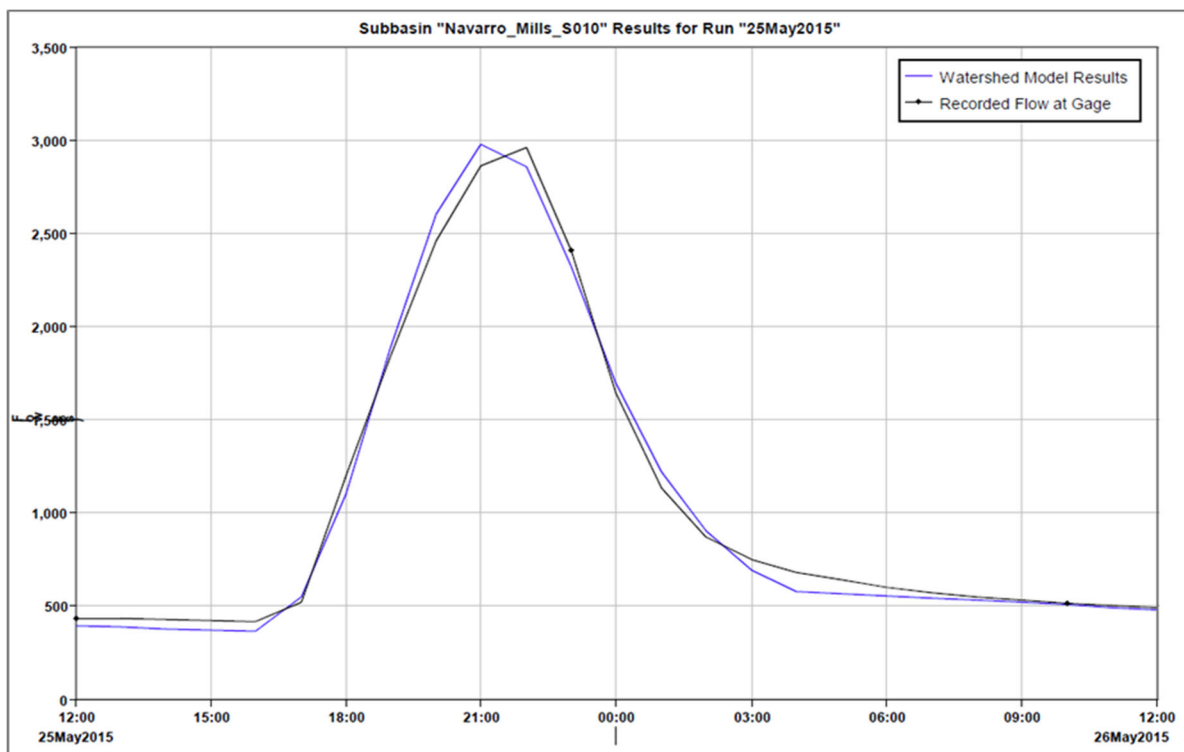


Figure 77c. May 25, 2015 Calibration Results for White Rock Creek near Irene, TX Gage

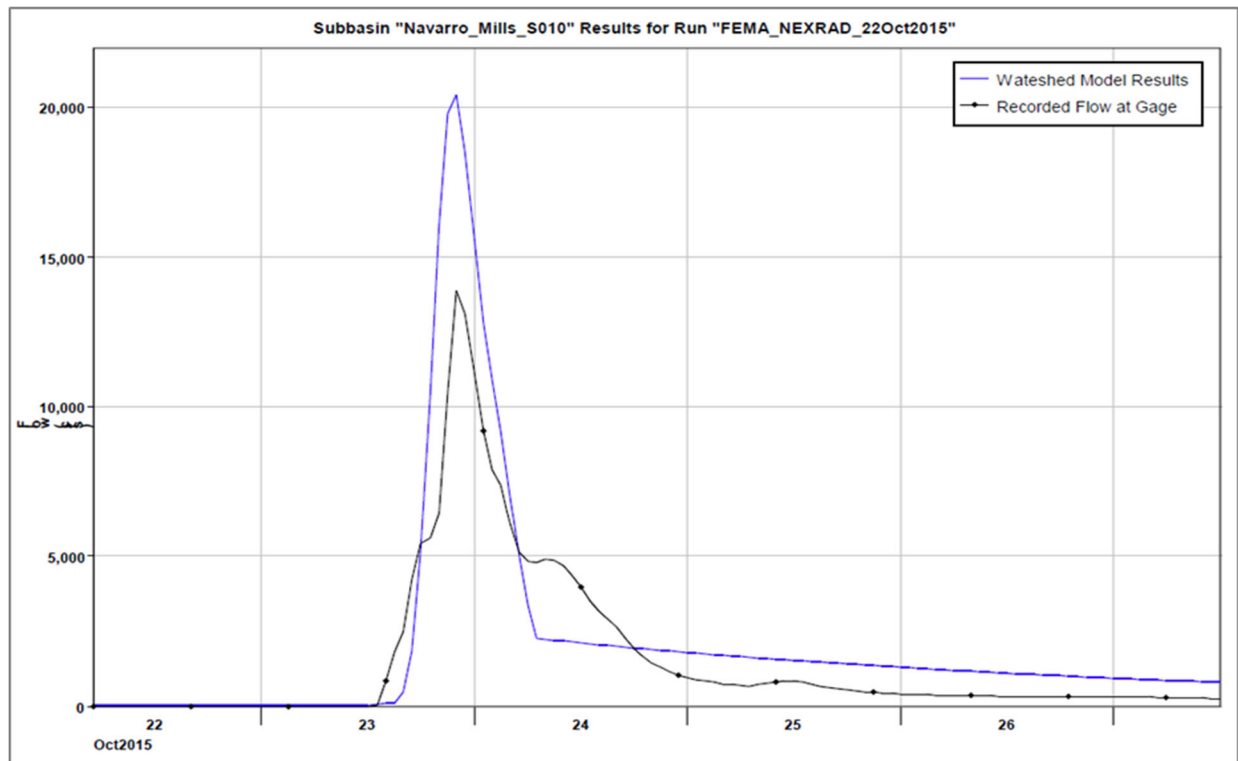


Figure 77d. October 22, 2015 Calibration Results for White Rock Creek near Irene, TX Gage

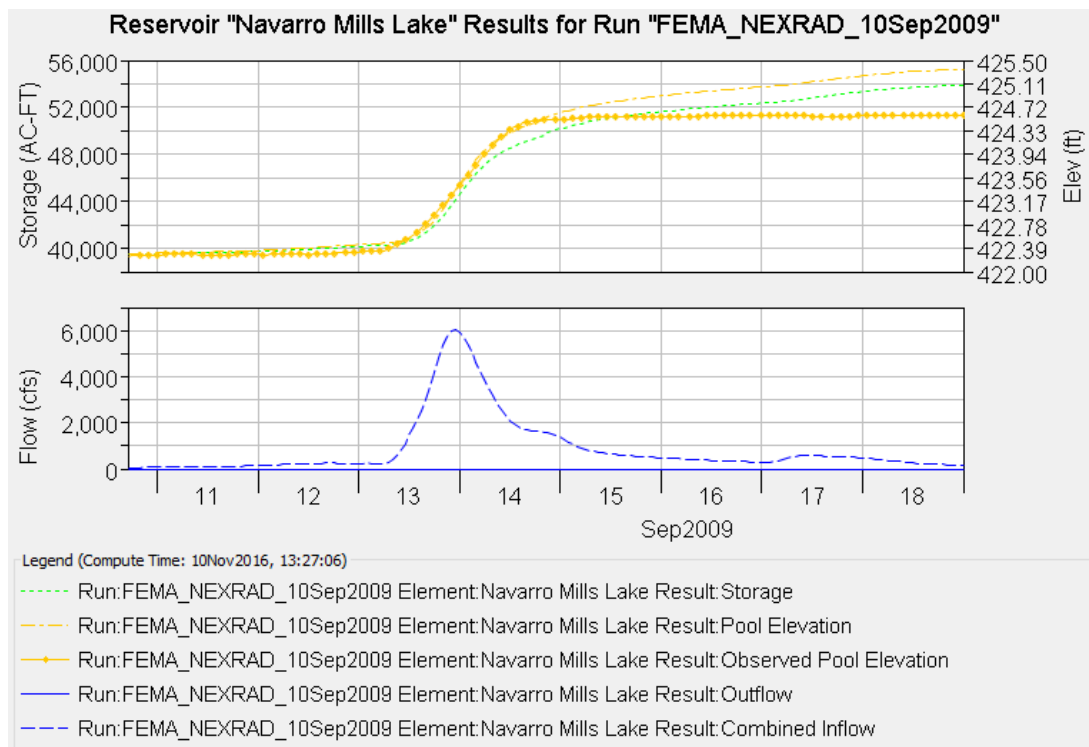


Figure 78a. September 2009 Calibration Results for Navarro Mills Reservoir

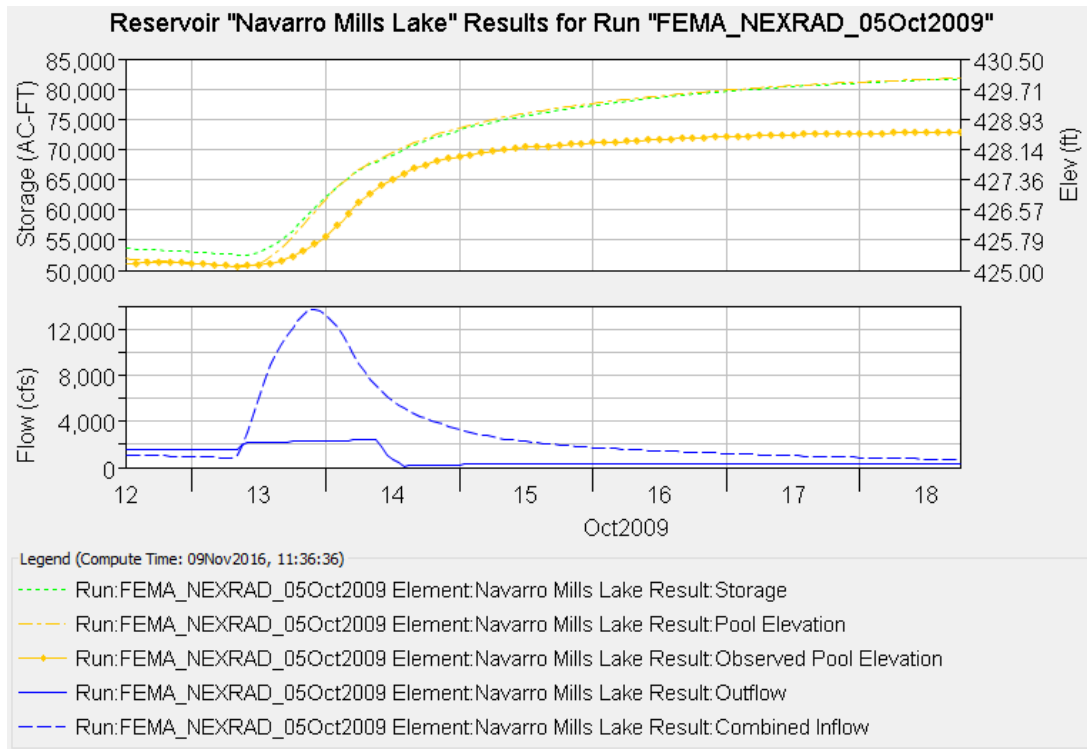


Figure 78b. October 2009 Calibration Results for Navarro Mills Reservoir

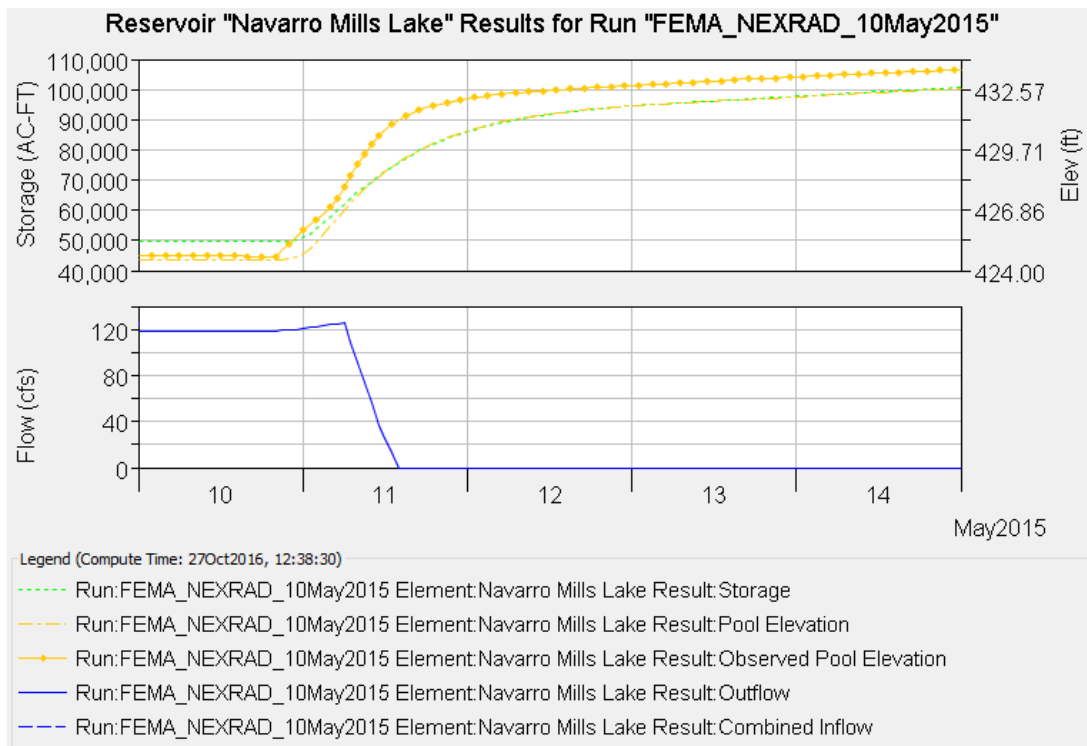


Figure 78c. May 2015 Calibration Results for Navarro Mills Reservoir

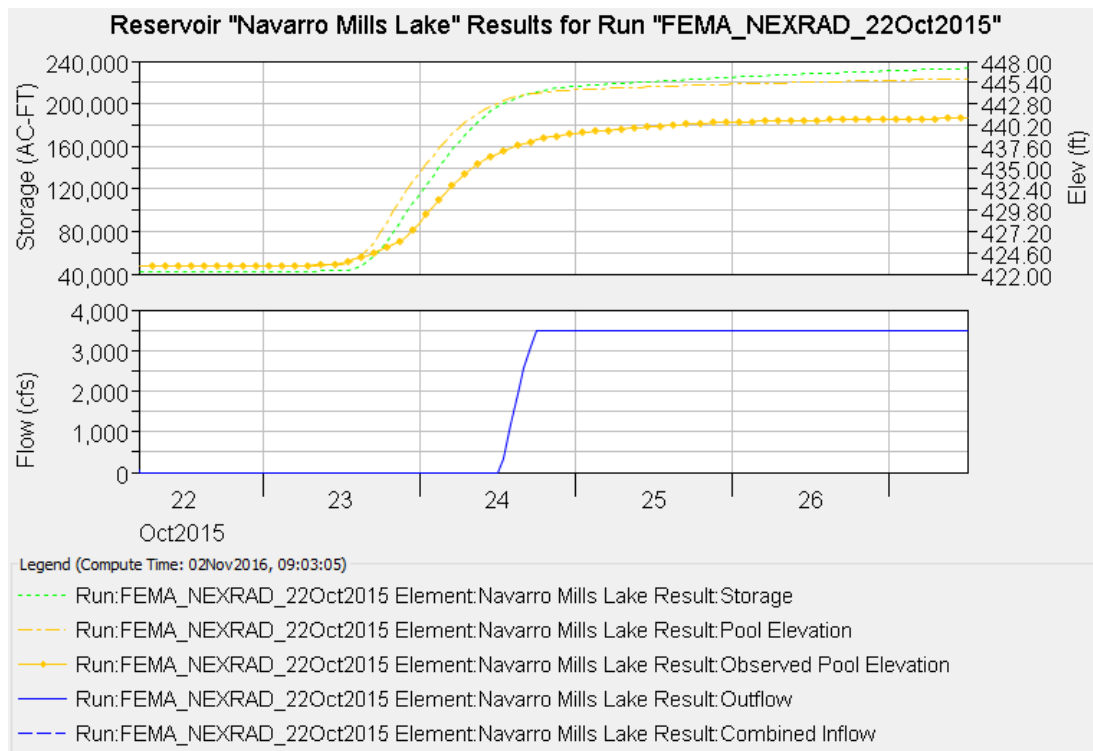


Figure 78d. October 2015 Calibration Results for Navarro Mills Reservoir

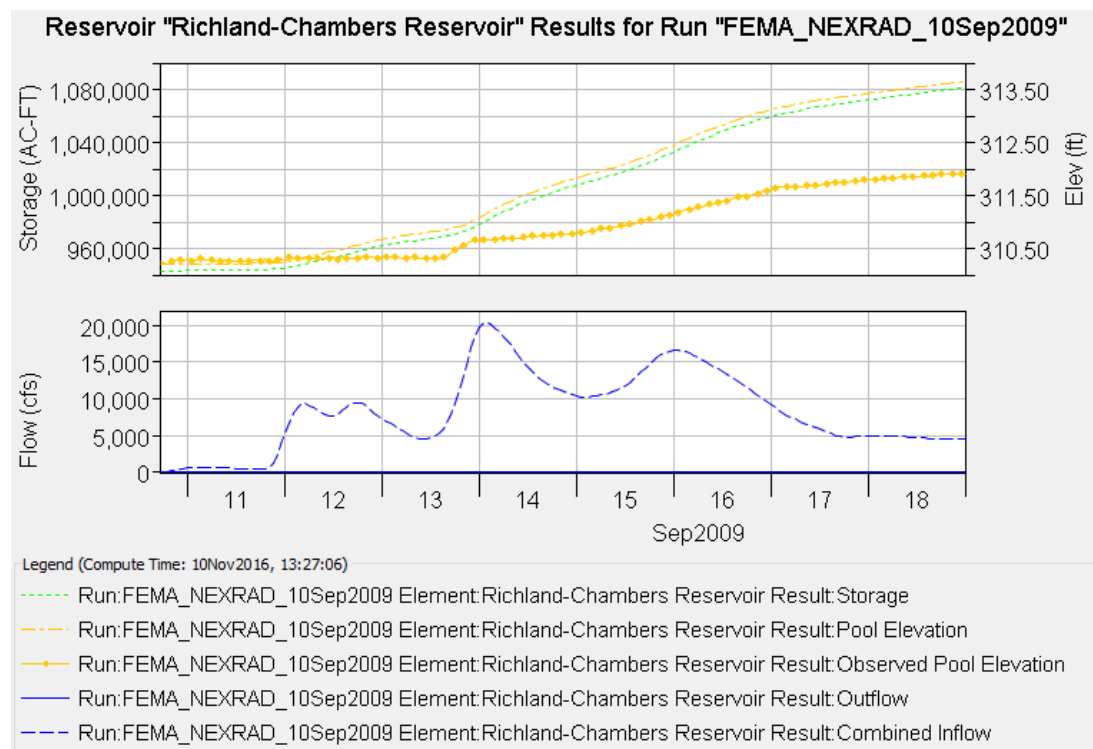


Figure 79a. September 2009 Calibration Results for Richland-Chambers Reservoir

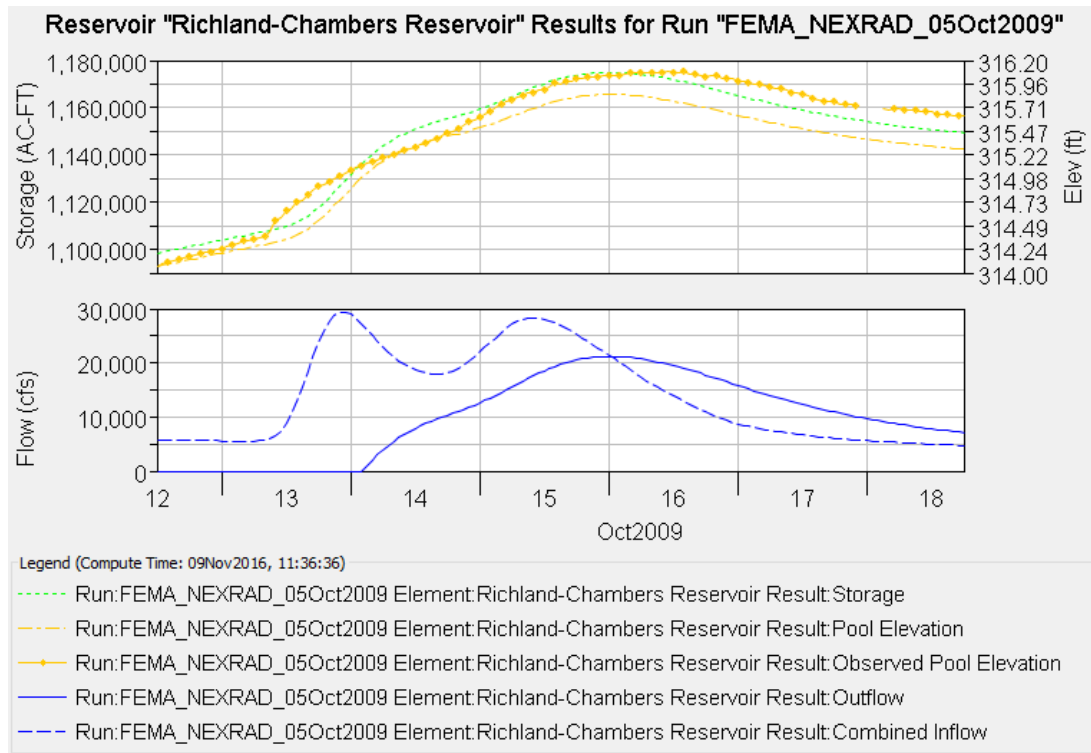


Figure 79b. October 2009 Calibration Results for Richland-Chambers Reservoir

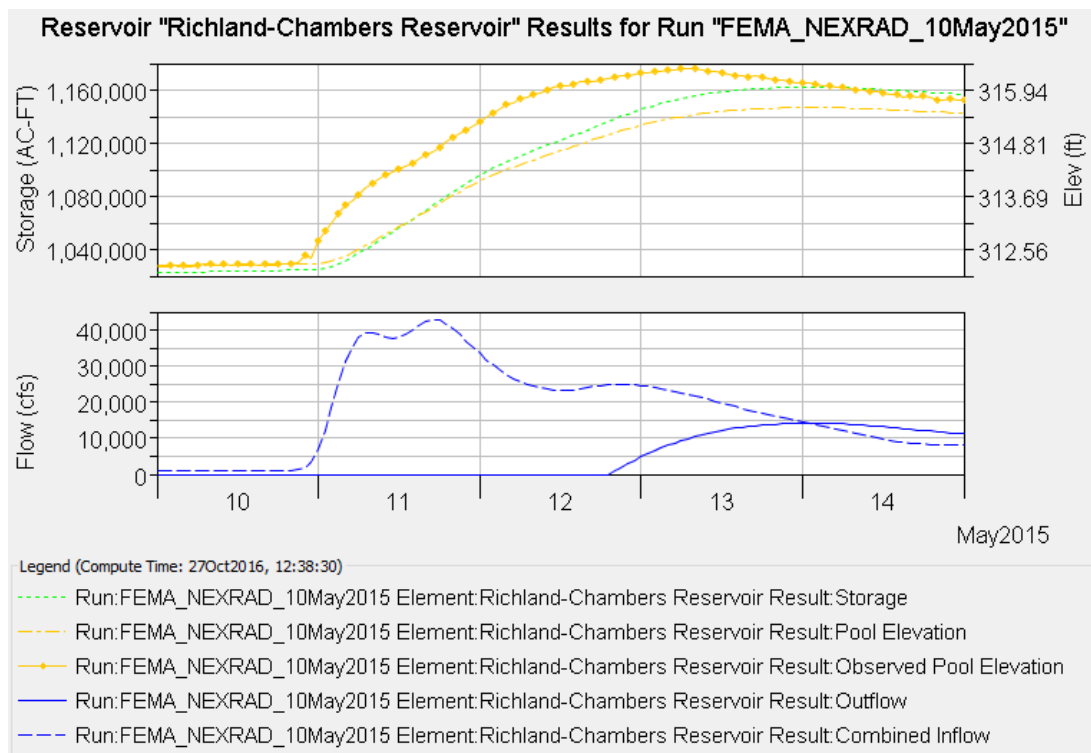


Figure 79c. May 2015 Calibration Results for Richland-Chambers Reservoir

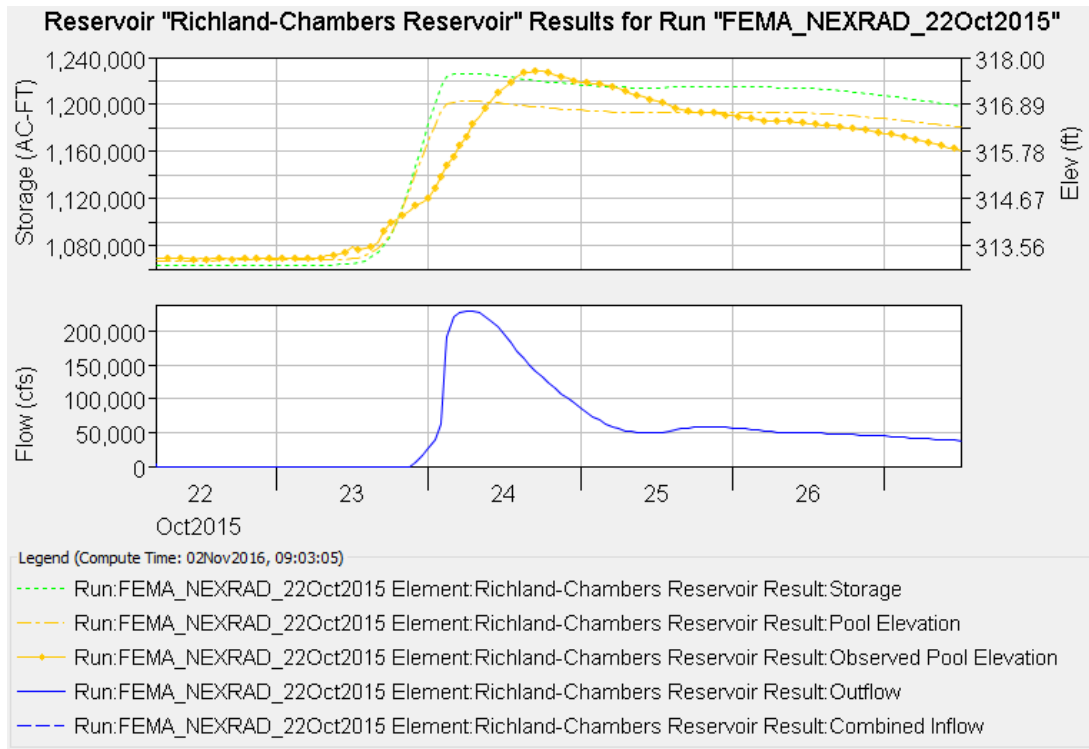


Figure 79d. October 2015 Calibration Results for Richland-Chambers Reservoir

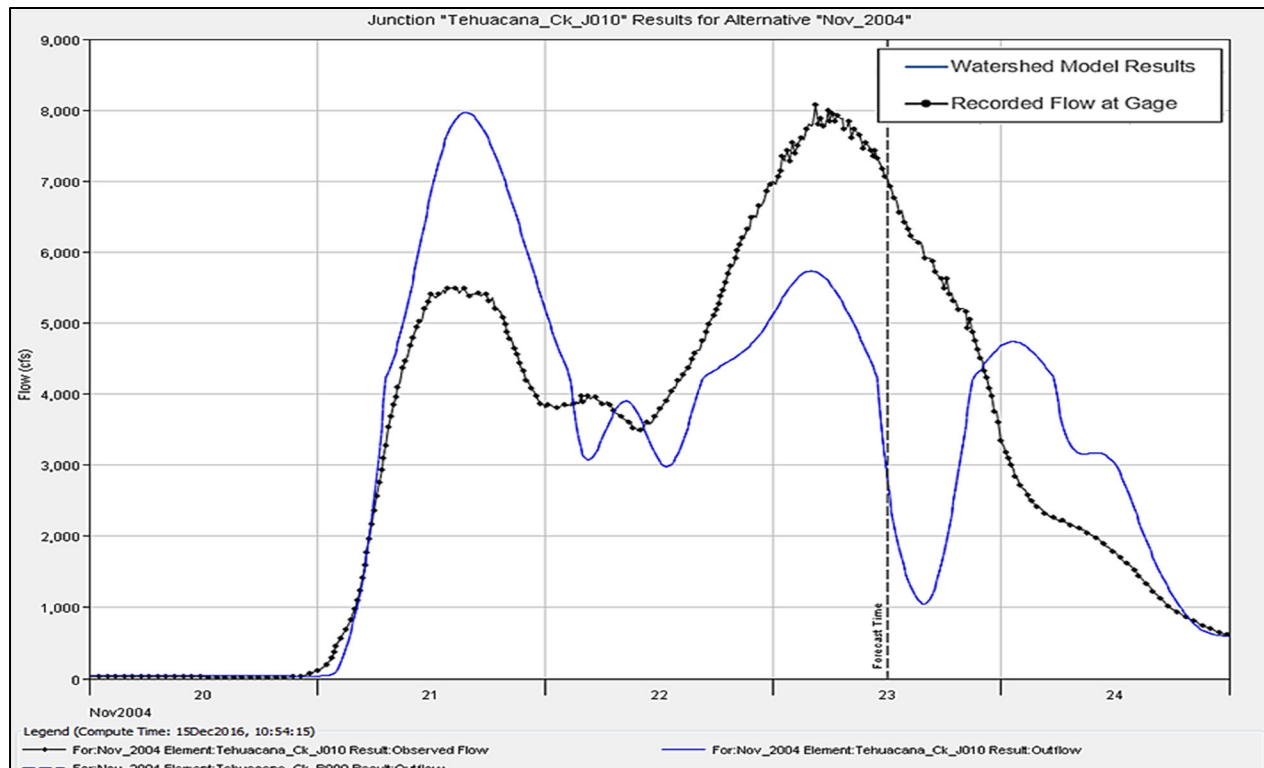


Figure 80a. November 23, 2004 Calibration for the Tehuacana Creek near Streetman, TX Gage

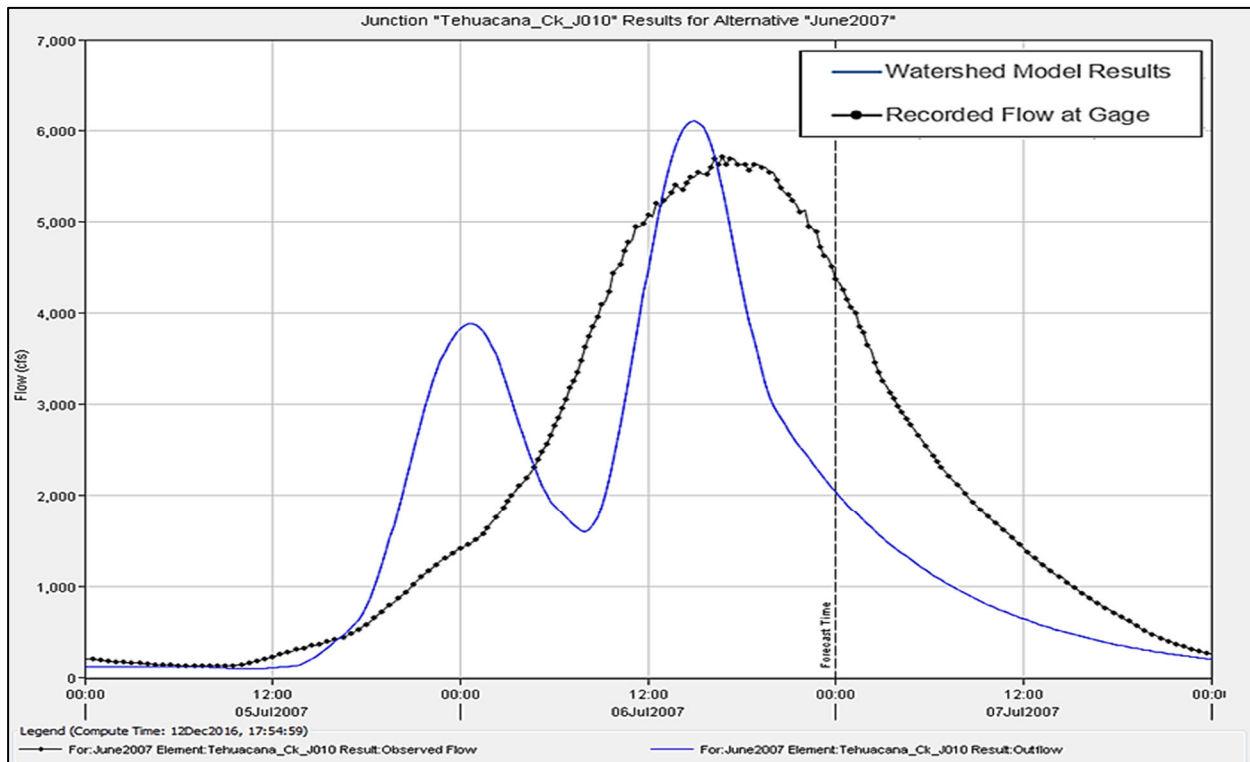


Figure 80b. July 6, 2007 Calibration for the Tehuacana Creek near Streetman, TX Gage

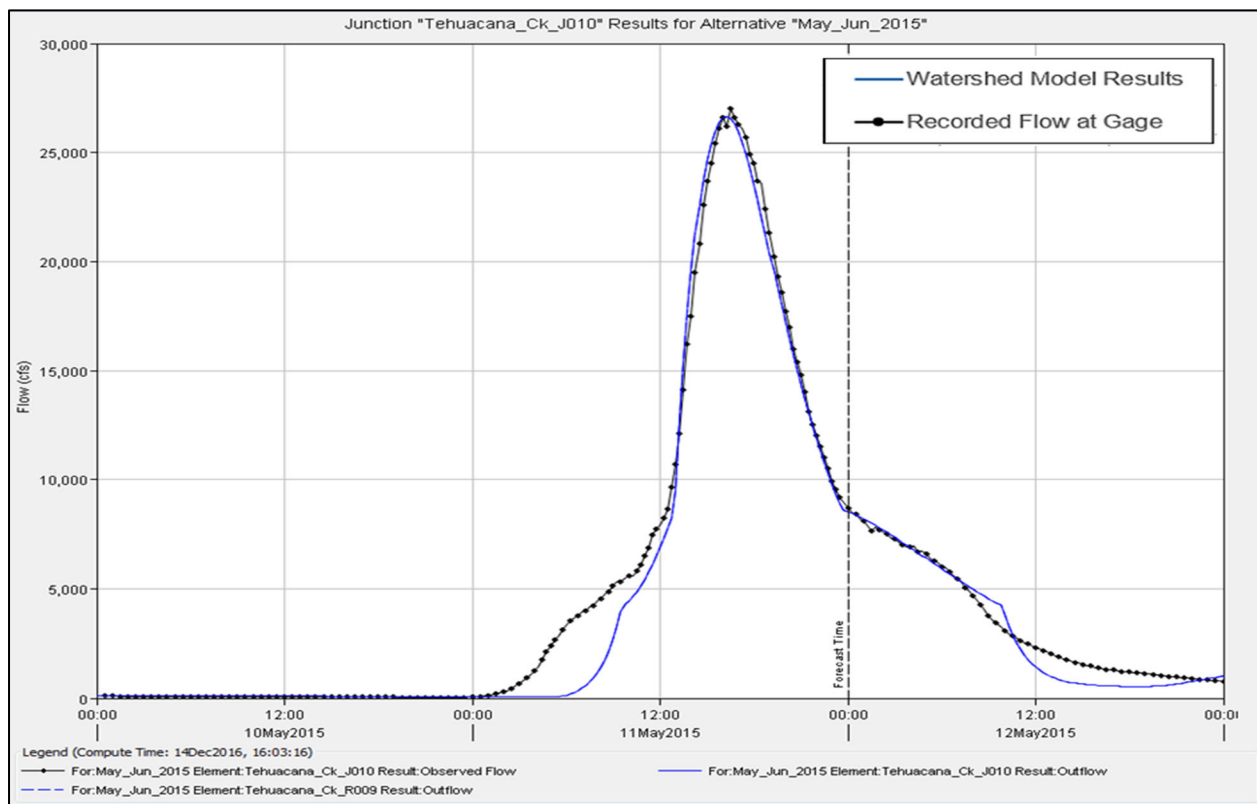


Figure 80c. May 11, 2015 Calibration for the Tehuacana Creek near Streetman, TX Gage

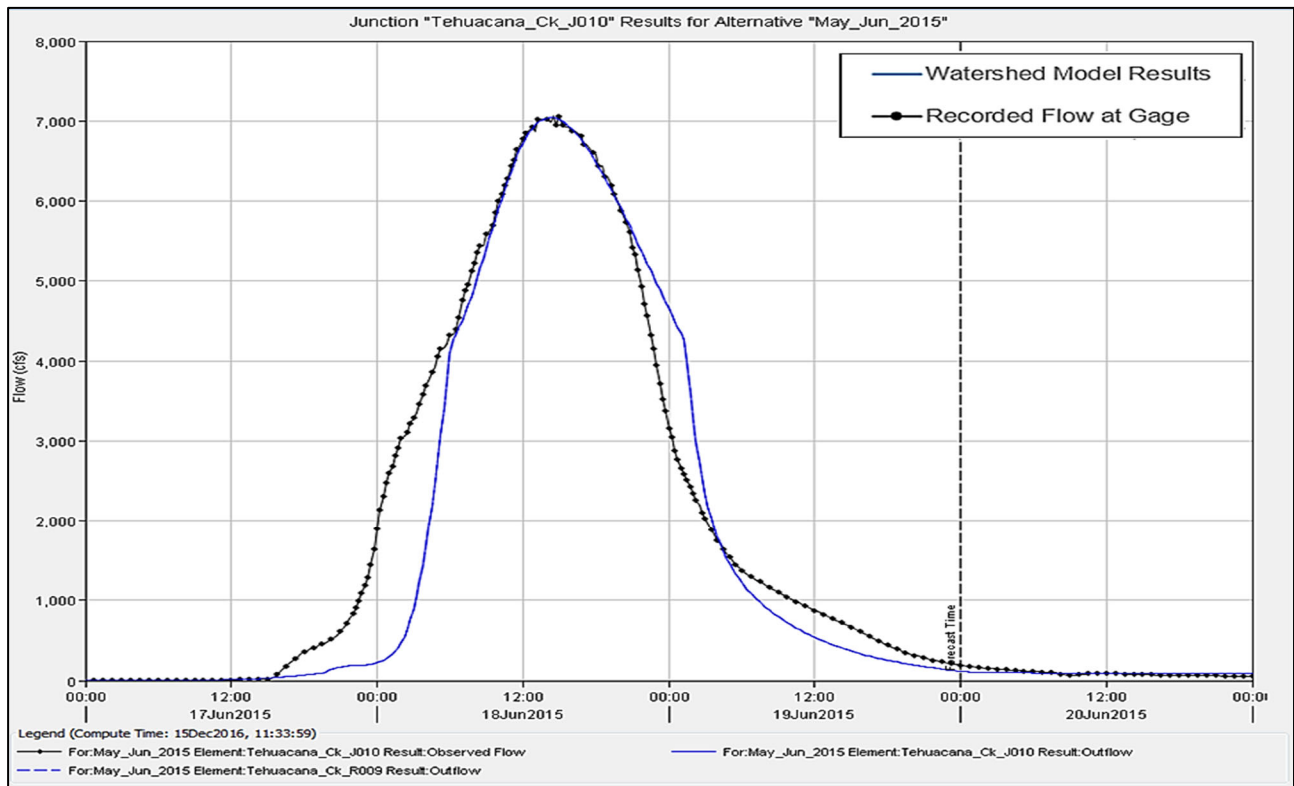


Figure 80d. June 18, 2015 Calibration for the Tehuacana Creek near Streetman, TX Gage

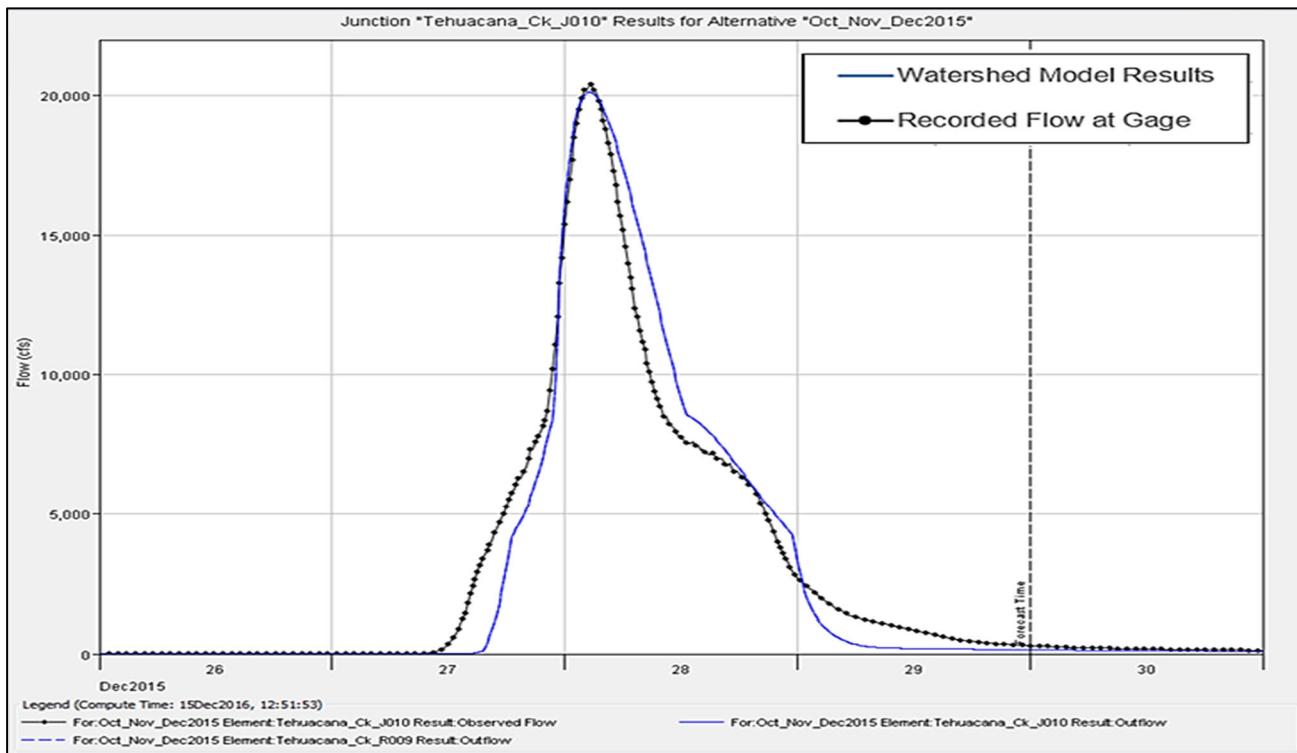


Figure 80e. December 28, 2015 Calibration for the Tehuacana Creek near Streetman, TX Gage

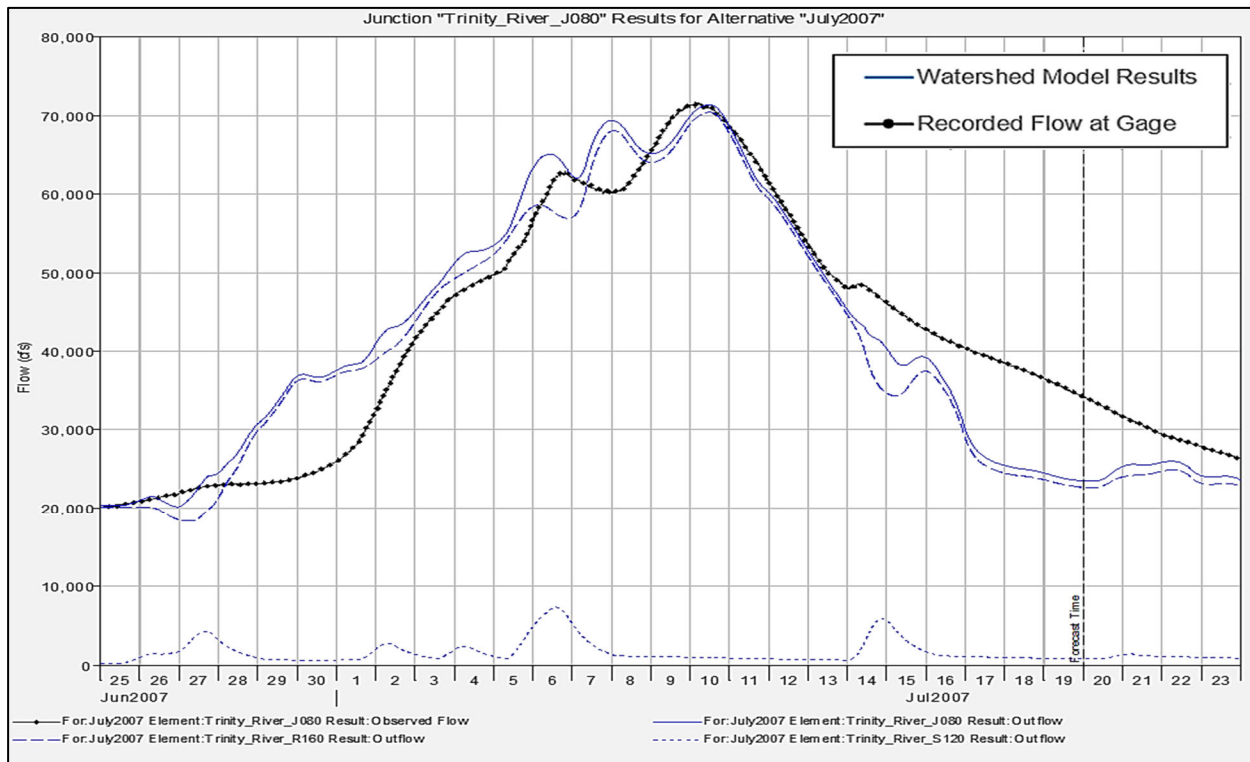


Figure 81a. July 9, 2007 Calibration for the Trinity River near Oakwood, TX Gage

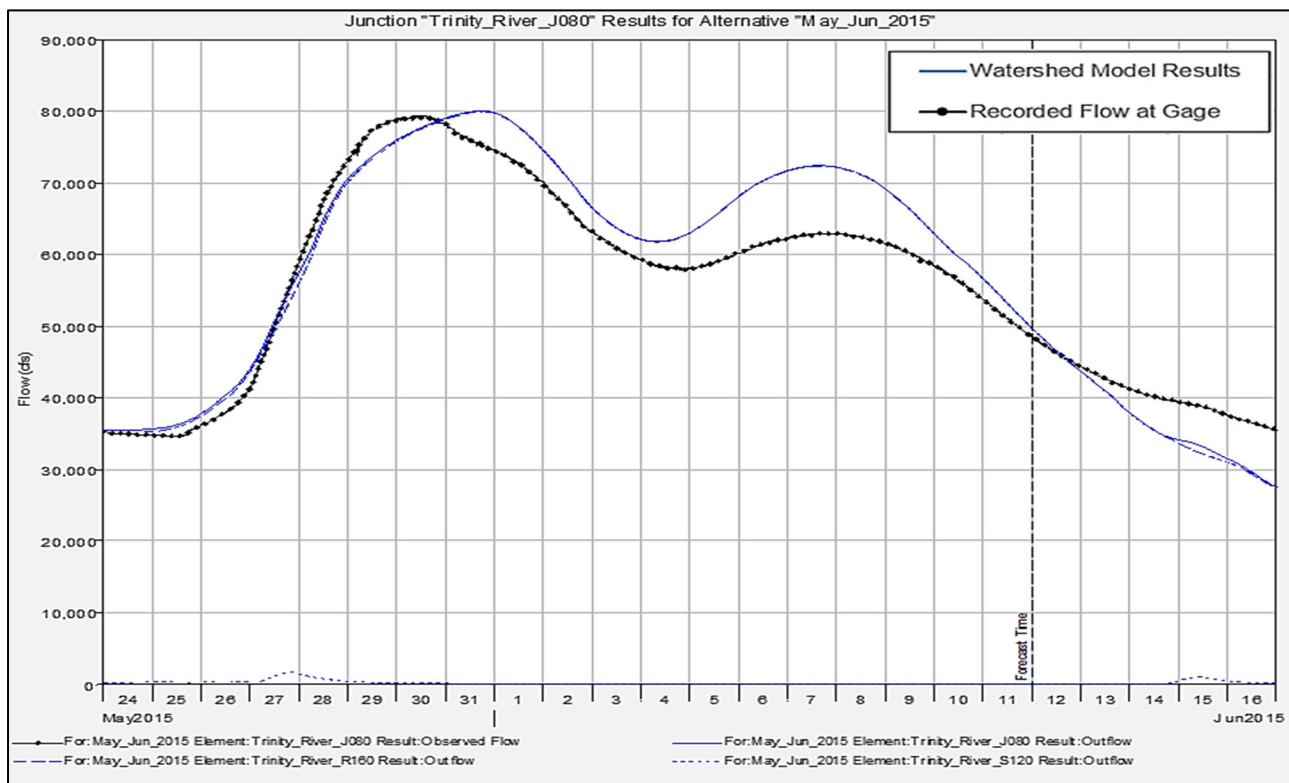


Figure 81b. May 29, 2015 Calibration for the Trinity River near Oakwood, TX Gage

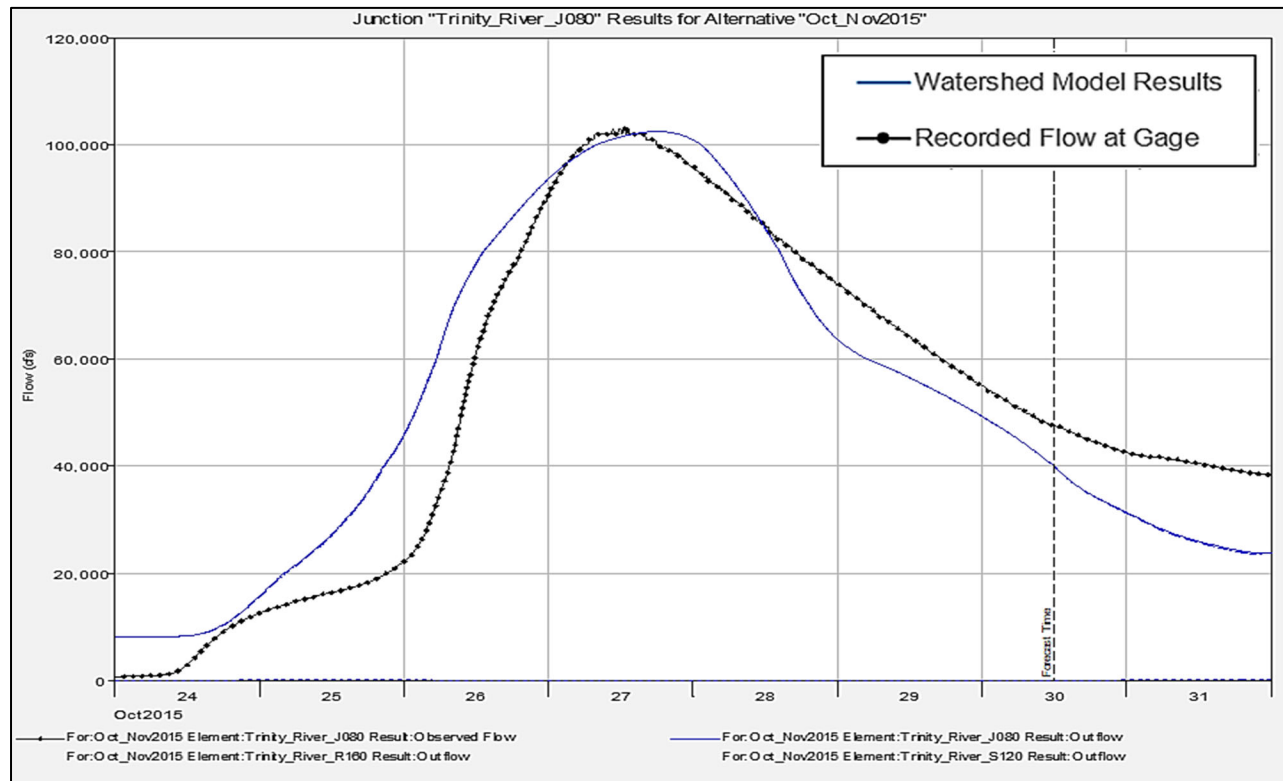


Figure 81c. October 27, 2015 Calibration for the Trinity River near Oakwood, TX Gage

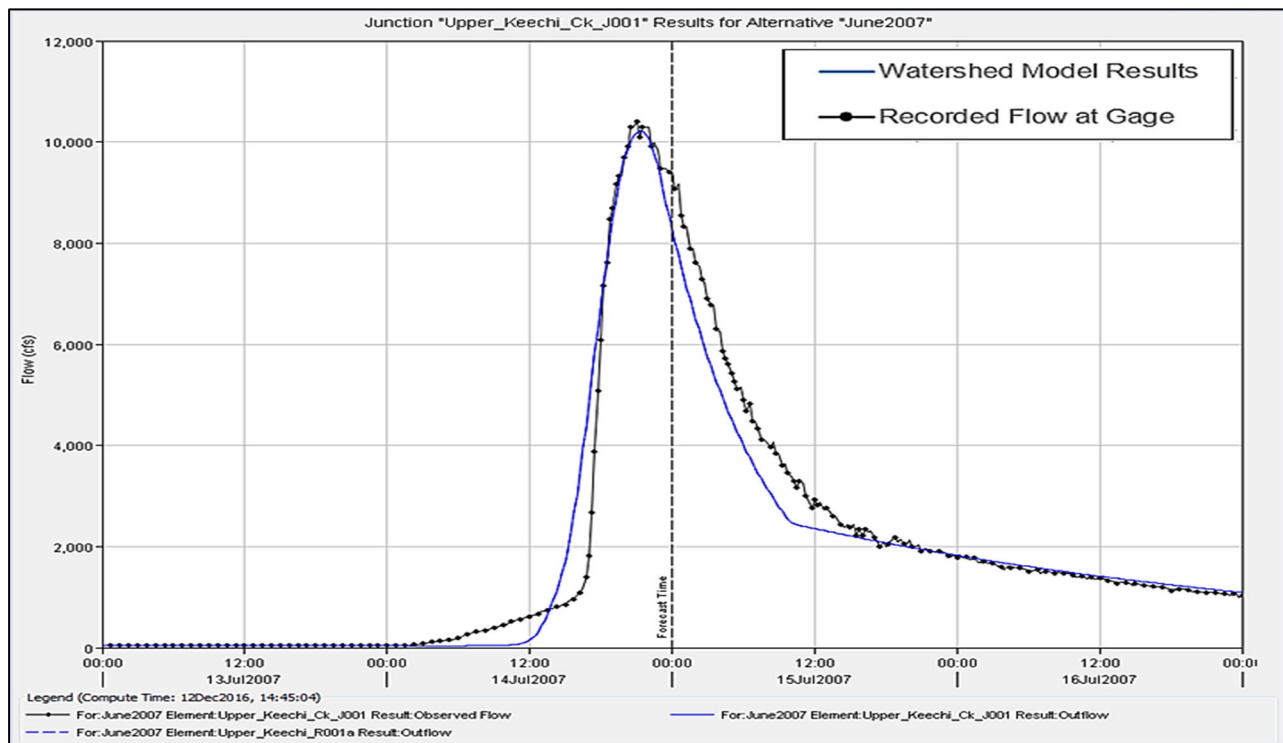


Figure 82a. July 14, 2007 Calibration for the Upper Keechi Creek near Oakwood, TX Gage

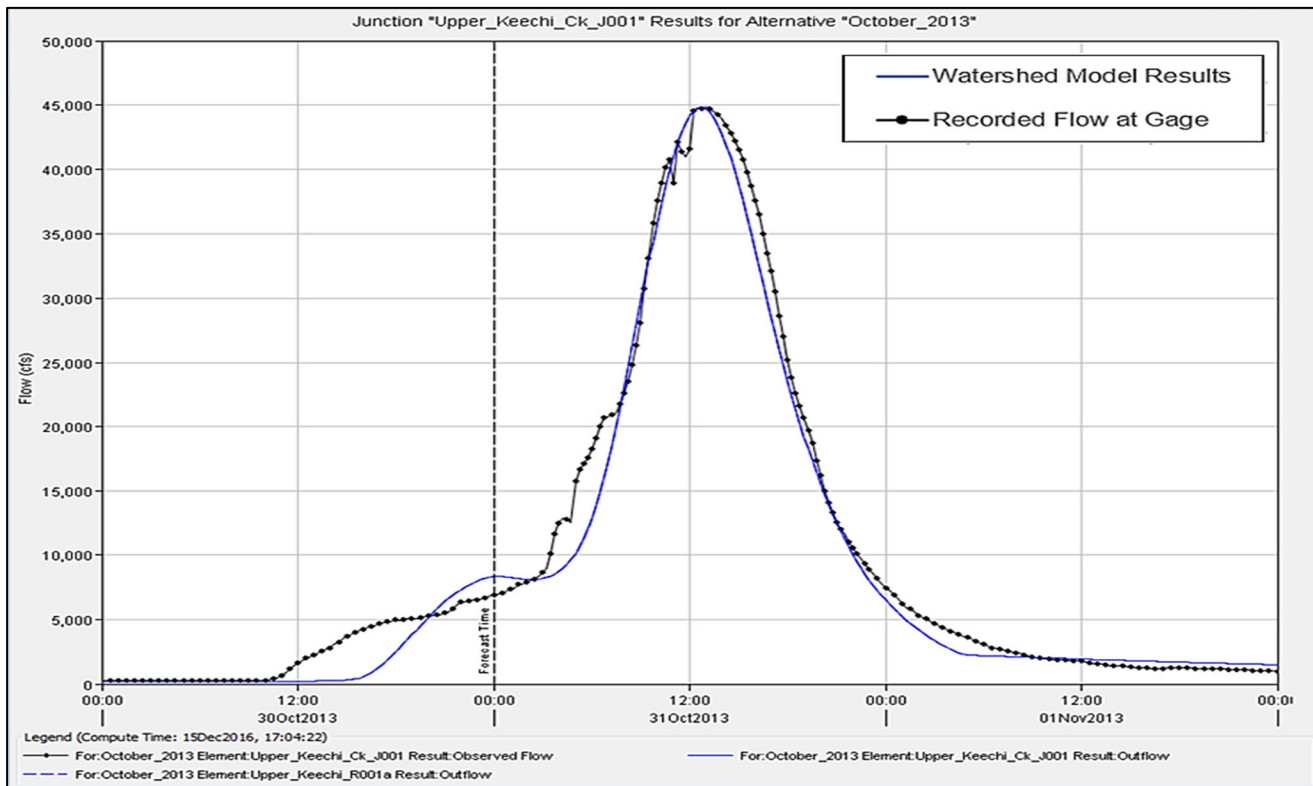


Figure 82b. October 31, 2013 Calibration for the Upper Keechi Creek near Oakwood, TX Gage

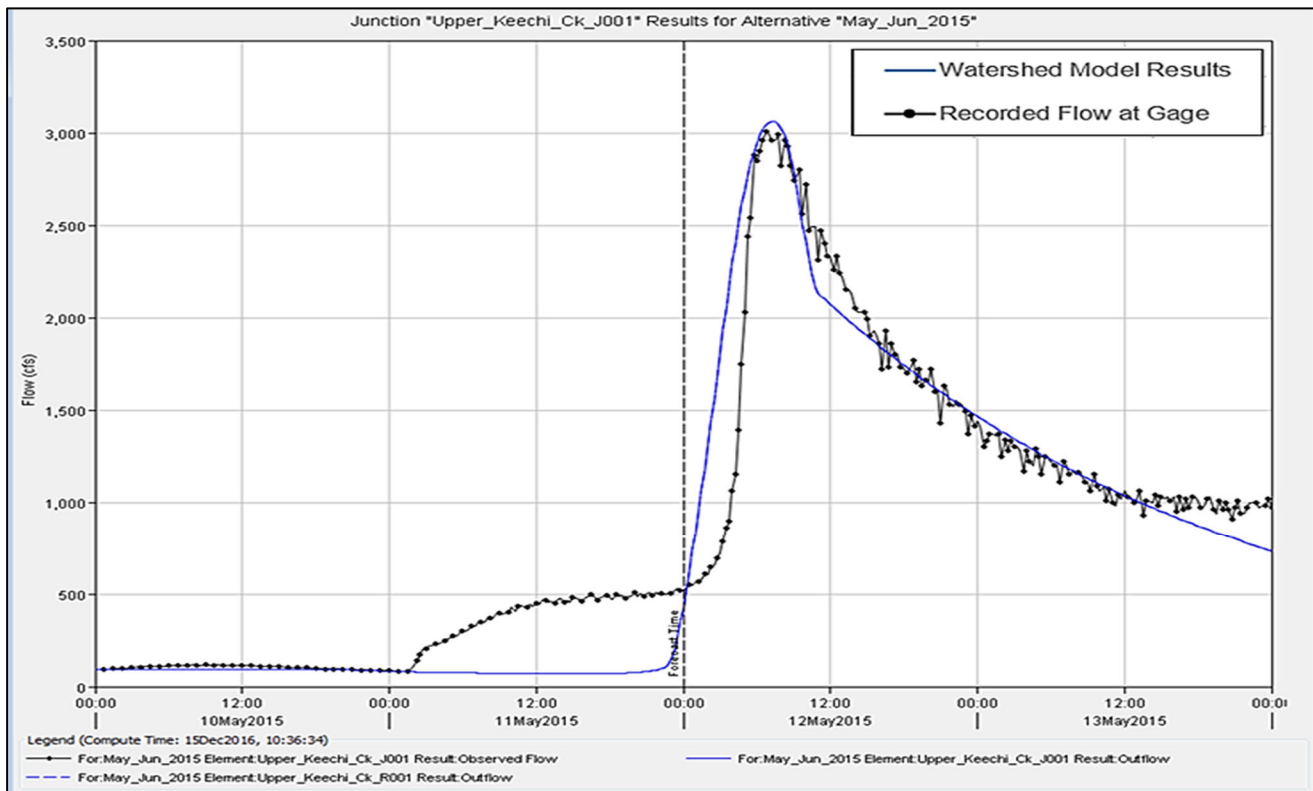


Figure 82c. May 12, 2015 Calibration for the Upper Keechi Creek near Oakwood, TX Gage

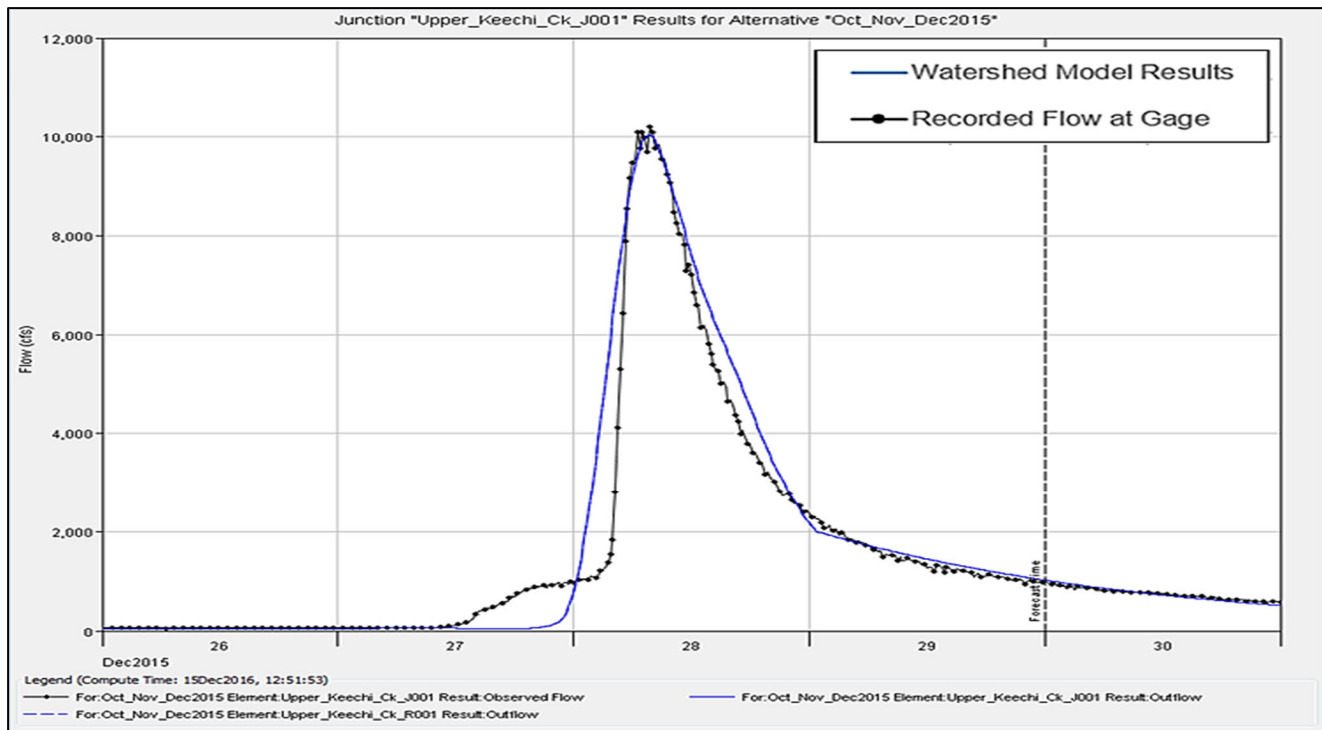


Figure 82d. December 28, 2015 Calibration for the Upper Keechi Creek near Oakwood, TX Gage

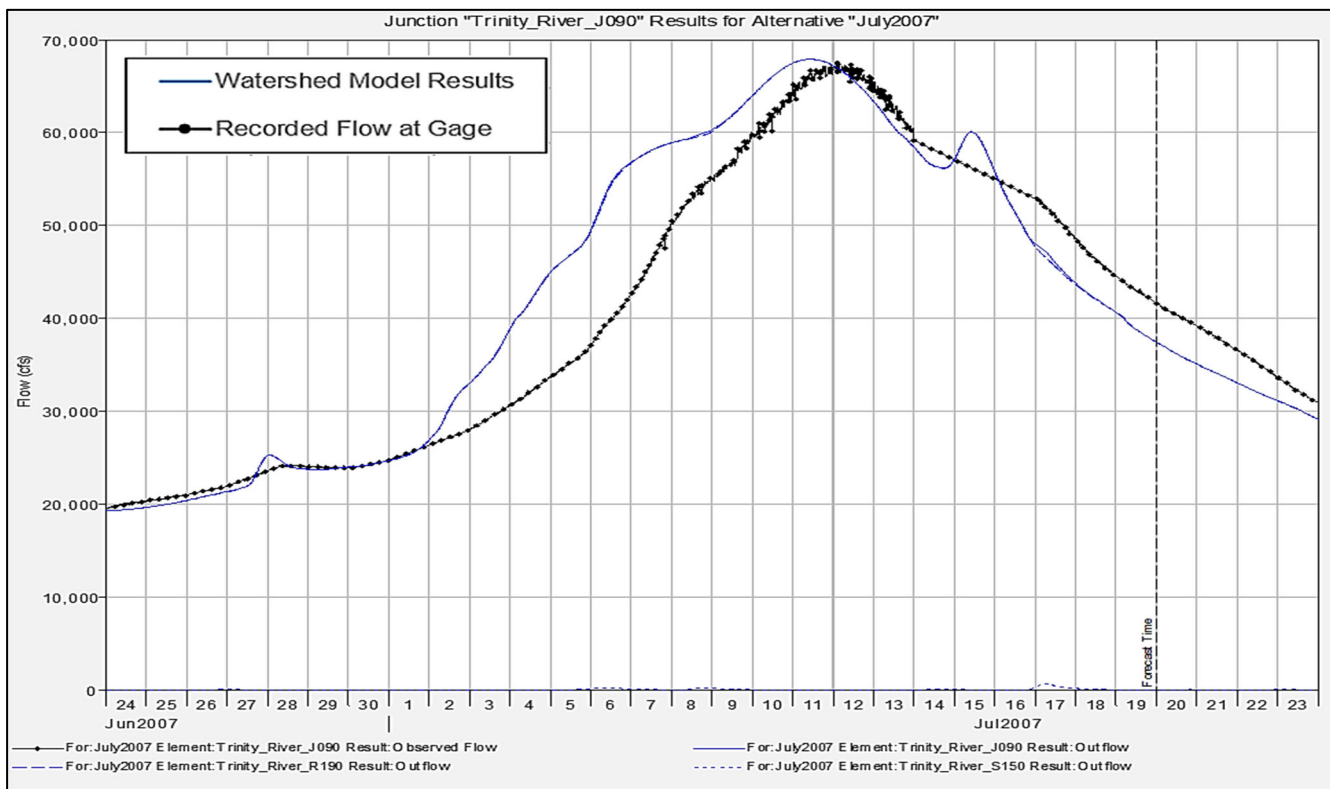


Figure 83a. July 11, 2007 Calibration for the Trinity River near Crockett, TX Gage

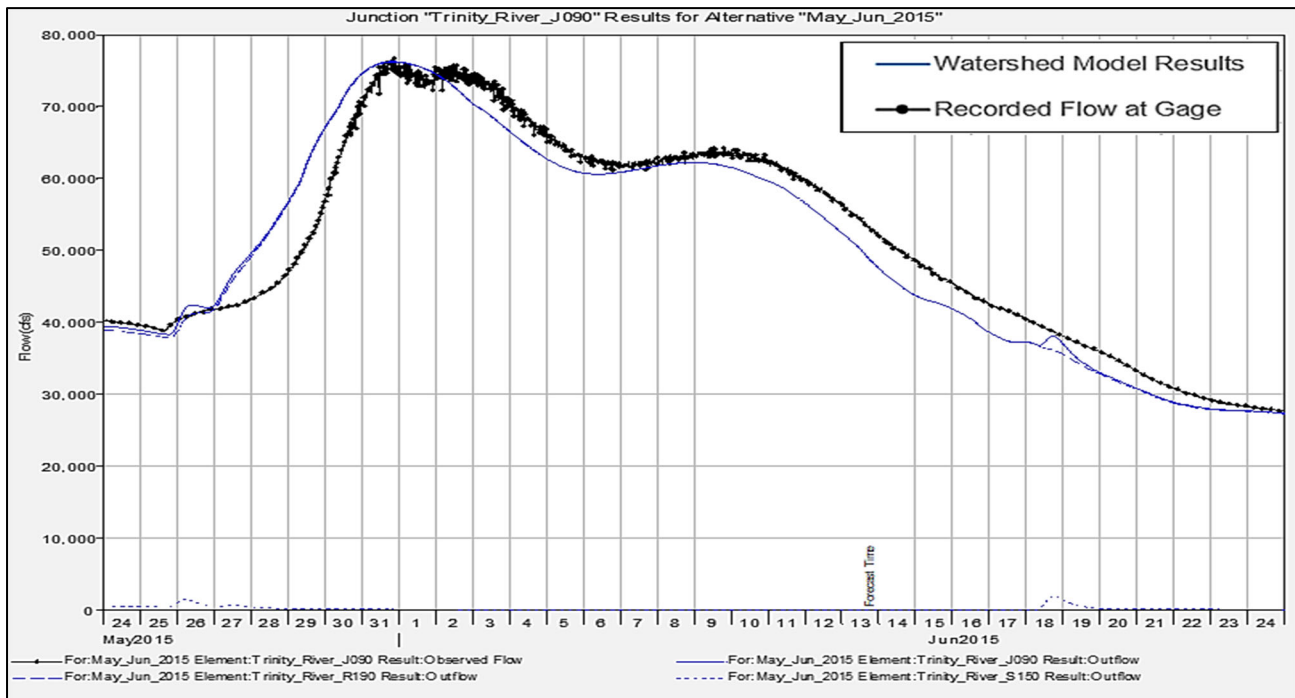


Figure 83b. May 31, 2015 Calibration for the Trinity River near Crockett, TX Gage

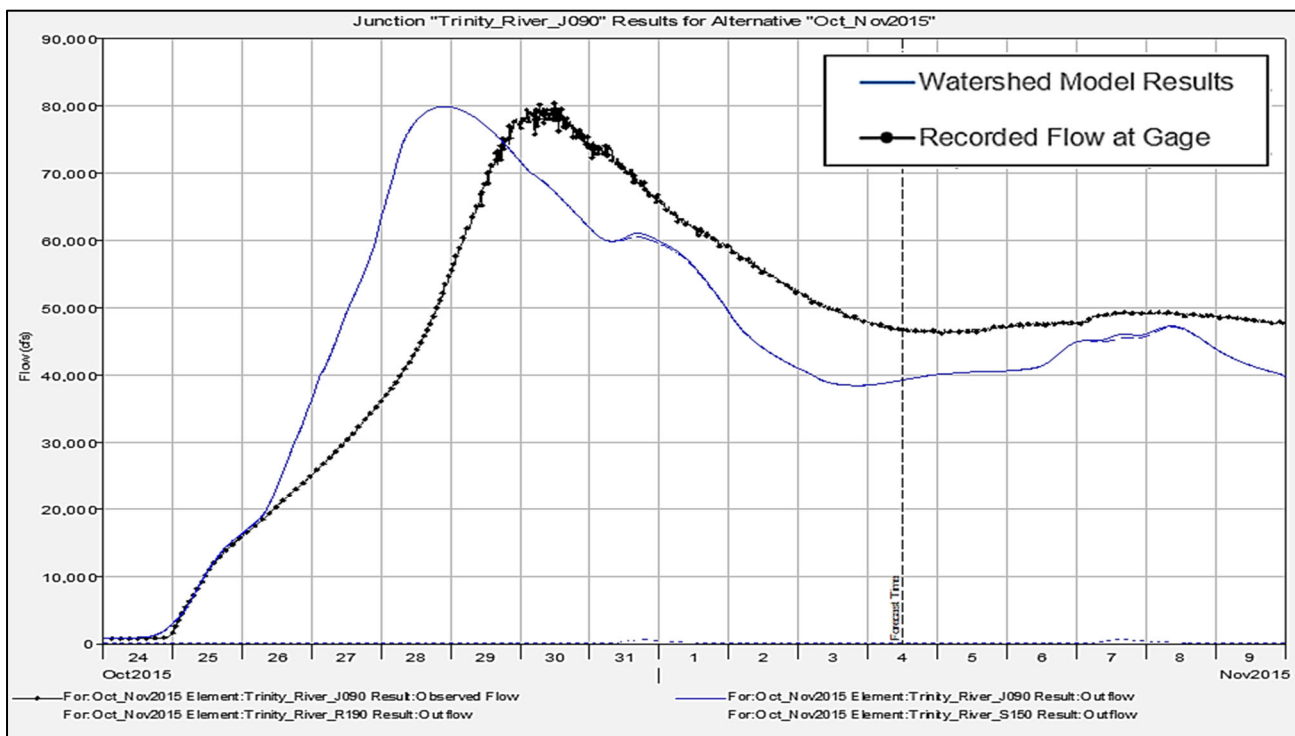


Figure 83c. October 29, 2015 Calibration for the Trinity River near Crockett, TX Gage

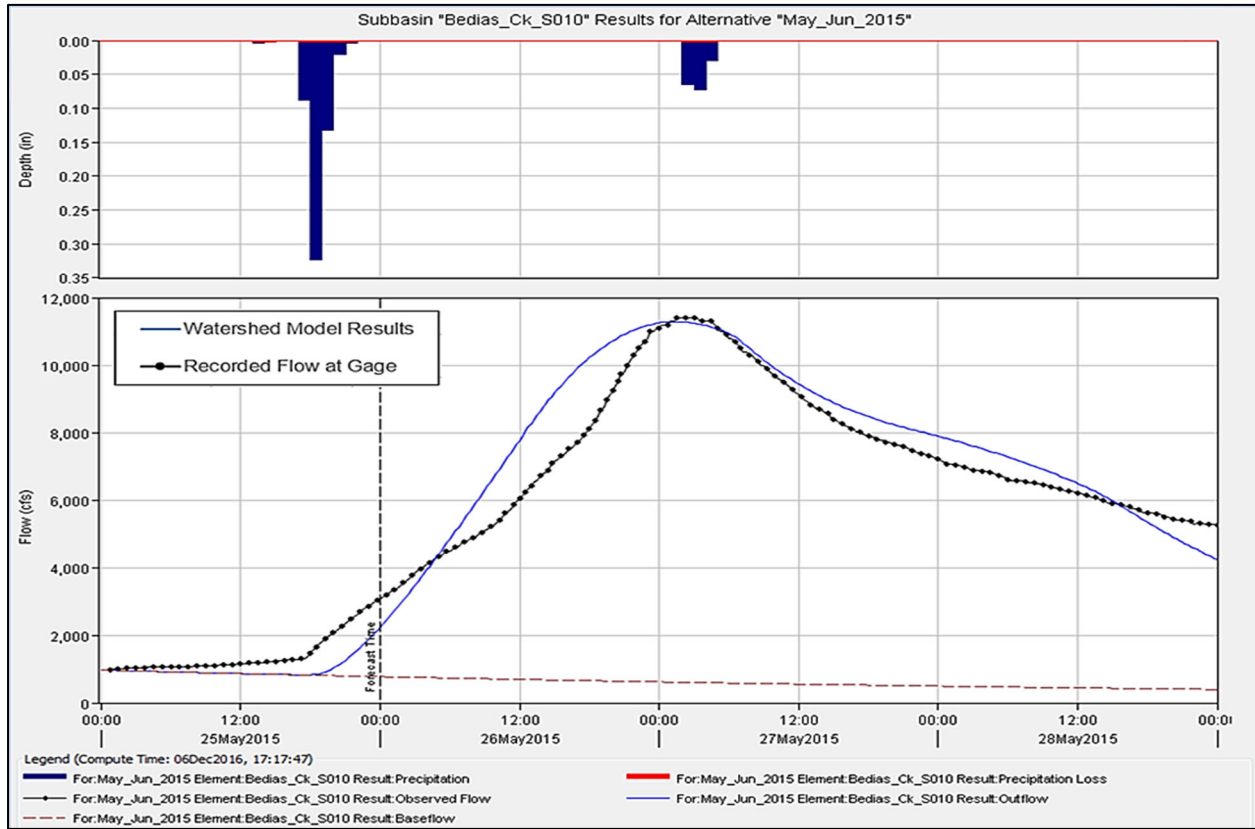


Figure 84a. May 26, 2015 Calibration for the Bédias Creek near Madisonville, TX Gage

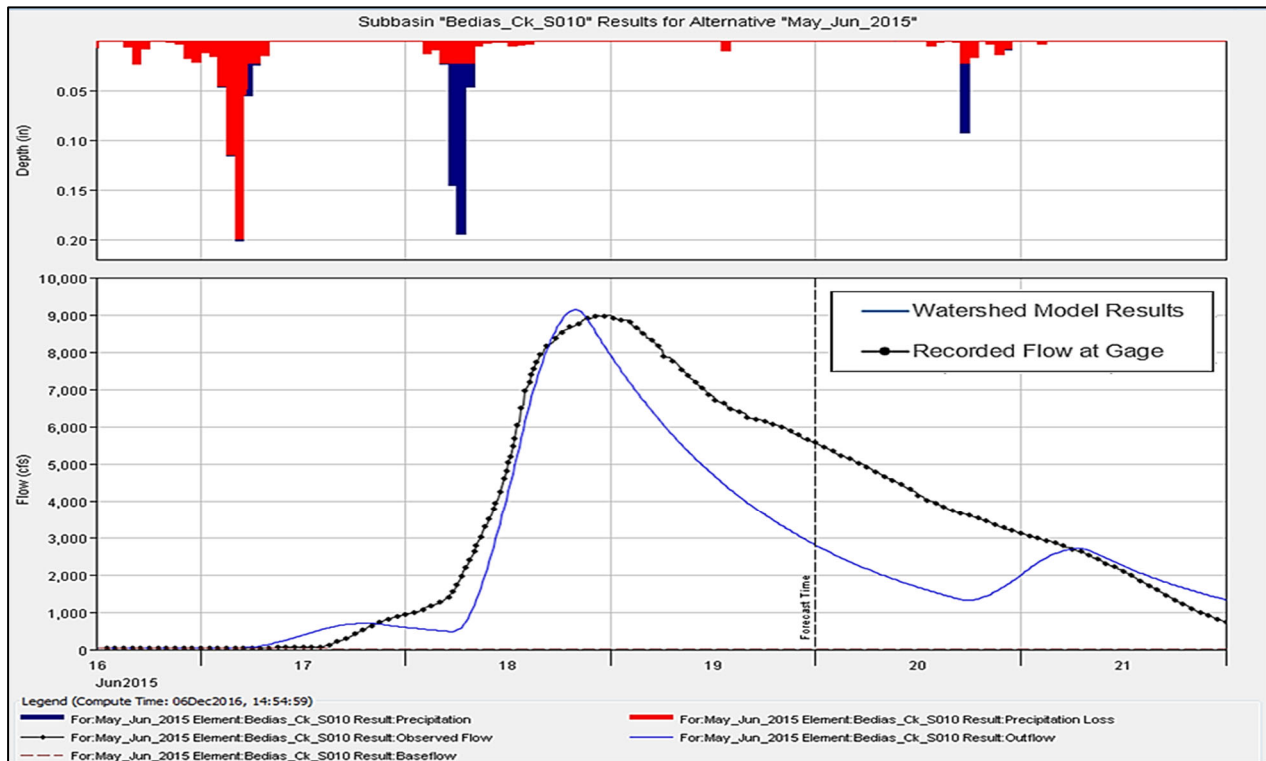


Figure 84b. June 18, 2015 Calibration for the Bédias Creek near Madisonville, TX Gage

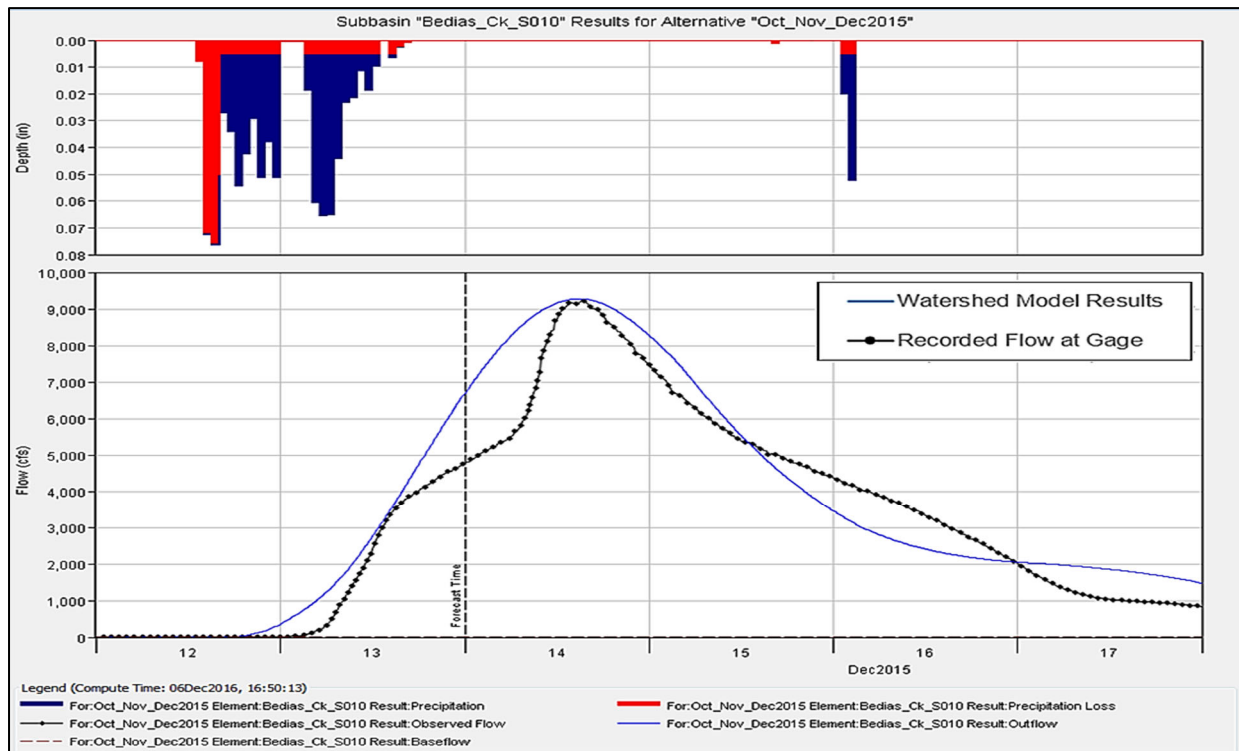


Figure 84c. December 14, 2015 Calibration for the Bédias Creek near Madisonville, TX Gage

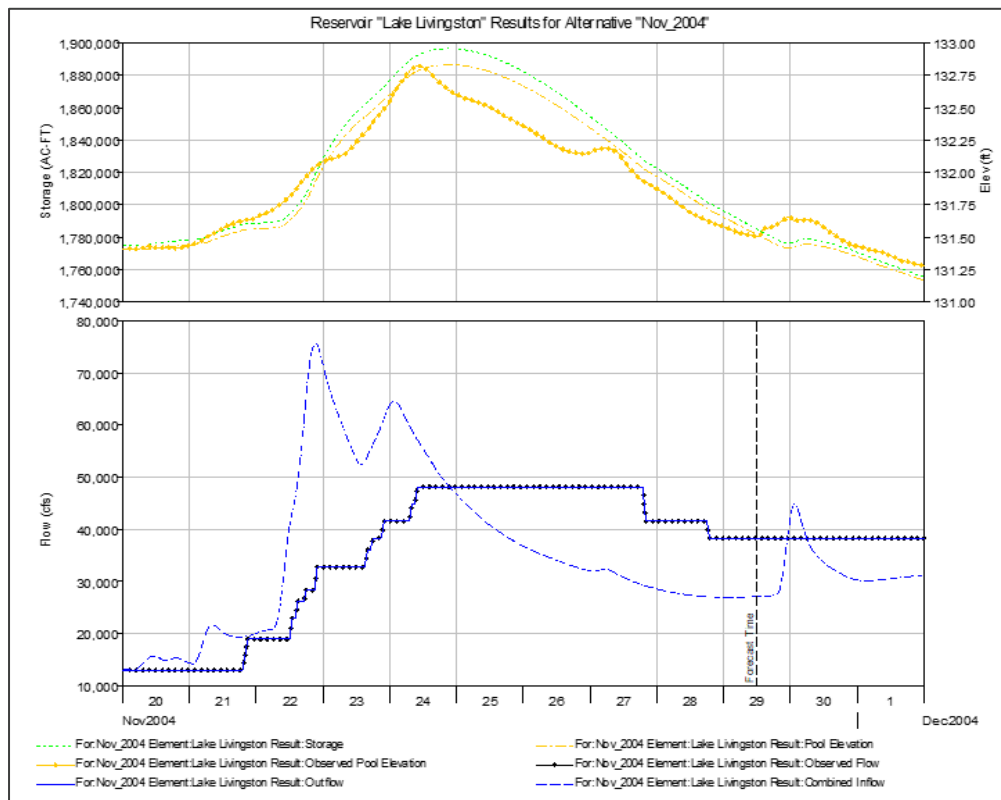


Figure 85a. November 2004 Calibration Results for Lake Livingston

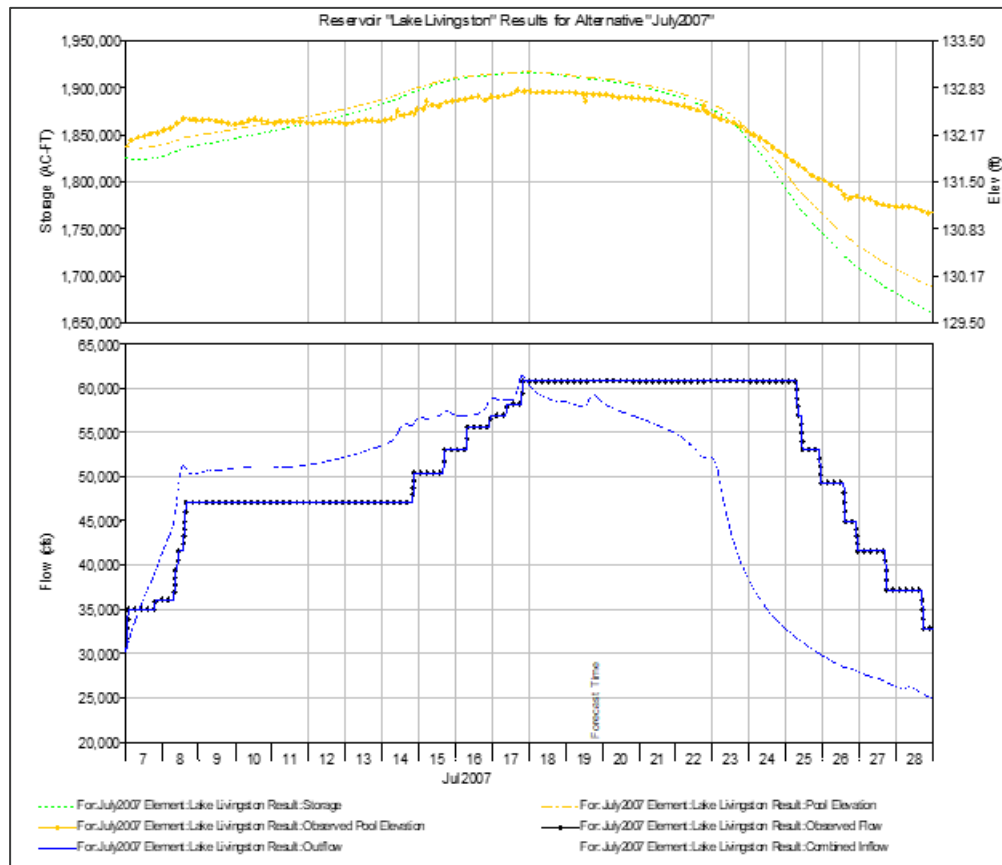


Figure 85b. July 2007 Calibration Results for Lake Livingston

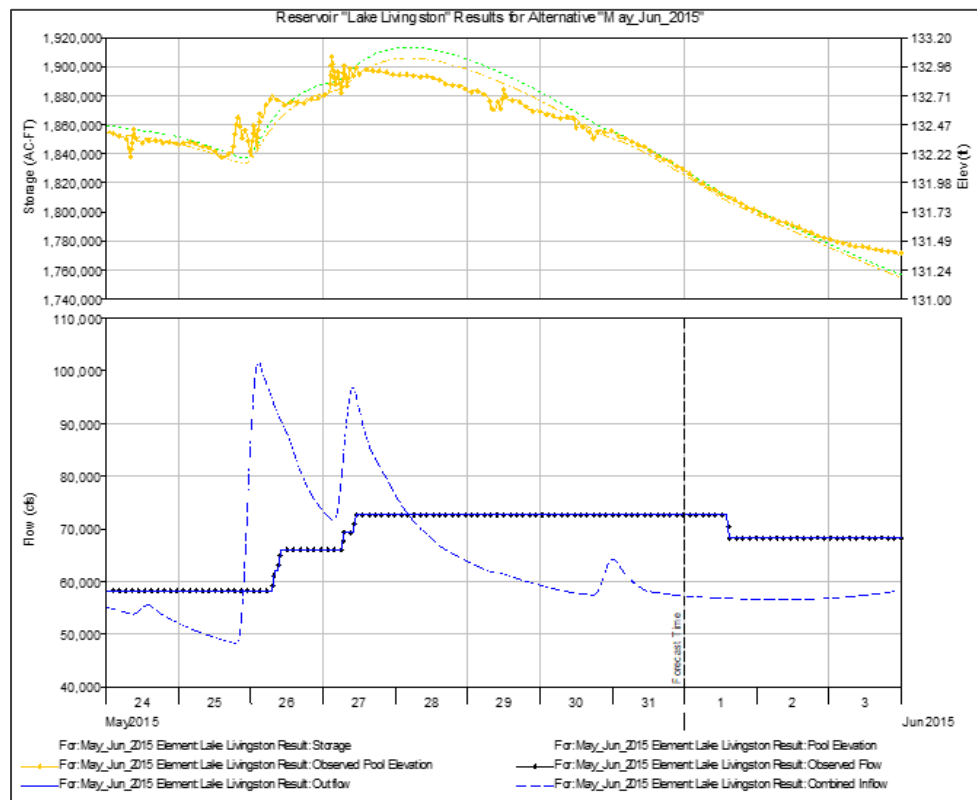


Figure 85c. May 2015 Calibration Results for Lake Livingston

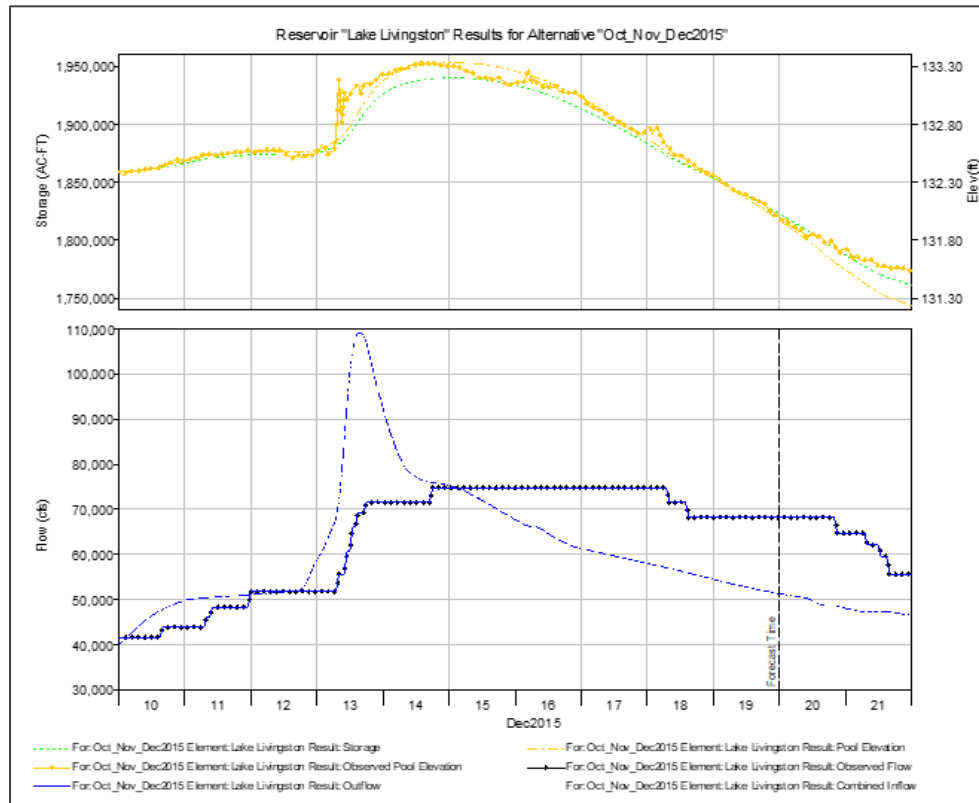


Figure 85d. December 2015 Calibration Results for Lake Livingston

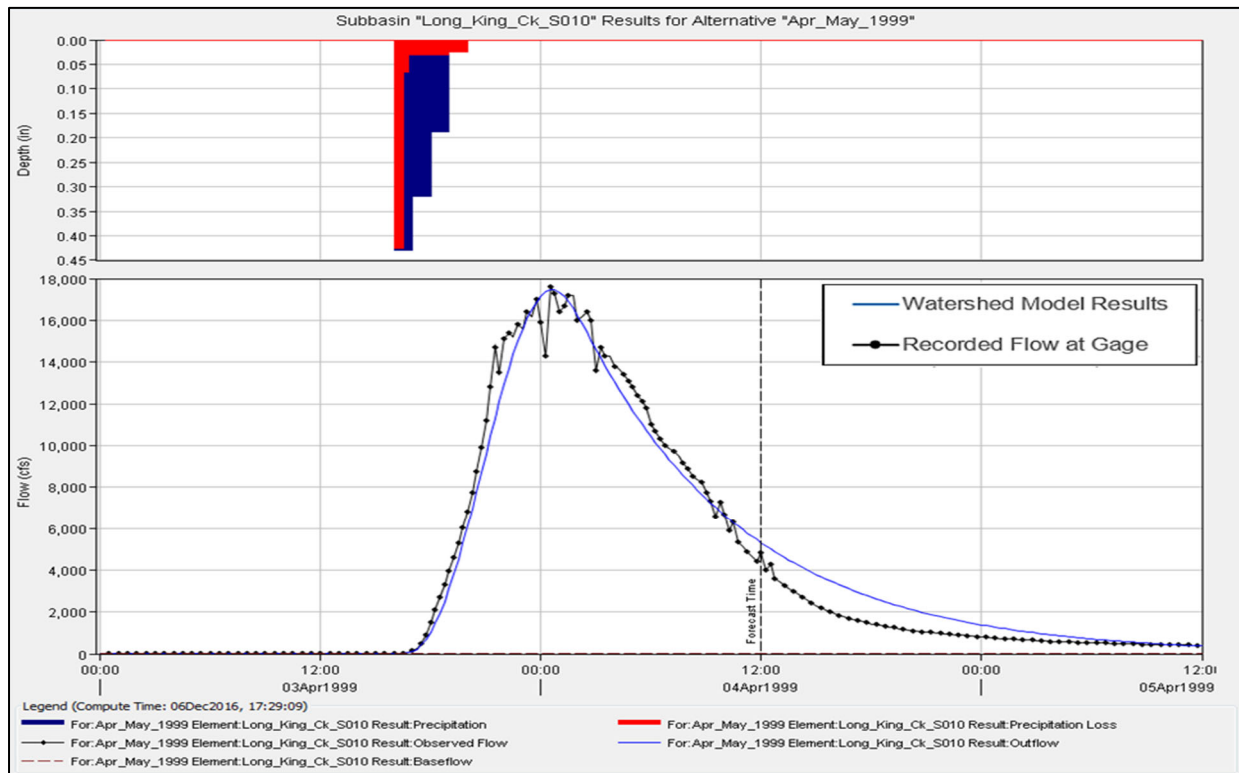


Figure 86a. April 4, 1999 Calibration for the Long King Creek at Livingston, TX Gage

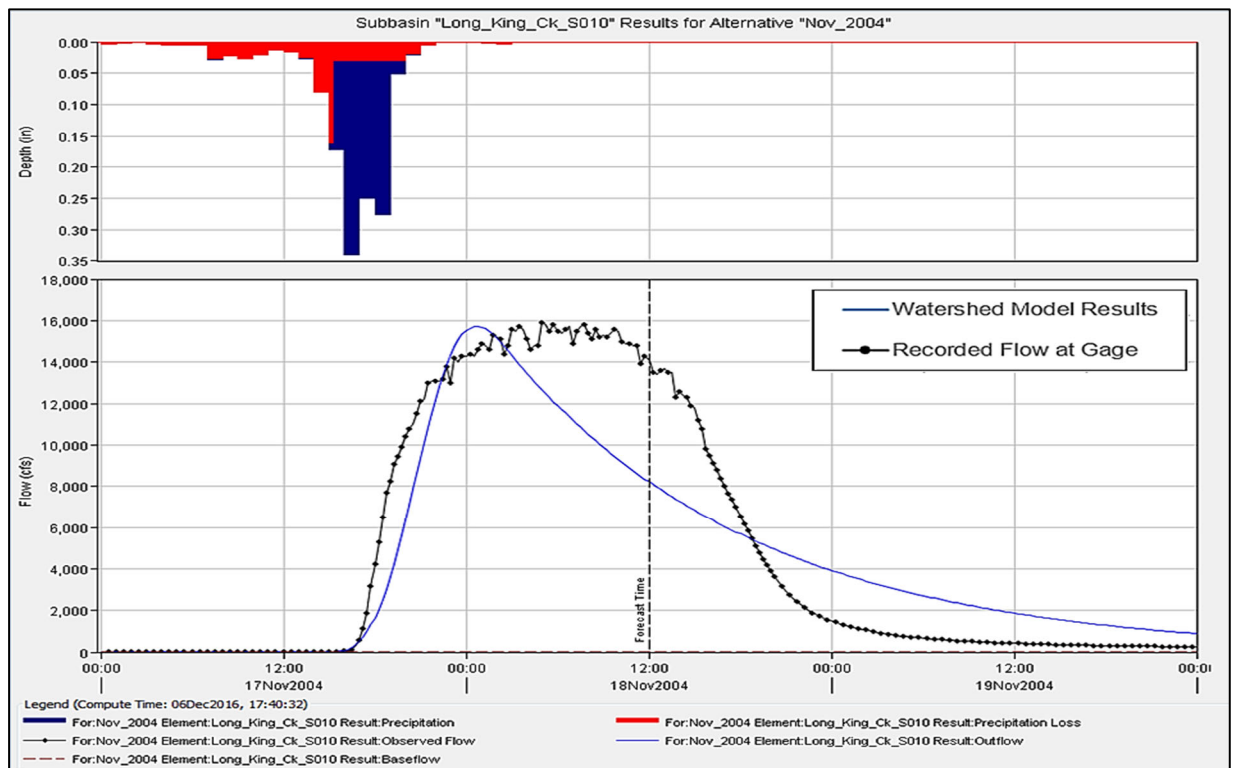


Figure 86b. November 17, 2004 Calibration for the Long King Creek at Livingston, TX Gage

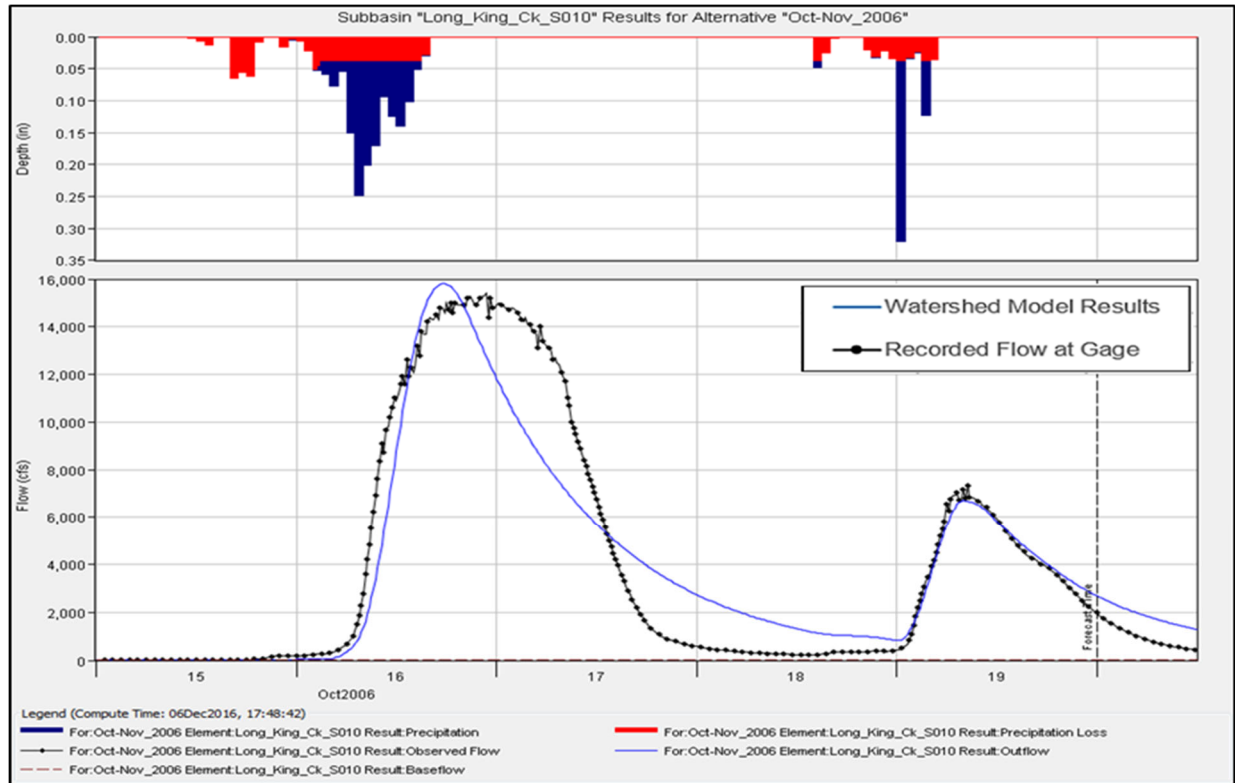


Figure 86c. October 16, 2006 Calibration for the Long King Creek at Livingston, TX Gage

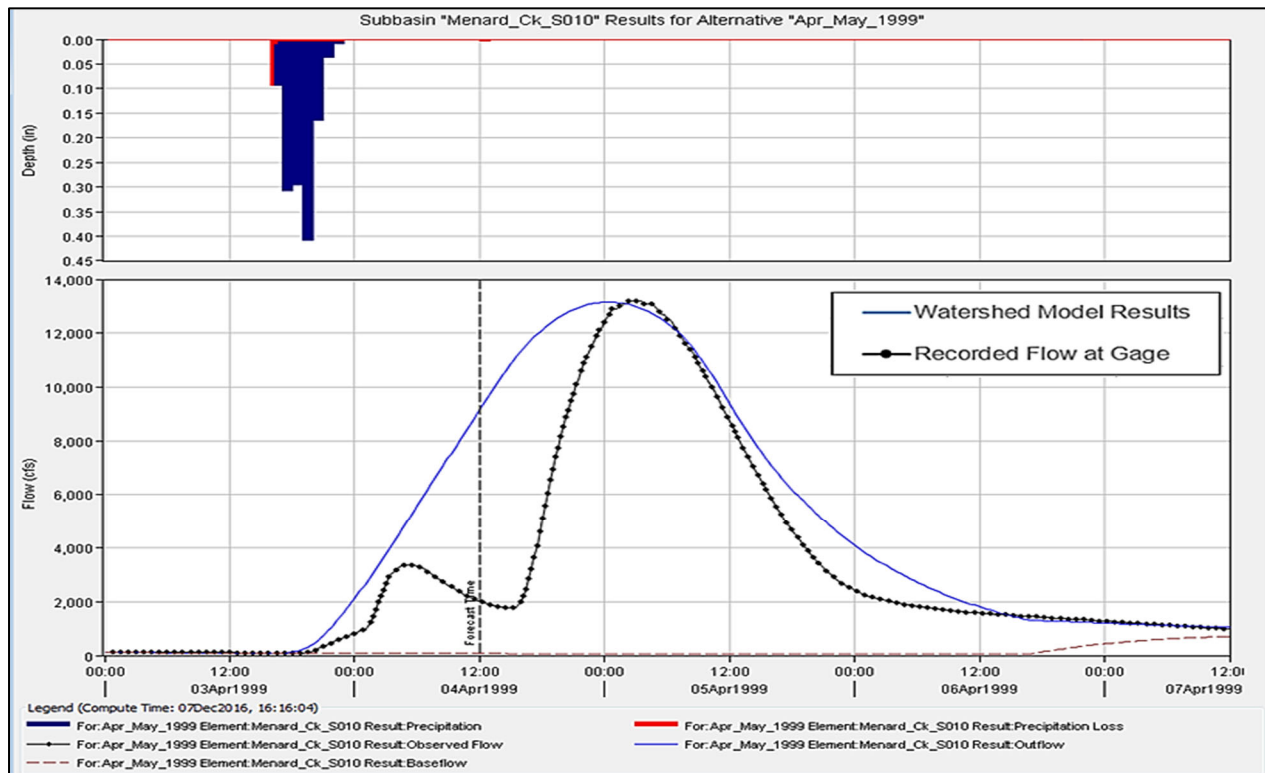


Figure 87a. April 4, 1999 Calibration for the Menard Creek near Rye, TX Gage

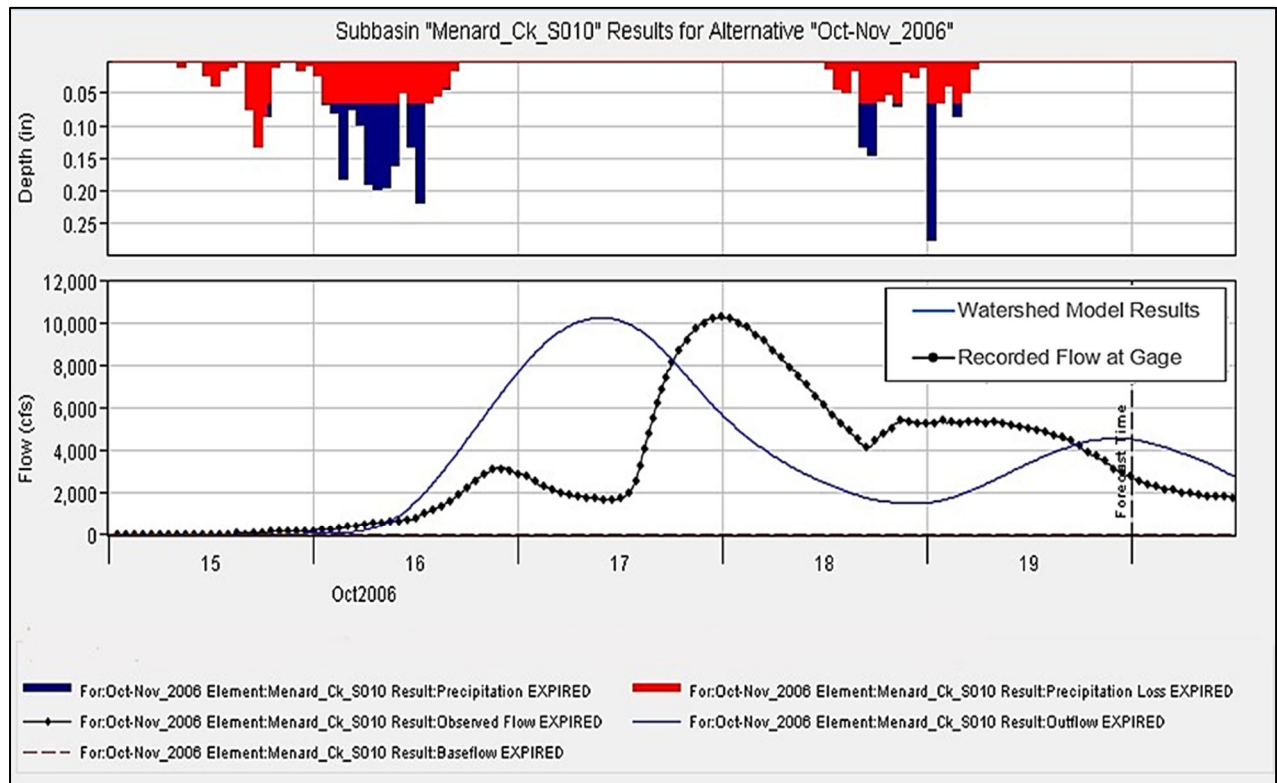


Figure 87b. October 17, 2006 Calibration for the Menard Creek near Rye, TX Gage

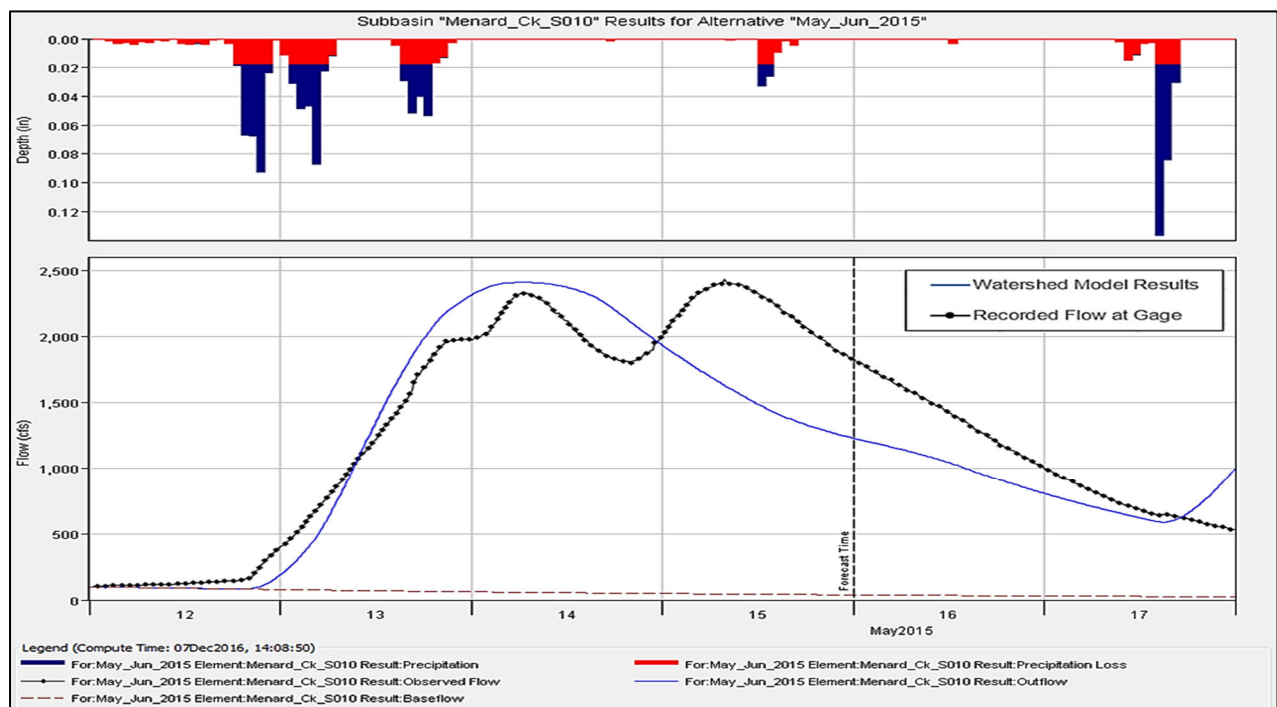


Figure 87c. May 13, 2015 Calibration for the Menard Creek near Rye, TX Gage

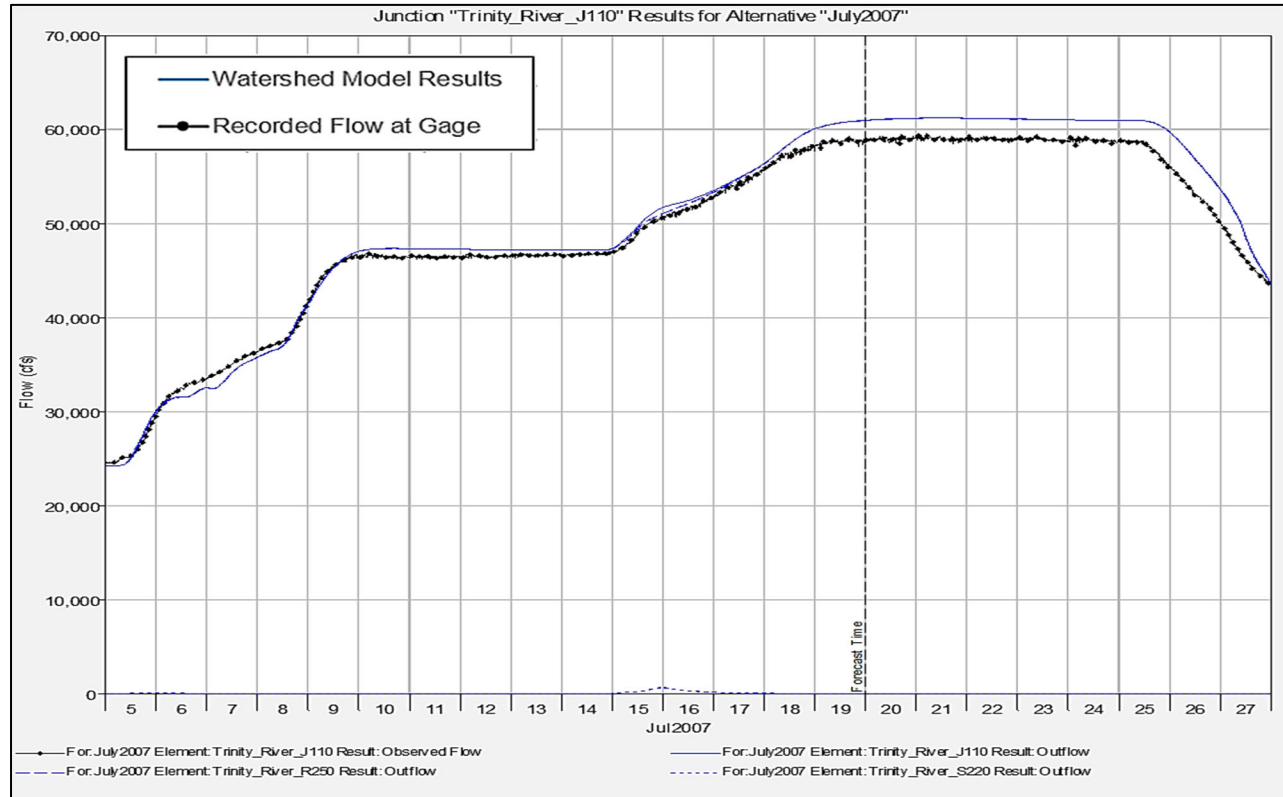


Figure 88a. July 19, 2007 Calibration for the Trinity River at Romayor, TX Gage

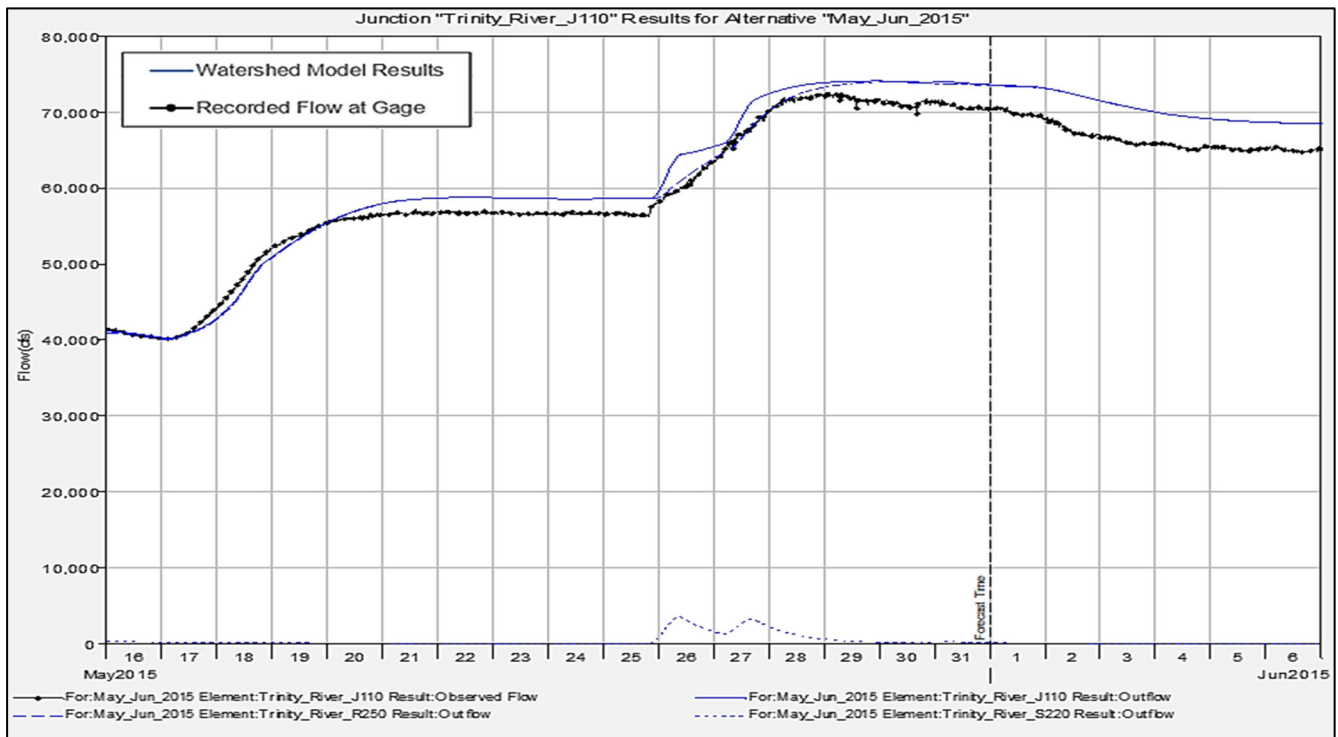


Figure 88b. May 28, 2015 Calibration for the Trinity River at Romayor, TX Gage

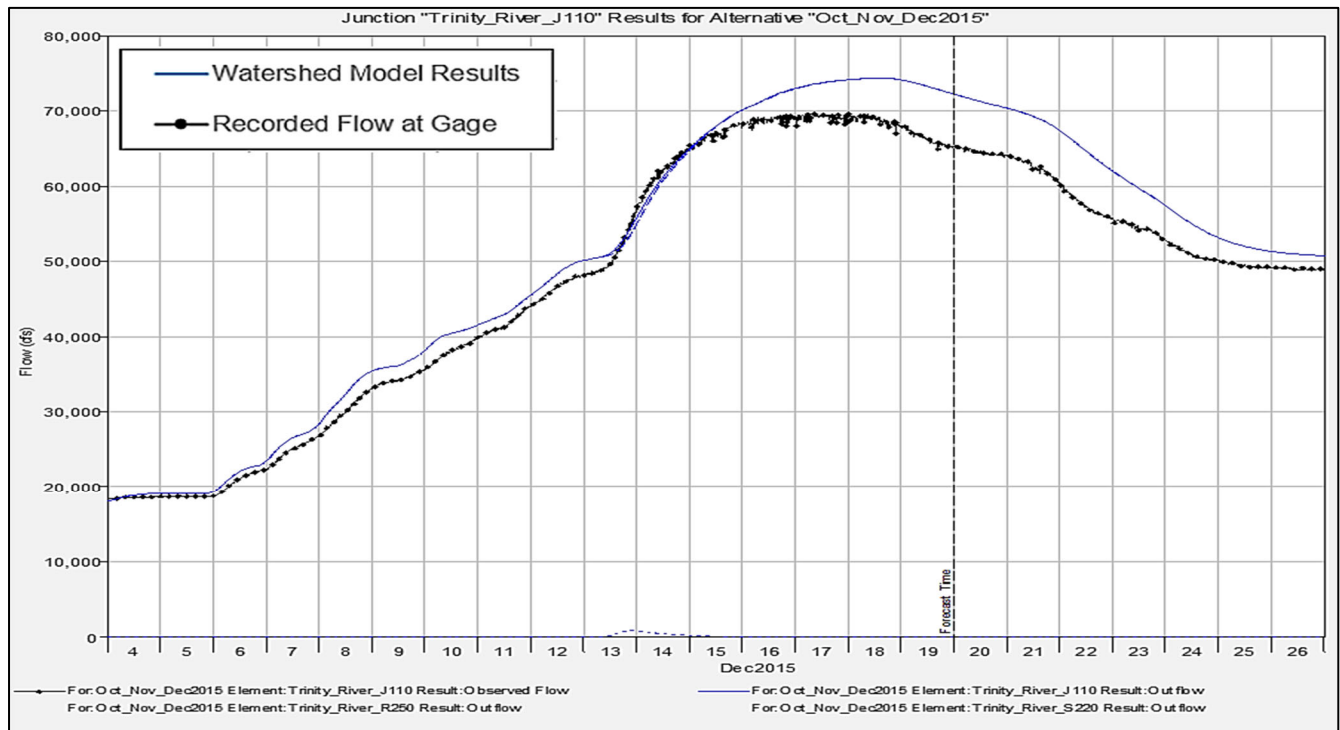


Figure 88c. December 17, 2015 Calibration for the Trinity River at Romamor, TX Gauge

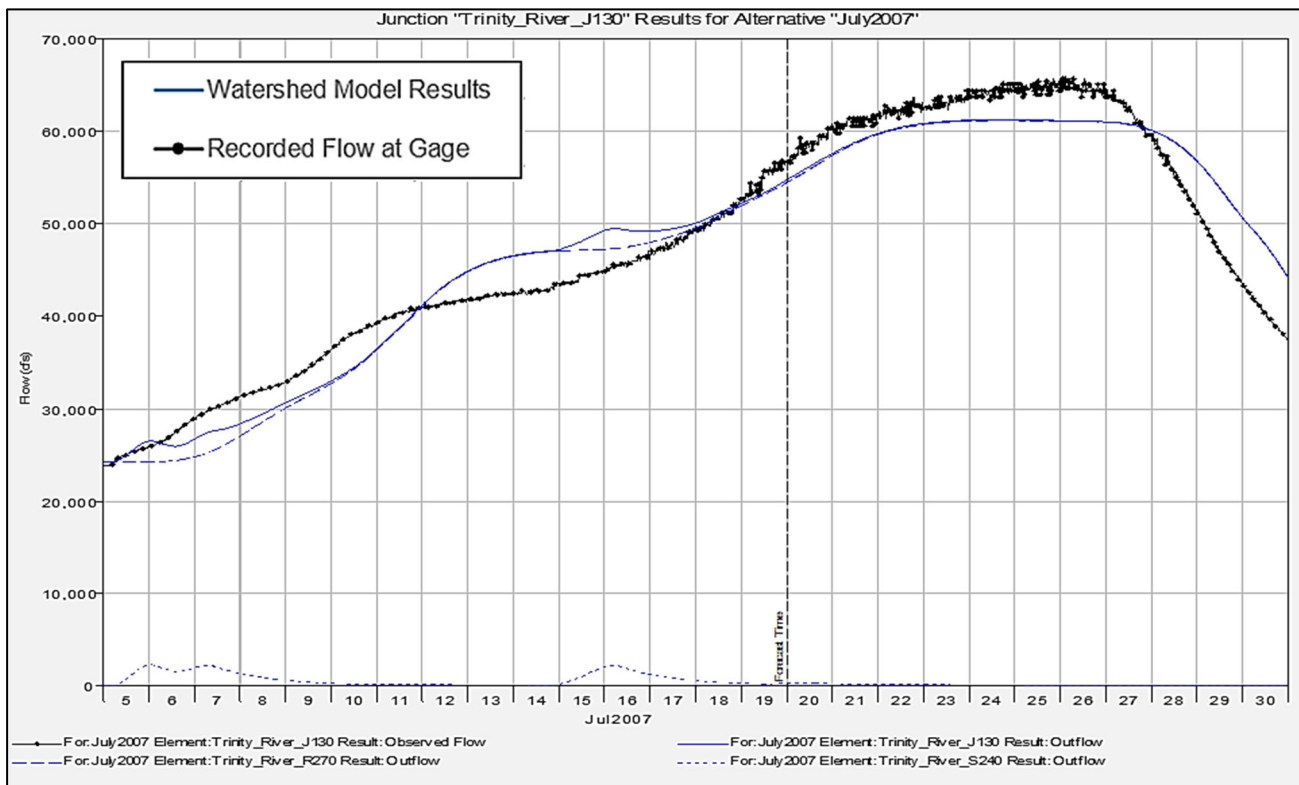


Figure 89a. July 25, 2007 Calibration for the Trinity River at Liberty, TX Gauge

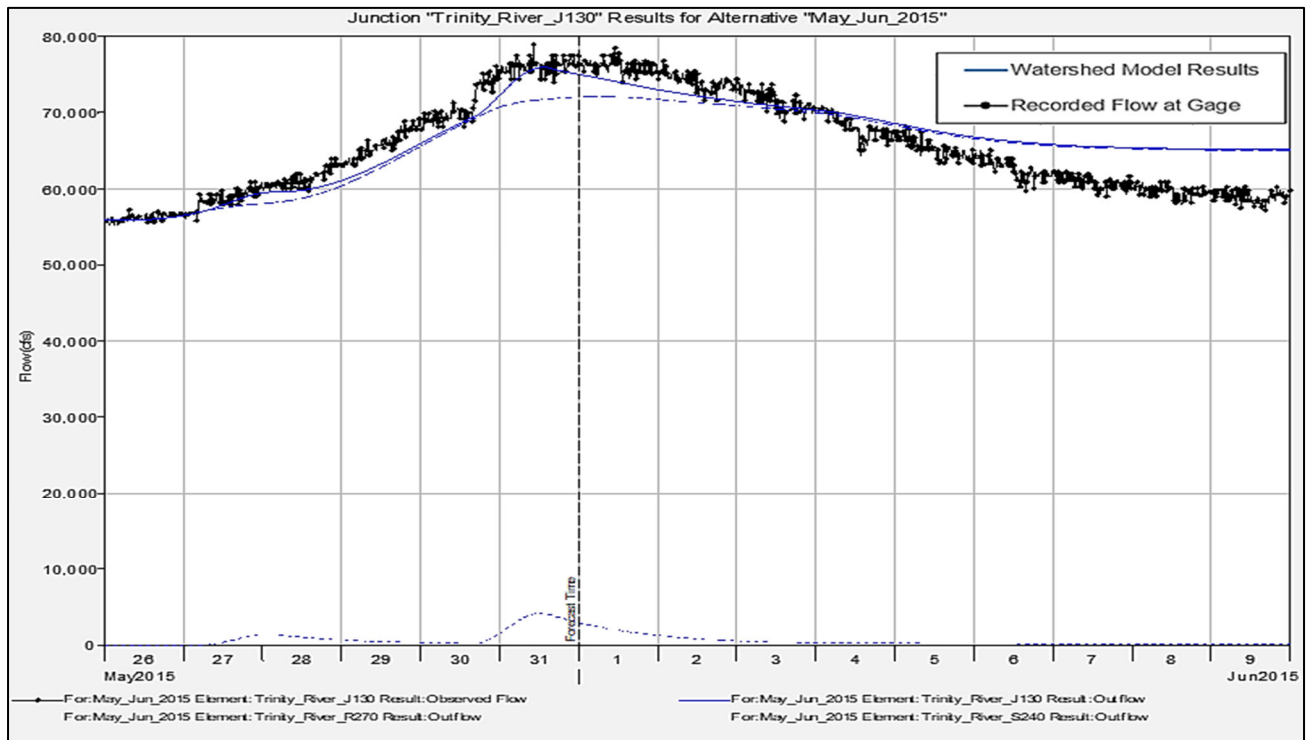


Figure 89b. May 31, 2015 Calibration for the Trinity River at Liberty, TX Gage

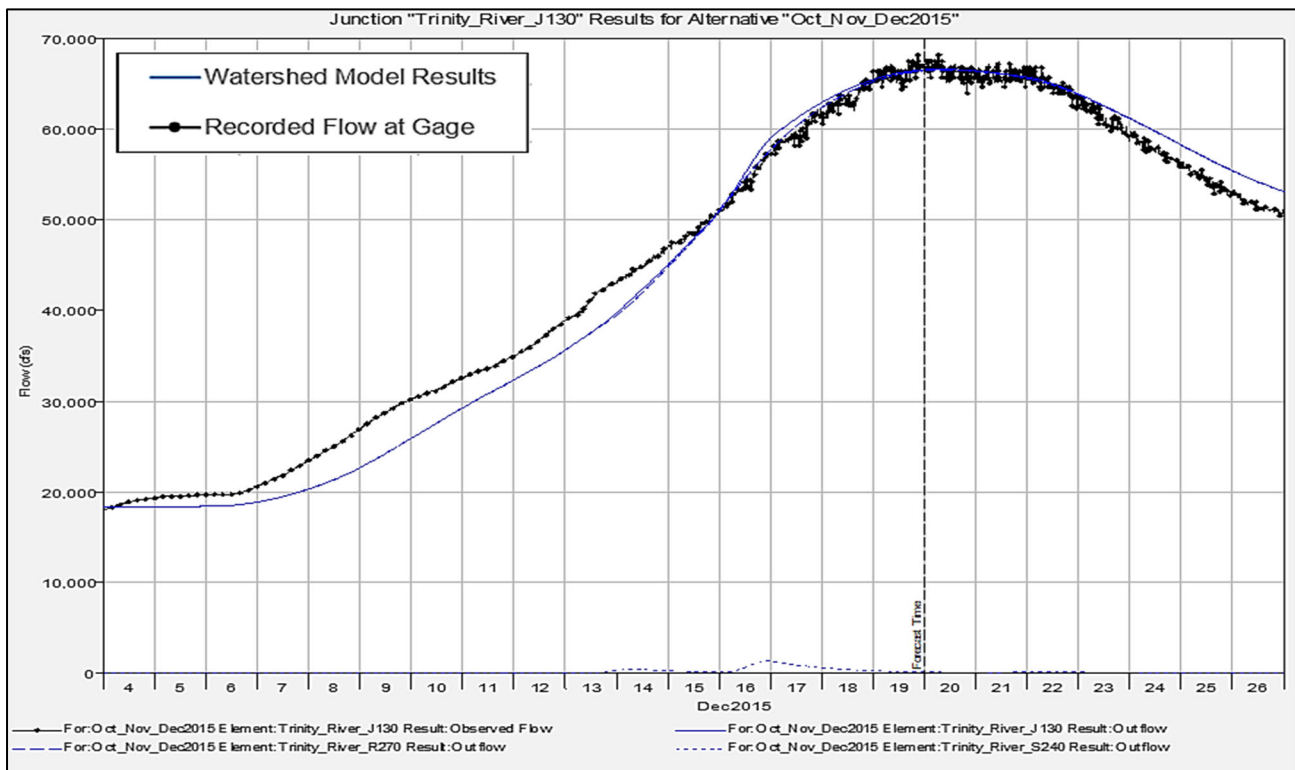


Figure 89c. December 19, 2015 Calibration for the Trinity River at Liberty, TX Gage

1.5 FINAL MODEL PARAMETERS

After the initial parameter estimates were made and the calibration process was completed, the final parameters were established. The final lag times and peaking coefficients were developed by taking a weighted average of the lag times and peaking coefficients from the calibration events. The peak discharge from the subbasin for that event was used to weight the calibrated lag times. This method has the effect of granting a higher weight to the lag times that were calibrated from larger, more intense storms, and it ignores the storms that generated no runoff from a particular subbasin. The final Snyder's lag times and peaking coefficients are shown in Table 23.

The final baseflow parameters were selected based on the results of the calibration runs. Specifically, initial flows were selected based on typical flow rates observed on each reach of the river, and the recession constant and ratio to peak were selected based on the slope and shape of the receding limb of the hydrograph at the downstream gages. The final baseflow parameters are also shown in Table 23.

A select few routing reaches used lag routing parameters. The final lag times are shown in Table 24.

The final Mod Puls storage discharge relationships were calculated from steady flow HEC-RAS models, and the final number of subreaches were selected based on calibration to the observed attenuation of the flood hydrograph in between stream gages. The final routing subreach values are shown in Table 25.

The final parameters for routing reaches using Muskingum and the final parameters for routing reaches using the straddle stagger approach can be found in Tables 26 and 27 respectively.

In observed storm events, the initial and constant losses vary from storm to storm according to the antecedent moisture conditions of the soil. The losses for the frequency storms were developed using the USACE Fort Worth District Method for determining losses based on percent sand (Rodman, 1977). This method produces a different set of loss rates for each storm frequency. These losses also fall well within the band of observed losses from the calibration storms. Some areas within the Trinity WHA model exhibit more variation in calibrated loss rates than others but the variation is present across the different soil types. For example, there are soils with high runoff potential (Group D, Clay) that have both high and low losses for each of the different events. See subbasins above Richland-Chambers reservoir as an example for soil group D. It should also be noted that while the calibration events do provide some information about observed losses, the limited number of calibration events that were used are not necessarily a complete picture of what loss rates are possible across the watershed. See Tables 11 and 12 for the losses identified during model calibration.

The default initial and constant losses for the 2-yr through 10-yr storms were adjusted for each given frequency in order to have a better correlation with the statistical frequency curves estimated from the USGS gage records. This was done because of the increased confidence level in the statistical frequency curve for the 2 through 10-yr recurrence intervals. The 25-yr losses were adjusted when needed to create a smooth transition between the 50-yr to the 10-yr values. The final loss rates used for each frequency storm event are given in Tables 28 and 29.

Table 23: Final Subbasin Parameters

Subbasin Name	Drainage Area (sqmi)	Percent Imperv. (%)	Snyder's Lag Time (hr)	Snyder's Peaking Coefficient	Initial Baseflow (cfs / sqmi)	Initial Baseflow (cfs)	Baseflow Recession Constant	Baseflow Ratio to Peak
West_Fork_S020	66.79	0	7.2	0.72		9.28	0.74	0.01
West_Fork_S010	61.99	0	5.5	0.72		8.79	0.75	0.01
West_Fork_S030	62.29	0	8	0.72		8.78	0.74	0.01
West_Fork_S040	40.40	0	6.8	0.72		9.29	0.72	0.01
West_Fork_S050	31.86	0	5.8	0.72		8.19	0.71	0.01
West_Fork_S060	69.09	0	8.4	0.72		9.44	0.7	0.01
West_Fork_S070	50.35	0	6.7	0.72		8.52	0.72	0.01
West_Fork_S080	20.33	0	4	0.69		8.42	0.67	0.02
West_Fork_S090	36.12	0	6.8	0.7		8.24	0.7	0.01
West_Fork_S100	38.84	0	6	0.7		7.68	0.66	0.02
West_Fork_S120	49.76	1	7.8	0.65		6.84	0.64	0.01
West_Fork_S110	21.59	0	6.6	0.66		7.55	0.61	0.01
Big_Cleveland_S010	52.56	0	7.3	0.65		6.88	0.64	0.02
Big_Cleveland_S020	46.10	1	6.7	0.64		5.34	0.61	0.02
West_Fork_S130	20.65	0	3.6	0.63		6.97	0.6	0.02
Lost_Ck_S010	28.82	3	4	0.53		6.92	0.76	0.04
Lost_Ck_S020	13.64	0	4.3	0.71		6.63	0.72	0.03
West_Fork_S140	39.60	1	5.3	0.71		0	0.69	0.03
West_Fork_S150	41.30	0	6	0.71		0	0.72	0.03
West_Fork_S160	35.60	2	5.2	0.71		0	0.67	0.04
Beans_Ck_S010	36.23	1	4.9	0.71		0	0.7	0.04
Beans_Ck_S020	10.72	1	2.7	0.71		0	0.71	0.05
Big_Ck_S010	50.69	0	5.6	0.71		0	0.68	0.04
Big_Ck_S030	19.58	2	3.9	0.71		0	0.72	0.05
Big_Ck_S020	13.25	2	3.7	0.71		0	0.7	0.04
Bridgeport_S030	43.63	1	6.1	0.7		0	0.74	0.05
Bridgeport_S010	35.71	42	5.4	0.71		0	0.73	0.05
Bridgeport_S040	33.43	3	5.3	0.7		0	0.76	0.05
Bridgeport_S020	24.81	1	4.6	0.71		0	0.71	0.05
West_Fork_S170	40.43	5	5.5	0.65		0.77	0.7	0.02
Dry_Ck_S010	26.74	4	5.7	0.66		1.02	0.7	0.01
West_Fork_S180	6.63	1	2.4	0.66		0	0.7	0.02
Amon_G_Carter_S030	40.30	8	5.2	0.62		0	0.74	0.05
Amon_G_Carter_S010	38.59	1	5.6	0.63		0	0.73	0.05
Amon_G_Carter_S020	30.62	0	5.3	0.63		0	0.74	0.05
Big_Sandy_Ck_S010	41.99	3	5.8	0.66		0	0.66	0.03
Big_Sandy_Ck_S020	40.70	1	7.7	0.66		0	0.63	0.03
Brushy_Ck_S010	30.88	3	6.8	0.71		0	0.65	0.04
Brushy_Ck_S020	27.86	1	6.9	0.66		0	0.63	0.04

Subbasin Name	Drainage Area (sqmi)	Percent Imperv. (%)	Snyder's Lag Time (hr)	Snyder's Peaking Coefficient	Initial Baseflow (cfs / sqmi)	Initial Baseflow (cfs)	Baseflow Recession Constant	Baseflow Ratio to Peak
Brushy_Ck_S030	11.86	1	4.8	0.65		0	0.64	0.07
Big_Sandy_Ck_S030	24.92	2	5	0.65		0	0.64	0.03
Big_Sandy_Ck_S040	46.60	1	7.5	0.63		0	0.67	0.03
Big_Sandy_Ck_S050	19.63	4	4.2	0.68		0.76	0.7	0.01
West_Fork_S190	28.29	4	3.3	0.68		0.65	0.7	0.01
West_Fork_S200	21.94	1	4.4	0.69		0	0.7	0.01
Garrett_Ck_S020	23.22	1	4.7	0.66		0.52	0.7	0.02
Garrett_Ck_S010	22.76	1	5.3	0.65		0.57	0.7	0.01
Garrett_Ck_S030	7.73	1	2.5	0.67		0	0.7	0.01
Salt_Ck_S010	28.17	1	4.3	0.66		1.02	0.7	0.02
Salt_Ck_S020	24.80	1	4.4	0.69		0	0.7	0.01
West_Fork_S210	30.40	1	4.6	0.68		0	0.7	0.01
West_Fork_S220	41.10	2	5	0.71		0	0.5	0.03
Eagle_Mountain_S010	36.13	9	3.9	0.72		0	0.5	0.03
Eagle_Mountain_S020	18.27	6	3.3	0.72		0	0.5	0.03
Walnut_Ck_S020	31.43	1	3.4	0.77		0.02	0.66	0.02
Walnut_Ck_S010	31.31	3	3	0.77		0.04	0.66	0.02
Walnut_Ck_S030	18.62	6	2.8	0.72		0	0.5	0.03
Eagle_Mountain_S040	42.47	30	3.1	0.71		0	0.5	0.02
Eagle_Mountain_S030	26.44	4	3.4	0.72		0	0.5	0.03
Silver_Ck_S020	34.75	8	5	0.59		0	0.66	0.04
Silver_Ck_S010	27.84	2	4.9	0.59		0	0.65	0.03
Lake_Worth_S010	24.10	19	4.5	0.59		0	0.64	0.03
Lake_Worth_S020	7.52	43	3.3	0.59		0	0.65	0.04
West_Fork_S230	27.93	35	4.1	0.71	1.42		0.7	0.08
Lk_Weatherford_S010	95.90	1	6.8	0.64	0.43		0.7	0.05
Lk_Weatherford_S020	12.82	17	2.1	0.66	0.37		0.7	0.05
Clear_Fork_S010	136.33	6	11	0.65	0.77		0.67	0.07
Clear_Fork_S020	18.79	4	2.9	0.64	0.77		0.67	0.06
Bear_Ck_S010	58.92	1	2.75	0.76	0.77		0.67	0.06
Bear_Ck_S020	5.49	4	0.85	0.76	0.77		0.67	0.05
Benbrook_S010	34.54	1	2.4	0.76	0.77		0.67	0.06
Benbrook_S020	34.23	2	2.7	0.63	0.77		0.67	0.06
Benbrook_S030	32.15	22	1.8	0.63	0.77		0.67	0.06
Clear_Fork_S030	9.43	26	0.9	0.7	0.91		0.75	0.03
Marys_Ck_S010	54.16	8	1.5	0.76	0.54		0.71	0.02
Clear_Fork_S040	25.37	39	1.6	0.7	0.75		0.76	0.04
Clear_Fork_S050	4.89	57	1.2	0.71	1.28		0.7	0.07
West_Fork_S240	1.17	39	0.6	0.72	1.49		0.7	0.02
Marine_Ck_S020	12.61	38	0.8	0.72	1.42		0.7	0.02
Marine_Ck_S010	9.11	28	1	0.72	1.37		0.7	0.02

Subbasin Name	Drainage Area (sqmi)	Percent Imperv. (%)	Snyder's Lag Time (hr)	Snyder's Peaking Coefficient	Initial Baseflow (cfs / sqmi)	Initial Baseflow (cfs)	Baseflow Recession Constant	Baseflow Ratio to Peak
West_Fork_S250	9.16	50	1.7	0.71	2		0.7	0.02
West_Fork_S260	39.24	36	2.3	0.53	2.34		0.7	0.02
West_Fork_S270	12.96	27	1.9	0.7	1.96		0.7	0.03
Big_Fossil_Ck_S010	56.86	30	3.6	0.7	1.65		0.7	0.04
LittleFossil_Ck_S010	19.72	39	2.3	0.7	1.69		0.7	0.03
West_Fork_S280	28.92	34	2.9	0.7	1.94		0.7	0.03
Village_Ck_S010	90.40	10	5.2	0.64	0.49		0.6	0.05
Village_Ck_S020	34.61	19	1.6	0.7	0.77		0.54	0.02
Lake_Arlington_S010	18.13	42	1.4	0.7	0.77		0.55	0.02
Village_Ck_S030	48.52	28	5.4	0.7	1.81		0.7	0.03
West_Fork_S290	43.91	34	4.9	0.7	1.81		0.7	0.03
West_Fork_S300	20.74	52	3.5	0.7	1.74		0.7	0.03
West_Fork_S310	4.76	29	0.8	0.7	1.61		0.7	0.04
West_Fork_S320	2.16	19	1.51	0.7	0.01		0.7	0.02
Big_Bear_Ck_S010	82.54	31	8.27	0.7	0.02		0.54	0.01
Big_Bear_Ck_S020	10.78	34	3.18	0.7	0.01		0.58	0.02
West_Fork_S330	8.58	33	2.26	0.7	0.01		0.7	0.02
Joe_Pool_S020	111.69	14	6.1	0.7	0.06		0.46	0.03
Joe_Pool_S030	62.88	8	6.7	0.7	0.06		0.54	0.02
Joe_Pool_S040	4.36	30	1	0.7	0.06		0.46	0.03
Joe_Pool_S010	25.95	3	4.07	0.7	0.02		0.4	0.02
Joe_Pool_S050	19.29	43	1.62	0.7	0.06		0.45	0.03
Mountain_Ck_S010	41.50	32	2.3	0.7	0.05		0.64	0.02
Mountain_Ck_S020	29.12	44	1.3	0.7	0.05		0.63	0.02
Mountain_Ck_S030	9.58	31	1.39	0.7	0.01		0.7	0.02
West_Fork_S340	13.27	37	2	0.7	0.01		0.8	0.02
Elm_Fork_S020	33.95	1	4.72	0.7	0.22		0.81	0.06
Elm_Fork_S010	33.40	2	3.86	0.7	0.35		0.83	0.08
Brushy_Elm_Ck_S010	13.95	1	2.71	0.7	0.21		0.81	0.08
Brushy_Elm_Ck_S020	11.59	5	2.99	0.7	0.19		0.81	0.06
Elm_Fork_S030	44.13	1	3.87	0.7	0.2		0.81	0.06
Elm_Fork_S040	40.17	3	3.69	0.7	0.18		0.81	0.06
Elm_Fork_S050	39.58	6	4.4	0.7	0.03		0.16	0.02
Elm_Fork_S070	28.10	2	5.06	0.7	0.03		0.16	0.02
Elm_Fork_S060	20.13	1	3.67	0.7	0.03		0.16	0.02
Spring_Ck_S010	40.63	0	3.57	0.7	0.04		0.17	0.02
Spring_Ck_S020	22.07	6	2.47	0.7	0.03		0.16	0.02
Ray_Roberts_S010	26.12	19	1.47	0.7	0.03		0.16	0.02
Timber_Ck_S010	39.04	1	5.1	0.78	0.03		0.49	0.02
Timber_Ck_S030	21.94	2	4.1	0.7	0.03		0.16	0.02
Timber_Ck_S020	3.17	0	1.85	0.7	0.03		0.19	0.02

Subbasin Name	Drainage Area (sqmi)	Percent Imperv. (%)	Snyder's Lag Time (hr)	Snyder's Peaking Coefficient	Initial Baseflow (cfs / sqmi)	Initial Baseflow (cfs)	Baseflow Recession Constant	Baseflow Ratio to Peak
Ray_Roberts_S030	56.63	30	1.53	0.7	0.03		0.16	0.02
Range_Ck_S010	29.31	0	2.4	0.75	0.01		0.31	0.02
Range_Ck_S020	21.25	1	4.9	0.7	0.03		0.16	0.02
Lake_Kiowa_S020	22.14	11	2.41	0.7	0.03		0.16	0.02
Lake_Kiowa_S010	16.82	7	3.1	0.7	0.03		0.16	0.02
Ray_Roberts_S020	37.46	32	1	0.7	0.03		0.16	0.02
Range_Ck_S030	31.13	3	3.8	0.7	0.03		0.16	0.02
Buck_Ck_S010	23.09	0	4.46	0.7	0.03		0.16	0.02
Ray_Roberts_S050	15.76	12	1	0.7	0.03		0.16	0.02
Ray_Roberts_S040	11.22	31	1.65	0.7	0.3		0.39	0.04
Ray_Roberts_S060	7.30	34	1	0.7	0.03		0.16	0.02
Timber_Ck_S040	2.52	7	2	0.62	0.03		0.17	0.02
Elm_Fork_S080	36.87	2	4.65	0.62	0.06		0.76	0.03
Clear_Ck_S010	50.56	0	5.13	0.62	0.22		0.88	0.11
Clear_Ck_S020	33.31	1	4.43	0.65	0.2		0.86	0.1
Clear_Ck_S030	16.06	1	2.03	0.62	0.19		0.85	0.1
Clear_Ck_S040	51.64	1	3.87	0.65	0.2		0.84	0.09
Clear_Ck_S050	35.61	0	6.2	0.6	0.19		0.83	0.09
Clear_Ck_S070	24.72	1	3.7	0.65	0.14		0.77	0.07
Clear_Ck_S060	2.56	0	1.15	0.62	0.13		0.78	0.08
Clear_Ck_S080	45.06	1	8.13	0.63	0.18		0.84	0.09
Clear_Ck_S090	35.10	2	6.95	0.63	0.16		0.81	0.08
Clear_Ck_S110	15.30	6	3.77	0.62	0.07		0.77	0.04
Clear_Ck_S100	12.82	2	4.18	0.62	0.09		0.78	0.04
Clear_Ck_S120	28.43	2	5.6	0.62	0.08		0.78	0.04
Little_Elm_Ck_S010	42.28	2	5	0.7	0.03		0.78	0.08
Little_Elm_Ck_S020	30.57	2	6.59	0.65	0.04		0.8	0.09
Little_Elm_Ck_S030	22.95	1	6.68	0.62	0.08		0.78	0.04
Pecan_Ck_S010	43.07	2	6.35	0.62	0.08		0.75	0.03
Doe_Branch_S010	38.40	4	5.21	0.62	0.94		0.76	0.02
Doe_Branch_S020	32.61	14	4.48	0.62	0.07		0.74	0.02
Lewisville_S030	21.39	10	3.09	0.62	0.06		0.74	0.03
Hickory_Ck_S020	41.14	1	4.86	0.72	0.03		0.73	0.03
Hickory_Ck_S010	39.53	1	3.69	0.72	0.03		0.73	0.03
Hickory_Ck_S030	18.09	11	3.49	0.72	0.03		0.73	0.03
Hickory_Ck_S040	30.17	6	3.11	0.72	0.02		0.72	0.03
Hickory_Ck_S050	19.98	11	2.08	0.62	0.07		0.77	0.04
Lewisville_S010	89.01	18	3.71	0.62	0.07		0.74	0.03
Lewisville_S040	43.47	27	2.32	0.62	0.07		0.75	0.04
Lewisville_S050	34.96	28	2.19	0.62	0.07		0.75	0.04
Lewisville_S020	32.48	26	1.63	0.62	0.07		0.77	0.04

Subbasin Name	Drainage Area (sqmi)	Percent Imperv. (%)	Snyder's Lag Time (hr)	Snyder's Peaking Coefficient	Initial Baseflow (cfs / sqmi)	Initial Baseflow (cfs)	Baseflow Recession Constant	Baseflow Ratio to Peak
Elm_Fork_S090	21.40	28	5.1	0.62	1.96		0.53	0.04
Elm_Fork_S110	16.05	34	3.15	0.7	0.28		0.52	0.03
Elm_Fork_S100	24.07	36	5.9	0.67	2.26		0.54	0.03
Elm_Fork_S120	18.41	50	6.6	0.62	1.51		0.52	0.03
Denton_Ck_S010	116.04	1	7	0.7	0.16		0.74	0.11
Denton_Ck_S020	169.01	1	7	0.7	0.1		0.75	0.11
Denton_Ck_S030	61.58	2	3.96	0.7	0.19		0.75	0.12
Denton_Ck_S040	53.41	1	4.55	0.69	0.19		0.76	0.1
Denton_Ck_S050	75.30	2	4.9	0.7	0.16		0.67	0.01
Denton_Ck_S060	30.78	5	5.25	0.7	0.16		0.67	0.01
Denton_Ck_S070	93.55	8	7.12	0.7	0.17		0.69	0.01
Grapevine_S010	94.75	21	2.44	0.7	0.2		0.67	0.01
Denton_Ck_S080	24.30	33	4.56	0.7	3.66		0.64	0.03
Elm_Fork_S130	39.18	50	2.66	0.7	0.01		0.5	0.02
Hackberry_Ck_S010	14.68	42	1.96	0.7	0.01		0.5	0.02
Hackberry_Ck_S020	4.62	43	1.37	0.7	0.01		0.5	0.02
Hackberry_Ck_S030	1.59	45	1.05	0.7	0.01		0.5	0.02
Elm_Fork_S140	16.13	47	2.61	0.7	0.01		0.5	0.02
Elm_Fork_S150	22.20	47	1.4	0.7	0.01		0.5	0.02
Bachman_Branch_S010	12.68	33	1.32	0.7	0.01		0.8	0.02
Bachman_Branch_S020	1.40	44	1.24	0.7	0.01		0.8	0.02
Elm_Fork_S160	6.09	45	0.94	0.7	0.01		0.8	0.02
Trinity_River_S010	12.47	38	1.79	0.7	0.01		0.8	0.02
Trinity_River_S020	42.89	54	1.98	0.7	0.01		0.5	0.02
White_Rock_Ck_S010	66.66	49	2.6	0.7	0.56		0.68	0.02
White_Rock_Ck_S020	17.61	49	1.1	0.7	0.45		0.68	0.02
White_Rock_Ck_S030	10.77	48	1.3	0.7	0.45		0.68	0.02
White_Rock_Ck_S040	39.84	30	2.1	0.7	0.01		0.5	0.02
Trinity_River_S030	22.54	30	2.1	0.7	0.01		0.5	0.02
Fivemile_Ck_S010	43.49	29	3.1	0.72		126	1	0.04
Trinity_River_S040	28.86	17	3	0.72	1.49		0.71	0.04
Trinity_River_S050	38.88	18	9	0.72	1.29		0.68	0.04
Tenmile_Ck_S010	74.21	21	6.5	0.72	1.51		0.69	0.04
Tenmile_Ck_S020	27.91	6	5	0.72	1.21		0.68	0.04
Trinity_River_S060	59.61	8	10	0.72	1.65		0.69	0.04
Indian_Ck_S010	104.60	2	12.7	0.45	1.37		0.82	0.15
Indian_Ck_S030	85.21	1	11.1	0.6	0.6		0.7	0.14
Indian_Ck_S020	15.96	1	7.5	0.6	0.6		0.81	0.08
Indian_Ck_S040	30.15	6	5.2	0.6	0.6		0.59	0.08
Sister_Grove_S010	83.15	2	12.7	0.43	1.19		0.79	0.25
Sister_Grove_S020	38.04	6	6.3	0.6	0.6		0.81	0.08

Subbasin Name	Drainage Area (sqmi)	Percent Imperv. (%)	Snyder's Lag Time (hr)	Snyder's Peaking Coefficient	Initial Baseflow (cfs / sqmi)	Initial Baseflow (cfs)	Baseflow Recession Constant	Baseflow Ratio to Peak
East_Fork_S020	118.24	2	12	0.58	0.78		0.85	0.21
East_Fork_S010	49.64	3	7	0.58	0.69		0.85	0.2
East_Fork_S030	22.23	9	4.8	0.55	0.53		0.85	0.08
East_Fork_S040	24.67	10	5.3	0.6	0.6		0.81	0.08
Wilson_Ck_S010	77.49	19	10.2	0.57	0.6		0.81	0.09
Lavon_S010	85.74	26	5.3	0.6	0.6		0.79	0.08
Lavon_S020	33.09	32	4.3	0.6	0.6		0.79	0.07
Rowlett_Ck_S010	119.88	38	4.1	0.65	1.58		0.75	0.05
Ray_Hubbard_S010	137.97	32	5.1	0.51	0.2		0.78	0.07
Ray_Hubbard_S020	43.94	48	5.4	0.5	0.2		0.77	0.07
East_Fork_S050	48.09	36	9.9	0.7	1.33		0.79	0.09
East_Fork_S070	9.63	11	3.5	0.5	0.35		0.6	0.28
East_Fork_S060	34.34	13	7.9	0.5	0.36		0.5	0.28
East_Fork_S080	23.00	21	5.4	0.5	0.29		0.5	0.28
East_Fork_S090	29.55	34	7.4	0.5	0.27		0.5	0.28
East_Fork_S110	19.14	6	5.2	0.5	0.32		0.5	0.28
East_Fork_S100	19.27	15	5.7	0.5	0.31		0.5	0.28
Trinity_River_S070	231.25	4	9.5	0.72	1.73		0.67	0.04
East_Fork_S120	104.18	3	9	0.72	1.75		0.7	0.04
Kings_Ck_S020	133.14	3	28	0.63	0.43		0.8	0.05
Kings_Ck_S010	89.44	5	22	0.63	0.41		0.8	0.05
Kings_Ck_S030	120.56	6	7.6	0.6	0.1		0.83	0.14
Cedar_Ck_S040	285.73	17	7.1	0.62	0.1		0.82	0.08
Cedar_Ck_S010	176.13	2	22.4	0.63	0.04		0.8	0.09
New_Terrell_City_Lake_S010	14.02	9	3.7	0.49	0.1		0.9	0.1
Cedar_Ck_S020	93.33	5	6.2	0.58	0.1		0.83	0.12
Cedar_Ck_S030	98.44	4	6.6	0.59	0.1		0.83	0.1
Trinity_River_S080	398.90	1	27.7	0.71	1.31		0.81	0.05
Trinity_River_S090	283.46	2	12	0.65	0.62		0.89	0.08
Chambers_Ck_S010	161.82	1.59	11.5	0.65	0.1		0.68	0.11
Chambers_Ck_S020	146.57	0.57	8.7	0.65	0.1		0.68	0.11
Chambers_Ck_S040	105.96	1	11.5	0.65	0.1		0.68	0.1
Chambers_Ck_S030	97.55	0.76	13	0.65	0.1		0.68	0.1
Waxahachie_Ck_S010	60.39	7.21	4.13	0.59	6.23		0.88	0.23
Waxahachie_Ck_S020	30.60	1.7	2.37	0.64	19.4		0.94	0.2
Waxahachie_Ck_S030	30.05	3.68	3.5	0.49	0.1		0.7	0.04
Mustang_Ck_S010	29.91	6.75	3.38	0.49	0.1		0.72	0.03
Bardwell_S010	23.44	29.25	2.23	0.39	0.1		0.71	0.14
Chambers_Ck_S050	75.82	0.43	10	0.65	0.1		0.68	0.11
Chambers_Ck_S060	33.26	0.15	5.5	0.65	0.1		0.68	0.11

Subbasin Name	Drainage Area (sqmi)	Percent Imperv. (%)	Snyder's Lag Time (hr)	Snyder's Peaking Coefficient	Initial Baseflow (cfs / sqmi)	Initial Baseflow (cfs)	Baseflow Recession Constant	Baseflow Ratio to Peak
Chambers_Ck_S070	29.09	1.01	5.5	0.65	0.1		0.68	0.11
Chambers_Ck_S080	145.13	3.57	5.81	0.51	0.1		0.58	0.19
Post_Oak_Ck_S010	29.49	13.16	3.3	0.34	0.1		0.81	0.16
Lake_Halbert_S010	11.53	4.53	1.9	0.48	1.11		0.83	0.06
Navarro_Mills_S020	143.52	1.46	6.54	0.6	0.23		0.83	0.09
Navarro_Mills_S030	74.88	1.17	9.29	0.6	0.43		0.83	0.08
Navarro_Mills_S010	65.75	0.5	4.8	0.66	2.14		0.7	0.16
Navarro_Mills_S040	35.71	22.5	5.33	0.62	0.22		0.81	0.1
Richland_Ck_S010	220.05	0.65	7.38	0.48	0.08		0.81	0.1
Richland_Ck_S020	174.90	0.38	7	0.44	0.08		0.81	0.1
Richland-Chambers_S010	141.82	22.68	8.12	0.42	0.07		0.82	0.09
Richland-Chambers_S020	92.54	47.06	7.23	0.42	0.07		0.82	0.09
Tehuacana_Ck_S020	245.04	2	16	0.65	0.79		0.89	0.1
Tehuacana_Ck_S010	141.34	1	7.6	0.72	0.52		0.46	0.15
Trinity_River_S100	70.59	2	17	0.65	0.63		0.89	0.1
Fairfield_Lake_S010	36.17	12	5.5	0.65	0.86		0.89	0.12
Trinity_River_S110	305.13	3	19.3	0.65	0.96		0.89	0.13
Big_Brown_Ck_S010	46.43	1	11.1	0.65	0.98		0.89	0.12
Trinity_River_S120	240.00	3	18.7	0.65	0.97		0.89	0.14
Trinity_River_S130	256.66	2	28.5	0.6	2.28		0.79	0.05
Upper_Keechi_Ck_S030	272.69	3	17.3	0.6	2.15		0.79	0.05
Upper_Keechi_Ck_S010	150.34	4	7.7	0.6	0.41		0.55	0.31
Upper_Keechi_Ck_S020	36.47	1	9	0.6	1.73		0.79	0.05
Upper_Keechi_Ck_S040	49.75	1	7.7	0.6	1.31		0.79	0.05
Trinity_River_S140	0.60	1	1.6	0.6	1.15		0.79	0.05
Little_Elkhart_S010	95.01	1	11.6	0.6	1.94		0.79	0.05
Houston_County_Lake_S010	47.98	6	3.5	0.45	1		0.79	0.05
Trinity_River_S150	112.48	2	11.6	0.6	3.07		0.79	0.05
Trinity_River_S160	176.66	1	14	0.55	3.34		0.6	0.05
Trinity_River_S170	187.60	1	17.8	0.55	2.87		0.6	0.05
Trinity_River_S180	395.03	2	24	0.55	3.52		0.6	0.05
Bedias_Ck_S010	330.55	1	16.5	0.72	1.67		0.82	0.04
Bedias_Ck_S020	273.70	1	16	0.55	3.76		0.6	0.05
Trinity_River_S190	328.14	4	18	0.55	3.12		0.6	0.05
Livingston_S010	509.39	3	17	0.55	3.31		0.6	0.05
Livingston_S030	414.80	27	6	0.55	3.05		0.6	0.05
Livingston_S020	70.27	17	5	0.55	3.78		0.6	0.05
Trinity_River_S200	39.41	3	5.5	0.5	1.71		0.6	0.02
Long_King_Ck_S010	141.11	1	7.5	0.44	0.09		0.8	0.03

Subbasin Name	Drainage Area (sqmi)	Percent Imperv. (%)	Snyder's Lag Time (hr)	Snyder's Peaking Coefficient	Initial Baseflow (cfs / sqmi)	Initial Baseflow (cfs)	Baseflow Recession Constant	Baseflow Ratio to Peak
Long_King_Ck_S020	85.25	4	10.8	0.5	1.67		0.6	0.02
Trinity_River_S210	61.11	4	8.5	0.5	1.86		0.6	0.02
Menard_Ck_S010	148.14	1	27	0.78	0.67		0.79	0.08
Trinity_River_S220	97.56	2	13	0.5	2.08		0.6	0.02
Trinity_River_S230	72.02	4	16.6	0.49	0.05		0.78	0.07
Trinity_River_S240	230.77	2	20.5	0.49	0.03		0.78	0.08
Trinity_River_S250	441.84	8	19	0.5	0.09		0.78	0.09

Table 24: Final Lag Routing Parameters

HEC-HMS Reach Name	Lag Time (min)
Clear_Fork_R041	26
West_Fork_R251	60
West_Fork_R263	60
Denton_Ck_Lag	130
Tehuacana_Ck_R008	430
Upper_Keechi_R001a	400

Table 25: Final Modified Puls Routing Parameters

HEC-HMS Reach Name	Subreaches	Storage Volume Adjustment Factor
West_Fork_R010	4	1.0
West_Fork_R020	1	1.0
West_Fork_R030	2	1.0
West_Fork_R040	1	1.0
West_Fork_R050	2	1.0
West_Fork_R060	2	1.0
West_Fork_R070	2	1.0
Big_Cleveland_R010	3	1.0
West_Fork_R080	1	1.0
Lost_Ck_R010	5	1.0
Beans_Ck_R010	1	1.0
Big_Ck_R010	3	1.0
Big_Ck_R020	1	1.0
West_Fork_R120	5	1.0
West_Fork_R130	2	1.0

HEC-HMS Reach Name	Subreaches	Storage Volume Adjustment Factor
Big_Sandy_Ck_R020	4	1.0
Big_Sandy_Ck_R030	9	1.0
Brushy_Ck_R010	6	1.0
Brushy_Ck_R020	1	1.0
Big_Sandy_Ck_R040	4	1.0
Big_Sandy_Ck_R050	4	1.0
Big_Sandy_Ck_R060	1	1.0
West_Fork_R140	2	1.0
West_Fork_R150	1	1.0
Garrett_Ck_R010	2	1.0
Garrett_Ck_R020	2	1.0
Salt_Ck_R010	4	1.0
Salt_Ck_R020	2	1.0
Salt_Ck_R030	1	1.0
West_Fork_R160	2	1.0
Walnut_Ck_R020	3	1.0
Silver_Ck_R010	7	1.0
West_Fork_R200	2	1.0
West_Fork_R201	1	1.0
Clear_Fork_R030	1	1.0
Clear_Fork_R040	6	1.0
Clear_Fork_R050	1	1.0
West_Fork_R210	2	1.0
Marine_Ck_R010	3	1.0
West_Fork_R220	3	1.0
West_Fork_R230	2	1.0
West_Fork_R231	2	1.0
West_Fork_R240	1	1.0
West_Fork_R250	1	1.0
Village_Ck_R010	5	1.0
Village_Ck_R020	1	1.0
West_Fork_R260	1	1.0
West_Fork_R261	1	1.0
West_Fork_R262	1	1.0
West_Fork_R264	1	1.0
West_Fork_R270	1	1.0
West_Fork_R280	1	1.0
Big_Bear_Ck_R010	6	1.0
West_Fork_R290	1	1.0
Mountain_Ck_R020	6	1.0
Mountain_Ck_R030	1	1.0
West_Fork_R300	1	1.0

HEC-HMS Reach Name	Subreaches	Storage Volume Adjustment Factor
Elm_Fork_R060	8	1.0
Clear_Ck_R050	1	1.0
Clear_Ck_R060	3	1.0
Elm_Fork_R065	1	1.0
Little_Elm_Ck_R030	1	1.0
Doe_Branch_R010	1	1.0
Hickory_Ck_R030	1	1.0
Elm_Fork_R070	5	1.0
Elm_Fork_R080	2	1.0
Denton_Ck_R010	14	1.0
Denton_Ck_R030	4	1.0
Denton_Ck_R040	2	1.0
Denton_Ck_R050	3	1.0
Denton_Ck_R055	2	1.0
Denton_Ck_R060	7	1.0
Elm_Fork_R090	5	1.0
Elm_Fork_R100	5	1.0
Elm_Fork_R120	4	1.0
Bachman_Branch_R010	1	1.0
Elm_Fork_R130	2	1.0
Trinity_River_R010	2	1.0
Trinity_River_R020	1	1.0
Trinity_River_R030	2	1.0
White_Rock_Ck_R020	4	1.0
Trinity_River_R040	1	1.0
Trinity_River_R050	1	1.0
Trinity_River_R060	1	0.8 - 1.15
Trinity_River_R070	1	0.8 - 1.2
East_Fork_R040	6	1.0
East_Fork_R050	1	1.0
East_Fork_R060	1	1.0
East_Fork_R070	1	1.0
East_Fork_R080	1	1.0 - 1.2
Trinity_River_R090	1	0.8 - 1.2
Trinity_River_R100	40	0.8 - 1.0
Trinity_River_R110	1	1.0
Trinity_River_R120	5	1.0
Chambers_Ck_R009	5	1.0
Chambers_Ck_R010	20	1.0
Chambers_Ck_R020	7	1.0
Chambers_Ck_R030	8	1.0
Chambers_Ck_R040	10	1.0

HEC-HMS Reach Name	Subreaches	Storage Volume Adjustment Factor
Richland_Ck_R020	11	1.0
Trinity_River_R130	3	1.0
Tehuacana_Ck_R009	1	1.0
Trinity_River_R140	1	1.0
Trinity_River_R150	1	1.0
Trinity_River_R160	7	0.75 - 1.0
Trinity_River_R170	1	0.8 -1.1
Trinity_River_R180	1	1.0
Trinity_River_R190	1	1.0
Trinity_River_R200	1	0.8 - 1.25
Trinity_River_R210	1	0.8 - 1.25
Trinity_River_R220	1	0.8 - 1.25
Trinity_River_R230	1	1.0
Trinity_River_R240	1	1.0
Trinity_River_R250	1	1.0
Trinity_River_R260	3	1.0
Trinity_River_R270	3	1.0
Trinity_River_R280	3	1.0

Table 26: Final Muskingum Routing Parameters

HEC-HMS Reach Name	K (hrs)	X	Subreaches
West_Fork_R090	1	0.25	1
West_Fork_R100	3	0.34	3
West_Fork_R110	3	0.36	3
West_Fork_R170	5	0.22	2
West_Fork_R180	3	0.22	1
Walnut_Ck_R010	1	0.25	1
West_Fork_R190	6	0.11	4
Bear_Ck_R010	1	0.25	1
Marys_Ck_R010	0.33	0.25	1
JPL_Walnut_Ck_R010	1	0.2	1
Mountain_Ck_R010	5	0.2	3
Elm_Fork_R010	3.5	0.3	4
Brushy_Elm_Ck_R010	3.9	0.3	4
Elm_Fork_R020	1.1	0.3	1
Elm_Fork_R030	1.4	0.3	1
Elm_Fork_R040	3.1	0.2	2
Elm_Fork_R050	4.4	0.2	3
Spring_Ck_R010	3.7	0.2	3

HEC-HMS Reach Name	K (hrs)	X	Subreaches
Timber_Ck_R010	1.3	0.2	1
Timber_Ck_R020	2	0.2	1
Range_Ck_R010	5.7	0.2	5
Range_Ck_R020	2	0.2	1
Lake_Kiowa_R010	1.7	0.2	1
Clear_Ck_R010	1	0.3	1
Clear_Ck_R020	4.7	0.3	3
Clear_Ck_R030	1.1	0.3	1
Clear_Ck_R040	5.9	0.3	4
Little_Elm_Ck_R010	6.7	0.34	8
Little_Elm_Ck_R035	2.5	0.1	1
Hickory_Ck_R010	4	0.3	4
Hickory_Ck_R020	3	0.3	2
Hickory_Ck_R035	6.9	0.1	3
Denton_Ck_R020	2	0.25	1
Hackberry_Ck_R010	1	0.25	1
Elm_Fork_R110	1	0.25	1
White_Rock_Ck_R010	3	0.3	2
Five_Mile_Ck_R010	0.5	0.3	1
Tenmile_Ck_R010	1.7	0.3	2
Indian_Ck_R010	5.1	0.25	3
Indian_Ck_R020	3.1	0.2	2
Sister_Grove_Ck_R010	7.1	0.2	4
East_Fork_R010	2	0.2	1
East_Fork_R020	5.8	0.2	3
East_Fork_R030	2.6	0.2	2
Lavon_RayHubbard_R010	4	0.2	7
Rowlett_Ck_R010	4	0.2	3
Trinity_River_R080	1	0.25	1
Kings_Ck_R010	1	0.4	1
Kings_Ck_R020	6	0.4	3
Cedar_Ck_R010	12	0.3	6
Cedar_Ck_R020	8	0.4	4
Cedar_Ck_R030	10	0.1	2
Waxahachie_Ck_R010	3.92	0.3	4
Waxahachie_Ck_R020	6.15	0.32	6
Waxahachie_Ck_R030	3.61	0.27	4
Post_Oak_Ck_R010	1.5	0.3	2
Richland_Ck_R010	8.93	0.35	9
Richland_Ck_R030	4.96	0.16	5
Richland_Ck_R040	1	0.1	1
Tehuacana_Ck_R010	6	0.1	3
Big_Brown_Ck_R010	1	0.1	1

HEC-HMS Reach Name	K (hrs)	X	Subreaches
Upper_Keechi_Ck_R010	3	0.1	1
Upper_Keechi_Ck_R020	3.5	0.1	1
Big_Elkhart_R010	2.5	0.1	1
Bedias_Ck_R010	6	0.25	2
Long_King_Ck_R010	4	0.1	1
Menard_Ck_R010	2	0.1	1

Table 27: Final Straddle Stagger Routing Parameters

HEC-HMS Reach Name	Lag Time (min)	Duration (min)
Clear_Fork_R010	360	120
Clear_Fork_R020	120	120

Table 28: Final Initial and Constant Losses for the 2-yr through 25-yr Frequency Storms

Subbasin Name	2-yr	2-yr	5-yr	5-yr	10-yr	10-yr	25-yr	25-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
West_Fork_S020	1.63	0.24	1.63	0.19	1.37	0.17	1.18	0.14
West_Fork_S010	1.66	0.24	1.73	0.19	1.52	0.17	1.37	0.14
West_Fork_S030	1.65	0.24	1.65	0.2	1.39	0.17	1.2	0.14
West_Fork_S040	1.63	0.24	1.64	0.19	1.38	0.17	1.19	0.14
West_Fork_S050	1.64	0.24	1.64	0.19	1.38	0.17	1.19	0.14
West_Fork_S060	1.63	0.24	1.63	0.19	1.37	0.17	1.18	0.14
West_Fork_S070	1.66	0.24	1.66	0.2	1.39	0.17	1.2	0.14
West_Fork_S080	1.62	0.24	1.62	0.19	1.36	0.17	1.17	0.14
West_Fork_S090	1.67	0.24	1.67	0.2	1.4	0.17	1.21	0.14
West_Fork_S100	1.6	0.24	1.6	0.19	1.35	0.16	1.16	0.14
West_Fork_S120	1.85	0.24	2.43	0.19	2.55	0.17	2.64	0.14
West_Fork_S110	1.69	0.25	1.69	0.2	1.41	0.17	1.22	0.14
Big_Cleveland_S010	1.99	0.24	2.97	0.19	3.36	0.17	3.63	0.14
Big_Cleveland_S020	1.83	0.24	2.37	0.19	2.46	0.17	2.52	0.14
West_Fork_S130	1.61	0.24	1.61	0.19	1.36	0.16	1.17	0.14
Lost_Ck_S010	1.9	0.24	1.63	0.19	1.37	0.17	1.18	0.14
Lost_Ck_S020	2.43	0.26	2.32	0.21	1.35	0.16	1.16	0.14
West_Fork_S140	2.64	0.26	3	0.21	2.09	0.17	2.06	0.14
West_Fork_S150	2.44	0.26	2.35	0.21	1.36	0.17	1.17	0.14
West_Fork_S160	2.5	0.26	2.39	0.22	1.39	0.17	1.2	0.14
Beans_Ck_S010	2.48	0.26	2.41	0.21	1.4	0.17	1.22	0.14
Beans_Ck_S020	2.51	0.26	2.41	0.22	1.39	0.17	1.2	0.14
Big_Ck_S010	2.55	0.27	2.47	0.22	1.44	0.17	1.25	0.14
Big_Ck_S030	2.63	0.27	2.51	0.22	1.45	0.17	1.25	0.15
Big_Ck_S020	2.56	0.27	2.45	0.22	1.42	0.17	1.23	0.14
Bridgeport_S030	2.68	0.28	2.55	0.23	1.47	0.18	1.27	0.15
Bridgeport_S010	2.22	0.24	2.13	0.19	1.25	0.15	1.07	0.13
Bridgeport_S040	2.65	0.27	2.54	0.22	1.46	0.18	1.26	0.15
Bridgeport_S020	2.54	0.27	2.44	0.22	1.41	0.17	1.21	0.14
West_Fork_S170	2.57	0.27	2.47	0.22	1.42	0.17	1.23	0.14
Dry_Ck_S010	2.69	0.28	2.64	0.23	1.56	0.18	1.38	0.15
West_Fork_S180	2.73	0.28	2.61	0.23	1.5	0.18	1.3	0.15
Amon_G_Carter_S030	2.03	0.24	1.98	0.2	1.87	0.17	1.79	0.14
Amon_G_Carter_S010	2.27	0.25	2.69	0.2	2.92	0.17	3.07	0.14
Amon_G_Carter_S020	2	0.25	1.82	0.2	1.62	0.17	1.48	0.14
Big_Sandy_Ck_S010	1.81	0.25	1.83	0.2	1.81	0.17	1.71	0.14
Big_Sandy_Ck_S020	1.77	0.26	1.57	0.21	1.36	0.18	1.39	0.15
Brushy_Ck_S010	1.76	0.26	1.59	0.21	1.42	0.18	1.42	0.15
Brushy_Ck_S020	1.85	0.26	1.78	0.21	1.69	0.18	1.63	0.15
Brushy_Ck_S030	1.97	0.26	2.18	0.21	2.29	0.18	2.07	0.15

Subbasin Name	2-yr	2-yr	5-yr	5-yr	10-yr	10-yr	25-yr	25-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Big_Sandy_Ck_S030	1.86	0.26	1.79	0.21	1.69	0.18	1.63	0.15
Big_Sandy_Ck_S040	1.81	0.26	1.64	0.21	1.47	0.18	1.46	0.15
Big_Sandy_Ck_S050	2.76	0.28	2.73	0.23	1.62	0.18	1.44	0.15
West_Fork_S190	2.73	0.28	2.7	0.23	1.6	0.18	1.43	0.15
West_Fork_S200	2.69	0.28	2.57	0.23	1.48	0.18	1.28	0.15
Garrett_Ck_S020	2.9	0.27	3	0.22	2.44	0.18	2.48	0.15
Garrett_Ck_S010	2.94	0.28	3	0.23	2.52	0.18	2.57	0.15
Garrett_Ck_S030	2.7	0.28	2.58	0.23	1.48	0.18	1.29	0.15
Salt_Ck_S010	3	0.28	3	0.23	3.54	0.18	3.82	0.15
Salt_Ck_S020	2.99	0.28	3	0.23	2.44	0.18	2.45	0.15
West_Fork_S210	2.72	0.28	2.6	0.23	1.49	0.18	1.29	0.15
West_Fork_S220	2.93	0.28	2.82	0.23	2.76	0.2	1.75	0.15
Eagle_Mountain_S010	2.81	0.27	2.53	0.22	2.34	0.19	1.25	0.15
Eagle_Mountain_S020	2.63	0.25	2.38	0.21	2.23	0.18	1.14	0.14
Walnut_Ck_S020	1.98	0.26	2.08	0.21	2.08	0.18	1.29	0.15
Walnut_Ck_S010	1.97	0.26	2.07	0.21	2.07	0.18	1.28	0.15
Walnut_Ck_S030	2.89	0.28	2.69	0.23	2.39	0.2	1.29	0.15
Eagle_Mountain_S040	2.66	0.26	2.5	0.21	2.25	0.18	1.16	0.14
Eagle_Mountain_S030	2.83	0.27	2.64	0.22	2.35	0.2	1.26	0.15
Silver_Ck_S020	2.81	0.27	2.73	0.22	2.53	0.19	1.48	0.14
Silver_Ck_S010	2.91	0.28	2.81	0.23	2.59	0.2	1.54	0.15
Lake_Worth_S010	2.78	0.27	2.6	0.22	2.32	0.19	1.23	0.14
Lake_Worth_S020	2.7	0.26	2.53	0.21	2.27	0.19	1.18	0.14
West_Fork_S230	2.6	0.26	2.55	0.21	2.28	0.18	1.32	0.15
Lk_Weatherford_S010	2.11	0.26	2.64	0.21	2.78	0.18	1.69	0.22
Lk_Weatherford_S020	1.86	0.24	2.09	0.2	2.03	0.17	1.71	0.22
Clear_Fork_S010	2.25	0.25	2.53	0.2	2.64	0.17	2.73	0.15
Clear_Fork_S020	1.97	0.25	1.7	0.2	1.42	0.17	1.23	0.14
Bear_Ck_S010	2.03	0.25	1.83	0.2	1.61	0.17	1.46	0.14
Bear_Ck_S020	1.92	0.24	1.65	0.19	1.38	0.17	1.19	0.14
Benbrook_S010	1.87	0.24	1.61	0.19	1.36	0.16	1.17	0.14
Benbrook_S020	1.81	0.23	1.56	0.19	1.32	0.16	1.13	0.14
Benbrook_S030	1.79	0.23	1.54	0.18	1.3	0.16	1.12	0.13
Clear_Fork_S030	1.92	0.24	1.91	0.19	1.83	0.17	1.19	0.14
Marys_Ck_S010	2.4	0.25	2.4	0.24	2.36	0.21	1.21	0.14
Clear_Fork_S040	2.21	0.26	2.2	0.21	2.17	0.18	2	0.15
Clear_Fork_S050	2.66	0.27	2.6	0.22	2.33	0.19	1.35	0.15
West_Fork_S240	2.64	0.26	2.44	0.2	2.19	0.18	1.26	0.15
Marine_Ck_S020	2.91	0.26	2.98	0.2	2.98	0.18	2.52	0.15
Marine_Ck_S010	1.76	0.23	1.51	0.18	1.28	0.16	1.1	0.13
West_Fork_S250	2.7	0.27	2.49	0.21	2.24	0.18	1.29	0.15

Subbasin Name	2-yr	2-yr	5-yr	5-yr	10-yr	10-yr	25-yr	25-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
West_Fork_S260	2.46	0.25	2.38	0.19	2.25	0.16	1.35	0.14
West_Fork_S270	3	0.28	3	0.22	2.98	0.19	1.76	0.15
Big_Fossil_Ck_S010	1.99	0.22	2.46	0.18	2.74	0.15	2.91	0.13
LittleFossil_Ck_S010	2.95	0.25	2.28	0.2	2.18	0.17	1.07	0.13
West_Fork_S280	3	0.27	2.53	0.21	2.48	0.19	1.18	0.14
Village_Ck_S010	1.67	0.23	1.65	0.19	1.45	0.16	1.29	0.14
Village_Ck_S020	1.81	0.23	1.56	0.19	1.31	0.16	1.13	0.14
Lake_Arlington_S010	1.78	0.23	1.53	0.18	1.3	0.16	1.11	0.13
Village_Ck_S030	3	0.28	2.64	0.22	2.58	0.19	1.23	0.14
West_Fork_S290	3	0.28	2.64	0.22	2.58	0.19	1.23	0.14
West_Fork_S300	3	0.26	2.46	0.21	2.38	0.18	1.15	0.14
West_Fork_S310	3	0.26	2.36	0.2	2.32	0.18	1.11	0.13
West_Fork_S320	2.03	0.25	1.75	0.2	1.46	0.18	1.26	0.15
Big_Bear_Ck_S010	1.94	0.24	1.77	0.19	1.58	0.17	1.43	0.14
Big_Bear_Ck_S020	2	0.25	1.72	0.2	1.44	0.17	1.24	0.15
West_Fork_S330	2	0.25	1.71	0.2	1.43	0.17	1.24	0.14
Joe_Pool_S020	1.7	0.21	1.7	0.17	1.66	0.15	1.6	0.13
Joe_Pool_S030	1.8	0.23	1.78	0.23	1.76	0.19	1.13	0.14
Joe_Pool_S040	1.75	0.23	1.51	0.18	1.28	0.16	1.1	0.13
Joe_Pool_S010	1.52	0.2	1.31	0.16	1.13	0.14	0.96	0.12
Joe_Pool_S050	1.59	0.21	1.38	0.17	1.18	0.15	1	0.12
Mountain_Ck_S010	1.63	0.21	1.42	0.17	1.22	0.15	1.04	0.13
Mountain_Ck_S020	1.65	0.21	1.42	0.17	1.21	0.15	1.04	0.13
Mountain_Ck_S030	1.7	0.22	1.68	0.21	1.5	0.18	1.07	0.13
West_Fork_S340	1.83	0.23	1.58	0.19	1.33	0.16	1.14	0.14
Elm_Fork_S020	1.99	0.22	2.33	0.18	2.51	0.16	2.62	0.13
Elm_Fork_S010	2.27	0.23	3.12	0.19	3.66	0.16	4.03	0.14
Brushy_Elm_Ck_S010	1.85	0.22	2.01	0.18	2.07	0.15	2.09	0.13
Brushy_Elm_Ck_S020	1.75	0.22	1.66	0.18	1.55	0.15	1.44	0.13
Elm_Fork_S030	1.88	0.22	2.11	0.18	2.22	0.15	2.27	0.13
Elm_Fork_S040	1.76	0.22	1.74	0.17	1.68	0.15	1.6	0.13
Elm_Fork_S050	1.91	0.23	1.87	0.19	1.77	0.16	1.69	0.14
Elm_Fork_S070	1.84	0.23	1.7	0.18	1.53	0.16	1.4	0.13
Elm_Fork_S060	1.61	0.21	1.39	0.17	1.19	0.15	1.02	0.13
Spring_Ck_S010	1.69	0.22	1.46	0.18	1.24	0.15	1.06	0.13
Spring_Ck_S020	1.69	0.22	1.46	0.18	1.24	0.15	1.06	0.13
Ray_Roberts_S010	1.95	0.22	2.23	0.18	2.37	0.16	2.45	0.13
Timber_Ck_S010	2.03	0.25	1.74	0.2	1.46	0.18	1.26	0.15
Timber_Ck_S030	1.85	0.23	1.59	0.19	1.34	0.16	1.15	0.14
Timber_Ck_S020	2.01	0.25	1.73	0.2	1.44	0.17	1.25	0.15
Ray_Roberts_S030	1.88	0.24	1.62	0.19	1.37	0.17	1.19	0.14

Subbasin Name	2-yr	2-yr	5-yr	5-yr	10-yr	10-yr	25-yr	25-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Range_Ck_S010	2.35	0.29	2.35	0.28	2.25	0.26	1	0.12
Range_Ck_S020	1.56	0.21	1.35	0.16	1.16	0.14	0.98	0.12
Lake_Kiowa_S020	1.99	0.25	1.7	0.2	1.43	0.17	1.23	0.14
Lake_Kiowa_S010	2.08	0.26	1.78	0.21	1.49	0.18	1.29	0.15
Ray_Roberts_S020	1.58	0.21	1.37	0.17	1.17	0.15	1	0.12
Range_Ck_S030	1.66	0.22	1.43	0.17	1.22	0.15	1.04	0.13
Buck_Ck_S010	1.57	0.21	1.36	0.17	1.16	0.14	0.99	0.12
Ray_Roberts_S050	1.59	0.21	1.37	0.17	1.17	0.15	1	0.12
Ray_Roberts_S040	1.77	0.22	1.67	0.18	1.54	0.15	1.42	0.13
Ray_Roberts_S060	1.76	0.23	1.51	0.18	1.28	0.16	1.1	0.13
Timber_Ck_S040	1.82	0.23	1.56	0.19	1.32	0.16	1.13	0.14
Elm_Fork_S080	2.35	0.3	2.19	0.26	1.36	0.17	1.17	0.14
Clear_Ck_S010	2.12	0.23	2.84	0.2	3.11	0.17	3.31	0.15
Clear_Ck_S020	2.06	0.23	2.57	0.21	2.69	0.18	2.78	0.15
Clear_Ck_S030	2.12	0.23	2.86	0.2	3.14	0.18	3.34	0.15
Clear_Ck_S040	2.02	0.22	2.87	0.19	3.25	0.16	3.5	0.14
Clear_Ck_S050	1.85	0.21	2.4	0.19	2.57	0.16	2.68	0.14
Clear_Ck_S070	1.67	0.21	1.87	0.18	1.82	0.16	1.76	0.13
Clear_Ck_S060	1.72	0.22	1.64	0.19	1.38	0.17	1.19	0.14
Clear_Ck_S080	1.85	0.21	2.41	0.19	2.6	0.16	2.72	0.14
Clear_Ck_S090	1.67	0.2	2.03	0.18	2.1	0.15	2.13	0.13
Clear_Ck_S110	1.66	0.22	1.43	0.17	1.22	0.15	1.04	0.13
Clear_Ck_S100	1.78	0.22	1.8	0.17	1.76	0.15	1.7	0.13
Clear_Ck_S120	1.75	0.22	1.55	0.18	1.36	0.16	1.2	0.13
Little_Elm_Ck_S010	2.02	0.23	2.26	0.17	2.52	0.14	2.66	0.12
Little_Elm_Ck_S020	1.87	0.22	1.86	0.16	1.93	0.14	1.94	0.12
Little_Elm_Ck_S030	1.53	0.2	1.33	0.16	1.14	0.14	0.97	0.12
Pecan_Ck_S010	1.85	0.24	1.59	0.19	1.34	0.16	1.15	0.14
Doe_Branch_S010	1.57	0.21	1.37	0.17	1.19	0.14	1.02	0.12
Doe_Branch_S020	1.6	0.21	1.38	0.17	1.18	0.15	1.01	0.12
Lewisville_S030	1.78	0.23	1.54	0.18	1.3	0.16	1.12	0.13
Hickory_Ck_S020	1.74	0.22	1.65	0.17	1.53	0.15	1.42	0.13
Hickory_Ck_S010	1.73	0.22	1.64	0.17	1.53	0.15	1.42	0.13
Hickory_Ck_S030	1.66	0.21	1.47	0.17	1.28	0.15	1.12	0.13
Hickory_Ck_S040	2	0.22	2.35	0.18	2.54	0.16	2.66	0.13
Hickory_Ck_S050	2.09	0.25	1.98	0.2	1.82	0.17	1.71	0.15
Lewisville_S010	1.89	0.24	1.68	0.19	1.47	0.16	1.3	0.14
Lewisville_S040	1.54	0.2	1.34	0.16	1.15	0.14	0.97	0.12
Lewisville_S050	1.59	0.21	1.37	0.17	1.17	0.15	1	0.12
Lewisville_S020	1.89	0.24	1.68	0.19	1.46	0.16	1.3	0.14
Elm_Fork_S090	3	0.29	2.75	0.26	2.6	0.21	1.08	0.13

Subbasin Name	2-yr	2-yr	5-yr	5-yr	10-yr	10-yr	25-yr	25-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Elm_Fork_S110	3	0.27	2.75	0.25	2.6	0.21	1.03	0.13
Elm_Fork_S100	3	0.31	2.75	0.28	2.6	0.24	1.26	0.14
Elm_Fork_S120	3	0.27	2.75	0.25	2.6	0.21	1.83	0.13
Denton_Ck_S010	1.9	0.26	2.22	0.21	2.33	0.18	2.64	0.15
Denton_Ck_S020	1.88	0.25	2.2	0.2	2.32	0.17	2.62	0.15
Denton_Ck_S030	1.83	0.25	2.12	0.2	2.21	0.17	2.48	0.14
Denton_Ck_S040	1.85	0.23	1.82	0.18	1.75	0.16	1.68	0.13
Denton_Ck_S050	1.89	0.22	2.02	0.18	2.05	0.16	2.05	0.13
Denton_Ck_S060	1.7	0.22	1.47	0.18	1.25	0.15	1.07	0.13
Denton_Ck_S070	1.72	0.22	1.5	0.18	1.29	0.15	1.12	0.13
Grapevine_S010	1.96	0.24	1.89	0.19	1.77	0.17	1.68	0.14
Denton_Ck_S080	3	0.3	2.98	0.28	2.96	0.22	1.13	0.14
Elm_Fork_S130	1.76	0.22	1.75	0.17	1.69	0.15	1.61	0.13
Hackberry_Ck_S010	1.71	0.2	1.93	0.16	2.06	0.14	2.1	0.12
Hackberry_Ck_S020	1.53	0.2	1.32	0.16	1.14	0.14	0.97	0.12
Hackberry_Ck_S030	1.57	0.21	1.36	0.17	1.16	0.14	0.99	0.12
Elm_Fork_S140	1.78	0.23	1.53	0.18	1.3	0.16	1.11	0.13
Elm_Fork_S150	1.79	0.23	1.54	0.18	1.3	0.16	1.12	0.13
Bachman_Branch_S010	1.9	0.24	1.63	0.19	1.37	0.17	1.18	0.14
Bachman_Branch_S020	1.8	0.23	1.55	0.19	1.31	0.16	1.13	0.14
Elm_Fork_S160	1.81	0.23	1.56	0.19	1.32	0.16	1.13	0.14
Trinity_River_S010	1.78	0.22	1.62	0.18	1.44	0.16	1.3	0.13
Trinity_River_S020	2.03	0.24	1.99	0.2	1.89	0.17	1.81	0.14
White_Rock_Ck_S010	1.92	0.22	2.12	0.18	2.21	0.16	2.24	0.13
White_Rock_Ck_S020	1.9	0.24	1.63	0.19	1.37	0.17	1.18	0.14
White_Rock_Ck_S030	1.87	0.24	1.61	0.19	1.35	0.16	1.16	0.14
White_Rock_Ck_S040	1.84	0.23	1.58	0.19	1.33	0.16	1.15	0.14
Trinity_River_S030	1.97	0.25	1.7	0.2	1.42	0.17	1.23	0.14
Fivemile_Ck_S010	2.04	0.25	1.87	0.2	1.66	0.17	1.52	0.14
Trinity_River_S040	1.84	0.23	1.59	0.19	1.34	0.16	1.15	0.14
Trinity_River_S050	1.79	0.23	1.54	0.18	1.3	0.16	1.12	0.13
Tenmile_Ck_S010	1.86	0.23	1.64	0.19	1.42	0.16	1.25	0.14
Tenmile_Ck_S020	1.66	0.22	1.43	0.17	1.22	0.15	1.04	0.13
Trinity_River_S060	1.89	0.24	1.71	0.19	1.51	0.16	1.35	0.14
Indian_Ck_S010	1.81	0.21	2.17	0.17	2.39	0.14	2.5	0.12
Indian_Ck_S030	1.83	0.22	1.82	0.18	1.76	0.16	1.69	0.13
Indian_Ck_S020	1.54	0.2	1.34	0.16	1.15	0.14	0.97	0.12
Indian_Ck_S040	1.75	0.21	1.95	0.17	2.05	0.15	2.08	0.12
Sister_Grove_S010	2.03	0.23	2.41	0.18	2.63	0.16	2.76	0.13
Sister_Grove_S020	1.82	0.22	1.97	0.17	2.03	0.15	2.04	0.13
East_Fork_S020	1.93	0.22	2.26	0.18	2.45	0.15	2.56	0.13

Subbasin Name	2-yr	2-yr	5-yr	5-yr	10-yr	10-yr	25-yr	25-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
East_Fork_S010	2.11	0.22	2.78	0.18	3.22	0.15	3.49	0.13
East_Fork_S030	1.77	0.22	1.7	0.18	1.59	0.15	1.49	0.13
East_Fork_S040	1.69	0.22	1.45	0.18	1.24	0.15	1.06	0.13
Wilson_Ck_S010	1.93	0.22	2.18	0.18	2.3	0.15	2.36	0.13
Lavon_S010	1.57	0.2	1.46	0.16	1.34	0.14	1.21	0.12
Lavon_S020	1.58	0.21	1.37	0.17	1.17	0.15	1	0.12
Rowlett_Ck_S010	2.3	0.25	2.16	0.2	1.8	0.17	1.18	0.13
Ray_Hubbard_S010	2.16	0.12	2.16	0.12	2.16	0.12	2.16	0.12
Ray_Hubbard_S020	1	0.12	1	0.12	1	0.12	1	0.12
East_Fork_S050	1.04	0.13	1.04	0.13	1.04	0.13	1.04	0.13
East_Fork_S070	1.15	0.14	1.04	0.14	2.48	0.12	0.98	0.12
East_Fork_S060	1.47	0.14	2.08	0.14	1.03	0.12	3.12	0.12
East_Fork_S080	1.14	0.14	1.04	0.14	1.03	0.12	0.98	0.12
East_Fork_S090	1.15	0.14	1.06	0.14	1.05	0.12	1.03	0.12
East_Fork_S110	1.21	0.15	1.26	0.15	1.11	0.13	1.17	0.12
East_Fork_S100	1.52	0.14	2.23	0.14	2.71	0.12	3.4	0.12
Trinity_River_S070	1.69	0.22	1.5	0.17	1.32	0.15	1.16	0.13
East_Fork_S120	1.75	0.21	1.96	0.17	2.06	0.15	2.1	0.12
Kings_Ck_S020	1.66	0.2	1.72	0.16	1.73	0.14	1.69	0.12
Kings_Ck_S010	1.81	0.21	1.99	0.17	2.07	0.15	2.1	0.13
Kings_Ck_S030	1.86	0.21	2.29	0.17	2.55	0.15	2.7	0.12
Cedar_Ck_S040	2.06	0.24	2.13	0.19	2.11	0.17	2.08	0.14
Cedar_Ck_S010	1.16	0.13	1.16	0.13	1.19	0.13	1.31	0.13
New_Terrell_City_Lake_S010	0.99	0.22	0.86	0.16	0.73	0.15	0.62	0.13
Cedar_Ck_S020	1.74	0.22	1.58	0.18	1.41	0.15	1.26	0.13
Cedar_Ck_S030	2.12	0.24	2.38	0.19	2.51	0.17	2.58	0.14
Trinity_River_S080	1.74	0.21	1.74	0.17	1.69	0.15	1.62	0.13
Trinity_River_S090	1.87	0.23	1.82	0.18	1.72	0.16	1.64	0.13
Chambers_Ck_S010	1.56	0.22	1.74	0.18	1.82	0.15	2.15	0.13
Chambers_Ck_S020	1.63	0.22	2.07	0.17	2.33	0.15	2.78	0.13
Chambers_Ck_S040	1.65	0.22	2.05	0.18	2.28	0.15	2.72	0.13
Chambers_Ck_S030	1.71	0.23	2.02	0.18	2.17	0.16	2.56	0.13
Waxahachie_Ck_S010	2.75	0.27	3.2	0.27	3.31	0.22	3.55	0.14
Waxahachie_Ck_S020	2.06	0.24	2.12	0.2	2.1	0.17	2.07	0.14
Waxahachie_Ck_S030	1.67	0.21	1.56	0.17	1.43	0.15	1.31	0.13
Mustang_Ck_S010	1.58	0.2	1.5	0.16	1.4	0.14	1.29	0.12
Bardwell_S010	1.63	0.2	1.62	0.16	1.57	0.14	1.49	0.12
Chambers_Ck_S050	1.51	0.2	1.92	0.16	2.18	0.14	2.61	0.12
Chambers_Ck_S060	1.47	0.21	1.6	0.17	1.64	0.15	1.93	0.13
Chambers_Ck_S070	1.51	0.21	1.91	0.16	2.16	0.14	2.59	0.12
Chambers_Ck_S080	1.73	0.21	1.82	0.17	1.83	0.15	1.81	0.13

Subbasin Name	2-yr	2-yr	5-yr	5-yr	10-yr	10-yr	25-yr	25-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Post_Oak_Ck_S010	1.77	0.21	1.91	0.17	1.97	0.15	1.98	0.13
Lake_Halbert_S010	1.66	0.2	1.72	0.16	1.72	0.14	1.68	0.12
Navarro_Mills_S020	1.7	0.21	1.75	0.17	1.74	0.15	1.7	0.12
Navarro_Mills_S030	2.09	0.22	2.74	0.18	3.15	0.15	3.41	0.13
Navarro_Mills_S010	2.07	0.23	2.44	0.19	2.65	0.16	2.77	0.14
Navarro_Mills_S040	1.61	0.21	1.39	0.17	1.19	0.15	1.01	0.13
Richland_Ck_S010	1.8	0.21	2	0.17	2.1	0.15	2.14	0.13
Richland_Ck_S020	1.85	0.21	2.26	0.17	2.51	0.15	2.65	0.12
Richland-Chambers_S010	1.62	0.21	1.4	0.17	1.2	0.15	1.02	0.13
Richland-Chambers_S020	1.58	0.21	1.37	0.17	1.17	0.15	1	0.12
Tehuacana_Ck_S020	2.29	0.24	2.81	0.2	3.11	0.17	3.31	0.14
Tehuacana_Ck_S010	1.2	0.22	1.6	0.18	2.11	0.16	2.13	0.13
Trinity_River_S100	1.81	0.23	1.55	0.19	1.31	0.16	1.13	0.14
Fairfield_Lake_S010	2.48	0.24	3.53	0.2	4.21	0.17	4.67	0.14
Trinity_River_S110	2.29	0.28	2	0.22	1.69	0.19	1.5	0.16
Big_Brown_Ck_S010	2.69	0.27	3.59	0.22	4.13	0.19	4.53	0.15
Trinity_River_S120	2.22	0.26	2.25	0.21	2.18	0.18	2.14	0.15
Trinity_River_S130	2.07	0.25	1.85	0.2	1.61	0.18	1.44	0.15
Upper_Keechi_Ck_S030	2.26	0.27	2.01	0.22	1.74	0.19	1.57	0.16
Upper_Keechi_Ck_S010	2.26	0.26	2.24	0.23	2.01	0.2	1.44	0.15
Upper_Keechi_Ck_S020	2.43	0.28	2.3	0.23	2.1	0.2	2	0.16
Upper_Keechi_Ck_S040	2.12	0.26	1.81	0.21	1.51	0.18	1.31	0.15
Trinity_River_S140	1.56	0.21	1.35	0.17	1.16	0.14	0.99	0.12
Little_Elkhart_S010	2.22	0.27	1.9	0.22	1.58	0.19	1.37	0.16
Houston_County_Lake_S010	2.84	0.28	3.79	0.23	4.37	0.19	4.8	0.16
Trinity_River_S150	1.95	0.24	1.69	0.2	1.43	0.17	1.24	0.14
Trinity_River_S160	1.96	0.25	1.68	0.2	1.41	0.17	1.22	0.14
Trinity_River_S170	2.23	0.27	1.93	0.22	1.61	0.19	1.41	0.16
Trinity_River_S180	1.95	0.25	1.68	0.2	1.41	0.17	1.22	0.14
Bedias_Ck_S010	1.85	0.24	2.24	0.19	2.47	0.16	2.62	0.14
Bedias_Ck_S020	1.93	0.24	1.66	0.2	1.39	0.17	1.2	0.14
Trinity_River_S190	1.9	0.24	1.64	0.19	1.39	0.17	1.2	0.14
Livingston_S010	1.95	0.24	1.68	0.2	1.42	0.17	1.23	0.14
Livingston_S030	1.86	0.24	1.6	0.19	1.35	0.16	1.16	0.14
Livingston_S020	1.83	0.23	1.57	0.19	1.33	0.16	1.14	0.14
Trinity_River_S200	1.65	0.2	1.64	0.19	1.38	0.17	1.18	0.14
Long_King_Ck_S010	1.93	0.24	1.66	0.2	1.39	0.17	1.2	0.14
Long_King_Ck_S020	1.82	0.2	1.82	0.2	1.62	0.17	1.48	0.14
Trinity_River_S210	1.87	0.2	1.85	0.2	1.61	0.18	1.45	0.15
Menard_Ck_S010	2.2	0.26	2.2	0.21	2.12	0.18	2.06	0.15

Subbasin Name	2-yr	2-yr	5-yr	5-yr	10-yr	10-yr	25-yr	25-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Trinity_River_S220	1.7	0.2	1.7	0.2	1.43	0.17	1.23	0.14
Trinity_River_S230	1.47	0.2	1.47	0.18	1.25	0.15	1.07	0.13
Trinity_River_S240	1.5	0.2	1.5	0.18	1.27	0.16	1.09	0.13
Trinity_River_S250	1.9	0.21	2.31	0.17	2.55	0.15	2.69	0.13

Table 29: Final Initial and Constant Losses for the 50-yr through 500-yr Frequency Storms

Subbasin Name	50-yr	50-yr	100-yr	100-yr	250-yr	250-yr	500-yr	500-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
West_Fork_S020	1.01	0.12	0.85	0.09	0.69	0.08	0.57	0.07
West_Fork_S010	1.21	0.12	1.05	0.09	0.89	0.08	0.57	0.07
West_Fork_S030	1.02	0.12	0.86	0.09	0.69	0.08	0.57	0.07
West_Fork_S040	1.02	0.12	0.85	0.09	0.69	0.08	0.57	0.07
West_Fork_S050	1.02	0.12	0.85	0.09	0.69	0.08	0.57	0.07
West_Fork_S060	1.01	0.12	0.85	0.09	0.69	0.08	0.57	0.07
West_Fork_S070	1.03	0.12	0.86	0.09	0.7	0.08	0.57	0.07
West_Fork_S080	1.01	0.12	0.85	0.09	0.69	0.08	0.56	0.07
West_Fork_S090	1.03	0.12	0.86	0.09	0.7	0.08	0.57	0.07
West_Fork_S100	1	0.12	0.84	0.09	0.68	0.08	0.56	0.07
West_Fork_S120	2.58	0.12	2.41	0.09	2.25	0.08	0.57	0.07
West_Fork_S110	1.04	0.12	0.87	0.09	0.7	0.08	0.58	0.07
Big_Cleveland_S010	3.66	0.12	3.49	0.09	3.33	0.08	0.57	0.07
Big_Cleveland_S020	2.46	0.12	2.29	0.09	2.13	0.08	0.57	0.07
West_Fork_S130	1	0.12	0.84	0.09	0.68	0.08	0.56	0.07
Lost_Ck_S010	1.01	0.12	0.85	0.09	0.69	0.08	0.57	0.07
Lost_Ck_S020	1	0.12	0.84	0.09	0.68	0.08	0.56	0.07
West_Fork_S140	1.97	0.12	1.81	0.09	1.65	0.08	0.56	0.07
West_Fork_S150	1.01	0.12	0.85	0.09	0.69	0.08	0.56	0.07
West_Fork_S160	1.02	0.12	0.86	0.09	0.69	0.08	0.57	0.07
Beans_Ck_S010	1.05	0.12	0.89	0.09	0.73	0.08	0.57	0.07
Beans_Ck_S020	1.03	0.12	0.86	0.09	0.69	0.08	0.57	0.07
Big_Ck_S010	1.08	0.12	0.9	0.09	0.74	0.08	0.58	0.07
Big_Ck_S030	1.07	0.13	0.88	0.1	0.71	0.08	0.59	0.08
Big_Ck_S020	1.04	0.12	0.87	0.09	0.7	0.08	0.58	0.07
Bridgeport_S030	1.08	0.13	0.89	0.1	0.72	0.09	0.59	0.08
Bridgeport_S010	0.93	0.11	0.8	0.08	0.65	0.07	0.53	0.06
Bridgeport_S040	1.07	0.13	0.88	0.1	0.72	0.09	0.59	0.08
Bridgeport_S020	1.04	0.12	0.86	0.09	0.7	0.08	0.58	0.07
West_Fork_S170	1.05	0.12	0.87	0.09	0.7	0.08	0.58	0.07
Dry_Ck_S010	1.2	0.13	1.01	0.1	0.84	0.09	0.59	0.08
West_Fork_S180	1.1	0.13	0.9	0.1	0.73	0.09	0.6	0.08

Subbasin Name	50-yr	50-yr	100-yr	100-yr	250-yr	250-yr	500-yr	500-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Amon_G_Carter_S030	1.67	0.12	1.5	0.09	1.34	0.08	0.57	0.07
Amon_G_Carter_S010	3.04	0.12	2.87	0.09	2.7	0.08	0.58	0.07
Amon_G_Carter_S020	1.32	0.12	1.15	0.09	0.98	0.08	0.58	0.07
Big_Sandy_Ck_S010	1.56	0.12	1.37	0.09	1.21	0.08	0.58	0.07
Big_Sandy_Ck_S020	1.19	0.13	1	0.1	0.83	0.09	0.6	0.08
Brushy_Ck_S010	1.24	0.13	1.05	0.1	0.88	0.09	0.59	0.08
Brushy_Ck_S020	1.46	0.13	1.26	0.1	1.09	0.09	0.6	0.08
Brushy_Ck_S030	1.94	0.13	1.74	0.1	1.57	0.09	0.6	0.08
Big_Sandy_Ck_S030	1.46	0.13	1.26	0.1	1.09	0.09	0.6	0.08
Big_Sandy_Ck_S040	1.28	0.13	1.08	0.1	0.91	0.09	0.6	0.08
Big_Sandy_Ck_S050	1.26	0.13	1.06	0.1	0.89	0.09	0.6	0.08
West_Fork_S190	1.25	0.13	1.05	0.1	0.88	0.09	0.6	0.08
West_Fork_S200	1.09	0.13	0.89	0.1	0.72	0.09	0.59	0.08
Garrett_Ck_S020	2.39	0.13	2.2	0.1	2.03	0.09	0.59	0.08
Garrett_Ck_S010	2.48	0.13	2.29	0.1	2.12	0.09	0.59	0.08
Garrett_Ck_S030	1.09	0.13	0.89	0.1	0.72	0.09	0.6	0.08
Salt_Ck_S010	3.82	0.13	3.62	0.1	3.45	0.09	0.6	0.08
Salt_Ck_S020	2.35	0.13	2.14	0.1	1.97	0.09	0.6	0.08
West_Fork_S210	1.09	0.13	0.9	0.1	0.73	0.09	0.6	0.08
West_Fork_S220	1.6	0.13	1.41	0.1	1.24	0.09	0.59	0.08
Eagle_Mountain_S010	1.06	0.13	0.88	0.1	0.71	0.08	0.59	0.08
Eagle_Mountain_S020	0.98	0.12	0.83	0.09	0.67	0.08	0.56	0.07
Walnut_Ck_S020	1.09	0.13	0.9	0.1	0.73	0.09	0.6	0.08
Walnut_Ck_S010	1.09	0.13	0.89	0.1	0.72	0.09	0.6	0.08
Walnut_Ck_S030	1.09	0.13	0.9	0.1	0.73	0.09	0.6	0.08
Eagle_Mountain_S040	0.99	0.12	0.84	0.09	0.68	0.08	0.56	0.07
Eagle_Mountain_S030	1.07	0.13	0.88	0.1	0.71	0.09	0.59	0.08
Silver_Ck_S020	1.32	0.12	1.15	0.09	0.98	0.08	0.58	0.07
Silver_Ck_S010	1.37	0.13	1.17	0.1	1	0.09	0.59	0.08
Lake_Worth_S010	1.05	0.12	0.87	0.09	0.7	0.08	0.58	0.07
Lake_Worth_S020	1.01	0.12	0.85	0.09	0.69	0.08	0.57	0.07
West_Fork_S230	1.11	0.13	0.91	0.1	0.74	0.09	0.6	0.08
Lk_Weatherford_S010	2.81	0.13	2.61	0.1	2.44	0.09	0.6	0.08
Lk_Weatherford_S020	1.87	0.12	1.7	0.09	1.54	0.08	0.57	0.07
Clear_Fork_S010	2.66	0.13	2.48	0.1	2.31	0.08	0.59	0.08
Clear_Fork_S020	1.05	0.12	0.87	0.09	0.7	0.08	0.58	0.07
Bear_Ck_S010	1.29	0.12	1.11	0.09	0.95	0.08	0.58	0.07
Bear_Ck_S020	1.02	0.12	0.85	0.09	0.69	0.08	0.57	0.07
Benbrook_S010	1	0.12	0.84	0.09	0.68	0.08	0.56	0.07
Benbrook_S020	0.98	0.12	0.83	0.09	0.67	0.07	0.55	0.07
Benbrook_S030	0.96	0.11	0.82	0.08	0.67	0.07	0.55	0.06

Subbasin Name	50-yr	50-yr	100-yr	100-yr	250-yr	250-yr	500-yr	500-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Clear_Fork_S030	1.02	0.12	0.85	0.09	0.69	0.08	0.57	0.07
Marys_Ck_S010	1.04	0.12	0.86	0.09	0.7	0.08	0.58	0.07
Clear_Fork_S040	1.86	0.13	1.66	0.1	1.49	0.09	0.6	0.08
Clear_Fork_S050	1.13	0.13	0.92	0.1	0.74	0.09	0.61	0.08
West_Fork_S240	1.07	0.13	0.88	0.1	0.71	0.09	0.59	0.08
Marine_Ck_S020	2.43	0.13	2.24	0.1	2.08	0.09	0.59	0.08
Marine_Ck_S010	0.95	0.11	0.81	0.08	0.66	0.07	0.54	0.06
West_Fork_S250	1.09	0.13	0.89	0.1	0.72	0.09	0.6	0.08
West_Fork_S260	1.2	0.12	1.04	0.09	0.88	0.08	0.56	0.07
West_Fork_S270	1.62	0.13	1.44	0.1	1.27	0.08	0.58	0.08
Big_Fossil_Ck_S010	2.92	0.11	2.8	0.08	2.65	0.07	0.53	0.06
LittleFossil_Ck_S010	0.93	0.11	0.8	0.08	0.65	0.07	0.53	0.06
West_Fork_S280	1.01	0.12	0.85	0.09	0.69	0.08	0.57	0.07
Village_Ck_S010	1.14	0.12	0.99	0.09	0.83	0.08	0.55	0.07
Village_Ck_S020	0.97	0.12	0.83	0.09	0.67	0.07	0.55	0.07
Lake_Arlington_S010	0.96	0.11	0.82	0.08	0.66	0.07	0.55	0.06
Village_Ck_S030	1.05	0.12	0.87	0.09	0.71	0.08	0.58	0.07
West_Fork_S290	1.05	0.12	0.87	0.09	0.7	0.08	0.58	0.07
West_Fork_S300	0.99	0.12	0.84	0.09	0.68	0.08	0.56	0.07
West_Fork_S310	0.96	0.11	0.82	0.08	0.66	0.07	0.54	0.06
West_Fork_S320	1.07	0.13	0.88	0.1	0.72	0.09	0.59	0.08
Big_Bear_Ck_S010	1.28	0.12	1.12	0.09	0.96	0.08	0.84	0.07
Big_Bear_Ck_S020	1.06	0.13	0.88	0.1	0.71	0.08	0.58	0.08
West_Fork_S330	1.05	0.12	0.87	0.09	0.71	0.08	0.58	0.07
Joe_Pool_S020	1.52	0.11	1.41	0.08	1.26	0.06	1.15	0.06
Joe_Pool_S030	0.97	0.12	0.83	0.09	0.67	0.07	0.55	0.07
Joe_Pool_S040	0.95	0.11	0.81	0.08	0.66	0.07	0.54	0.06
Joe_Pool_S010	0.85	0.1	0.75	0.07	0.61	0.06	0.5	0.05
Joe_Pool_S050	0.88	0.1	0.77	0.07	0.63	0.06	0.52	0.05
Mountain_Ck_S010	0.92	0.11	0.8	0.08	0.66	0.06	0.54	0.06
Mountain_Ck_S020	0.9	0.11	0.79	0.08	0.64	0.07	0.52	0.06
Mountain_Ck_S030	0.93	0.11	0.8	0.08	0.65	0.07	0.53	0.06
West_Fork_S340	0.98	0.12	0.83	0.09	0.67	0.08	0.56	0.07
Elm_Fork_S020	2.59	0.11	2.46	0.08	2.3	0.07	2.19	0.06
Elm_Fork_S010	4.11	0.12	3.96	0.09	3.8	0.07	3.68	0.07
Brushy_Elm_Ck_S010	2.04	0.11	1.91	0.08	1.76	0.07	1.65	0.06
Brushy_Elm_Ck_S020	1.33	0.11	1.21	0.08	1.06	0.07	0.95	0.06
Elm_Fork_S030	2.23	0.11	2.11	0.08	1.96	0.07	1.84	0.06
Elm_Fork_S040	1.51	0.11	1.39	0.08	1.24	0.07	1.13	0.06
Elm_Fork_S050	1.58	0.12	1.43	0.09	1.27	0.07	1.15	0.07
Elm_Fork_S070	1.27	0.11	1.12	0.08	0.97	0.07	0.85	0.06

Subbasin Name	50-yr	50-yr	100-yr	100-yr	250-yr	250-yr	500-yr	500-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Elm_Fork_S060	0.89	0.11	0.78	0.08	0.63	0.06	0.52	0.06
Spring_Ck_S010	0.92	0.11	0.8	0.08	0.65	0.07	0.53	0.06
Spring_Ck_S020	0.92	0.11	0.8	0.08	0.65	0.07	0.53	0.06
Ray_Roberts_S010	2.41	0.11	2.28	0.08	2.13	0.07	2.01	0.06
Timber_Ck_S010	1.07	0.13	0.88	0.1	0.72	0.09	0.59	0.08
Timber_Ck_S030	0.99	0.12	0.84	0.09	0.68	0.08	0.56	0.07
Timber_Ck_S020	1.06	0.13	0.88	0.1	0.71	0.08	0.59	0.08
Ray_Roberts_S030	1.02	0.12	0.86	0.09	0.7	0.08	0.58	0.07
Range_Ck_S010	0.88	0.1	0.77	0.07	0.63	0.06	0.51	0.05
Range_Ck_S020	0.86	0.1	0.76	0.07	0.62	0.06	0.51	0.05
Lake_Kiowa_S020	1.05	0.12	0.87	0.09	0.71	0.08	0.58	0.07
Lake_Kiowa_S010	1.09	0.13	0.9	0.1	0.73	0.09	0.6	0.08
Ray_Roberts_S020	0.88	0.1	0.77	0.07	0.62	0.06	0.51	0.05
Range_Ck_S030	0.91	0.11	0.79	0.08	0.64	0.07	0.53	0.06
Buck_Ck_S010	0.87	0.1	0.77	0.07	0.62	0.06	0.51	0.05
Ray_Roberts_S050	0.88	0.1	0.77	0.07	0.62	0.06	0.51	0.05
Ray_Roberts_S040	1.31	0.11	1.18	0.08	1.02	0.07	0.91	0.06
Ray_Roberts_S060	0.95	0.11	0.81	0.08	0.66	0.07	0.54	0.06
Timber_Ck_S040	0.98	0.12	0.83	0.09	0.67	0.07	0.55	0.07
Elm_Fork_S080	1	0.12	0.84	0.09	0.68	0.08	0.56	0.07
Clear_Ck_S010	3.29	0.13	3.1	0.1	2.94	0.08	2.81	0.08
Clear_Ck_S020	2.71	0.13	2.52	0.1	2.35	0.09	2.22	0.08
Clear_Ck_S030	3.32	0.13	3.13	0.1	2.96	0.08	2.84	0.08
Clear_Ck_S040	3.53	0.12	3.37	0.09	3.21	0.08	3.09	0.07
Clear_Ck_S050	2.65	0.12	2.5	0.09	2.34	0.07	2.22	0.07
Clear_Ck_S070	1.67	0.11	1.53	0.08	1.38	0.07	1.26	0.06
Clear_Ck_S060	1.02	0.12	0.85	0.09	0.69	0.08	0.57	0.07
Clear_Ck_S080	2.69	0.12	2.55	0.09	2.39	0.07	2.27	0.07
Clear_Ck_S090	2.08	0.11	1.95	0.08	1.8	0.07	1.69	0.06
Clear_Ck_S110	0.91	0.11	0.79	0.08	0.64	0.07	0.53	0.06
Clear_Ck_S100	1.62	0.11	1.5	0.08	1.35	0.07	1.23	0.06
Clear_Ck_S120	1.06	0.11	0.93	0.08	0.78	0.07	0.66	0.06
Little_Elm_Ck_S010	2.68	0.1	2.57	0.07	2.43	0.06	2.32	0.05
Little_Elm_Ck_S020	1.9	0.1	1.8	0.07	1.66	0.06	1.55	0.05
Little_Elm_Ck_S030	0.85	0.1	0.76	0.07	0.61	0.06	0.51	0.05
Pecan_Ck_S010	0.99	0.12	0.84	0.09	0.68	0.08	0.56	0.07
Doe_Branch_S010	0.91	0.1	0.8	0.07	0.66	0.06	0.55	0.05
Doe_Branch_S020	0.88	0.1	0.77	0.07	0.63	0.06	0.52	0.05
Lewisville_S030	0.96	0.11	0.82	0.08	0.67	0.07	0.55	0.06
Hickory_Ck_S020	1.31	0.11	1.19	0.08	1.04	0.07	0.93	0.06
Hickory_Ck_S010	1.31	0.11	1.19	0.08	1.04	0.07	0.93	0.06

Subbasin Name	50-yr	50-yr	100-yr	100-yr	250-yr	250-yr	500-yr	500-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Hickory_Ck_S030	0.99	0.11	0.88	0.08	0.73	0.07	0.61	0.06
Hickory_Ck_S040	2.64	0.11	2.5	0.08	2.35	0.07	2.23	0.06
Hickory_Ck_S050	1.56	0.13	1.38	0.1	1.21	0.08	1.09	0.08
Lewisville_S010	1.15	0.12	0.99	0.09	0.83	0.08	0.71	0.07
Lewisville_S040	0.86	0.1	0.76	0.07	0.62	0.06	0.51	0.05
Lewisville_S050	0.88	0.1	0.77	0.07	0.62	0.06	0.51	0.05
Lewisville_S020	1.15	0.12	0.99	0.09	0.83	0.08	0.71	0.07
Elm_Fork_S090	0.93	0.11	0.8	0.08	0.65	0.07	0.54	0.06
Elm_Fork_S110	0.9	0.11	0.78	0.08	0.63	0.07	0.52	0.06
Elm_Fork_S100	1.11	0.12	0.95	0.09	0.79	0.08	0.67	0.07
Elm_Fork_S120	1.77	0.11	1.65	0.08	1.5	0.07	1.39	0.06
Denton_Ck_S010	2.78	0.13	3.08	0.1	2.91	0.09	2.78	0.08
Denton_Ck_S020	2.76	0.13	3.07	0.1	2.9	0.08	2.77	0.08
Denton_Ck_S030	2.61	0.12	2.89	0.09	2.72	0.08	2.6	0.07
Denton_Ck_S040	1.58	0.11	1.44	0.08	1.29	0.07	1.17	0.06
Denton_Ck_S050	1.99	0.11	1.85	0.08	1.7	0.07	1.58	0.06
Denton_Ck_S060	0.93	0.11	0.8	0.08	0.65	0.07	0.53	0.06
Denton_Ck_S070	0.98	0.11	0.85	0.08	0.7	0.07	0.58	0.06
Grapevine_S010	1.55	0.12	1.4	0.09	1.24	0.08	1.11	0.07
Denton_Ck_S080	0.97	0.12	0.83	0.09	0.67	0.07	0.55	0.07
Elm_Fork_S130	1.52	0.11	1.4	0.08	1.25	0.07	1.14	0.06
Hackberry_Ck_S010	2.08	0.1	1.98	0.07	1.84	0.06	1.73	0.05
Hackberry_Ck_S020	0.85	0.1	0.76	0.07	0.61	0.06	0.5	0.05
Hackberry_Ck_S030	0.87	0.1	0.77	0.07	0.62	0.06	0.51	0.05
Elm_Fork_S140	0.96	0.11	0.82	0.08	0.66	0.07	0.55	0.06
Elm_Fork_S150	0.97	0.11	0.82	0.08	0.67	0.07	0.55	0.06
Bachman_Branch_S010	1.01	0.12	0.85	0.09	0.69	0.08	0.57	0.07
Bachman_Branch_S020	0.97	0.12	0.83	0.09	0.67	0.07	0.55	0.07
Elm_Fork_S160	0.98	0.12	0.83	0.09	0.67	0.07	0.55	0.07
Trinity_River_S010	1.17	0.11	1.03	0.08	0.88	0.07	0.76	0.06
Trinity_River_S020	1.68	0.12	1.51	0.09	1.35	0.08	1.23	0.07
White_Rock_Ck_S010	2.19	0.11	2.06	0.08	1.91	0.07	1.79	0.06
White_Rock_Ck_S020	1.01	0.12	0.85	0.09	0.69	0.08	0.57	0.07
White_Rock_Ck_S030	1	0.12	0.84	0.09	0.68	0.08	0.56	0.07
White_Rock_Ck_S040	0.99	0.12	0.83	0.09	0.68	0.08	0.56	0.07
Trinity_River_S030	1.05	0.12	0.87	0.09	0.7	0.08	0.58	0.07
Fivemile_Ck_S010	1.36	0.12	1.18	0.09	1.02	0.08	0.89	0.07
Trinity_River_S040	0.99	0.12	0.84	0.09	0.68	0.08	0.56	0.07
Trinity_River_S050	0.97	0.11	0.82	0.08	0.67	0.07	0.55	0.06
Tenmile_Ck_S010	1.09	0.12	0.94	0.09	0.78	0.08	0.66	0.07
Tenmile_Ck_S020	0.91	0.11	0.79	0.08	0.64	0.07	0.53	0.06

Subbasin Name	50-yr	50-yr	100-yr	100-yr	250-yr	250-yr	500-yr	500-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Trinity_River_S060	1.2	0.12	1.05	0.09	0.89	0.08	0.77	0.07
Indian_Ck_S010	2.51	0.1	2.41	0.07	2.26	0.06	2.15	0.05
Indian_Ck_S030	1.6	0.11	1.47	0.08	1.31	0.07	1.2	0.06
Indian_Ck_S020	0.86	0.1	0.76	0.07	0.62	0.06	0.51	0.05
Indian_Ck_S040	2.05	0.1	1.94	0.07	1.8	0.06	1.69	0.05
Sister_Grove_S010	2.75	0.11	2.61	0.08	2.46	0.07	2.34	0.06
Sister_Grove_S020	1.98	0.11	1.86	0.08	1.71	0.07	1.6	0.06
East_Fork_S020	2.54	0.11	2.42	0.08	2.27	0.07	2.15	0.06
East_Fork_S010	3.55	0.11	3.42	0.08	3.26	0.07	3.15	0.06
East_Fork_S030	1.39	0.11	1.26	0.08	1.11	0.07	0.99	0.06
East_Fork_S040	0.92	0.11	0.8	0.08	0.65	0.07	0.53	0.06
Wilson_Ck_S010	2.32	0.11	2.19	0.08	2.04	0.07	1.92	0.06
Lavon_S010	1.12	0.1	1.02	0.07	0.88	0.06	0.77	0.05
Lavon_S020	0.87	0.1	0.77	0.07	0.62	0.06	0.51	0.05
Rowlett_Ck_S010	1.05	0.11	0.93	0.08	0.78	0.07	0.66	0.06
Ray_Hubbard_S010	2.14	0.1	2.04	0.07	1.9	0.06	1.79	0.05
Ray_Hubbard_S020	0.88	0.1	0.77	0.07	0.62	0.06	0.51	0.05
East_Fork_S050	0.91	0.11	0.8	0.08	0.65	0.06	0.54	0.06
East_Fork_S070	0.86	0.1	0.76	0.07	0.62	0.06	0.51	0.05
East_Fork_S060	3.18	0.1	3.09	0.07	2.94	0.06	2.83	0.05
East_Fork_S080	0.86	0.1	0.76	0.07	0.62	0.06	0.51	0.05
East_Fork_S090	0.91	0.1	0.82	0.07	0.67	0.06	0.56	0.05
East_Fork_S110	1.06	0.1	0.96	0.07	0.81	0.06	0.7	0.05
East_Fork_S100	3.48	0.1	3.39	0.07	3.24	0.06	3.13	0.05
Trinity_River_S070	1.03	0.11	0.91	0.08	0.76	0.07	0.65	0.06
East_Fork_S120	2.07	0.1	1.96	0.07	1.82	0.06	1.71	0.05
Kings_Ck_S020	1.63	0.1	1.53	0.07	1.38	0.06	1.28	0.05
Kings_Ck_S010	2.05	0.11	1.94	0.08	1.79	0.07	1.68	0.06
Kings_Ck_S030	2.71	0.1	2.6	0.07	2.46	0.06	2.35	0.05
Cedar_Ck_S040	1.98	0.12	1.82	0.09	1.66	0.08	1.53	0.07
Cedar_Ck_S010	2.13	0.11	1.99	0.08	1.84	0.07	1.72	0.06
New_Terrell_City_Lake_S010	0.91	0.11	0.79	0.08	0.64	0.07	0.53	0.06
Cedar_Ck_S020	1.14	0.11	1.01	0.08	0.86	0.07	0.74	0.06
Cedar_Ck_S030	2.53	0.12	2.37	0.09	2.21	0.08	2.09	0.07
Trinity_River_S080	1.54	0.11	1.42	0.08	1.27	0.07	1.16	0.06
Trinity_River_S090	1.53	0.11	1.38	0.08	1.23	0.07	1.11	0.06
Chambers_Ck_S010	2.1	0.11	1.97	0.08	1.82	0.07	1.71	0.06
Chambers_Ck_S020	2.79	0.11	2.67	0.08	2.51	0.07	2.41	0.06
Chambers_Ck_S040	2.71	0.11	2.59	0.08	2.43	0.07	2.32	0.06
Chambers_Ck_S030	2.53	0.11	2.39	0.08	2.23	0.08	2.12	0.06
Waxahachie_Ck_S010	3.56	0.12	3.39	0.09	3.22	0.09	3.1	0.07

Subbasin Name	50-yr	50-yr	100-yr	100-yr	250-yr	250-yr	500-yr	500-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Waxahachie_Ck_S020	1.97	0.12	1.8	0.09	1.64	0.08	1.52	0.07
Waxahachie_Ck_S030	1.2	0.11	1.09	0.08	0.94	0.07	0.83	0.06
Mustang_Ck_S010	1.2	0.1	1.11	0.07	0.96	0.06	0.86	0.05
Bardwell_S010	1.42	0.1	1.32	0.07	1.17	0.06	1.07	0.05
Chambers_Ck_S050	2.63	0.1	2.53	0.07	2.38	0.06	2.27	0.05
Chambers_Ck_S060	1.88	0.11	1.76	0.08	1.61	0.07	1.5	0.06
Chambers_Ck_S070	2.6	0.1	2.5	0.07	2.35	0.06	2.25	0.05
Chambers_Ck_S080	1.75	0.11	1.64	0.08	1.49	0.07	1.38	0.06
Post_Oak_Ck_S010	1.94	0.11	1.83	0.08	1.67	0.07	1.57	0.06
Lake_Halbert_S010	1.62	0.1	1.52	0.07	1.37	0.06	1.27	0.05
Navarro_Mills_S020	1.64	0.1	1.53	0.07	1.38	0.07	1.27	0.05
Navarro_Mills_S030	3.46	0.11	3.33	0.08	3.16	0.07	3.06	0.06
Navarro_Mills_S010	2.75	0.12	2.6	0.09	2.44	0.08	2.33	0.07
Navarro_Mills_S040	0.89	0.11	0.78	0.08	0.62	0.07	0.52	0.06
Richland_Ck_S010	2.1	0.11	1.99	0.08	1.84	0.07	1.73	0.06
Richland_Ck_S020	2.66	0.1	2.56	0.07	2.41	0.07	2.3	0.05
Richland-Chambers_S010	0.89	0.11	0.78	0.08	0.63	0.07	0.52	0.06
Richland-Chambers_S020	0.88	0.1	0.77	0.07	0.62	0.07	0.51	0.05
Tehuacana_Ck_S020	3.3	0.12	3.13	0.09	2.97	0.08	2.85	0.07
Tehuacana_Ck_S010	2.07	0.11	1.94	0.08	1.79	0.07	1.67	0.06
Trinity_River_S100	0.97	0.12	0.83	0.09	0.67	0.07	0.55	0.07
Fairfield_Lake_S010	4.78	0.12	4.62	0.09	4.45	0.08	4.33	0.07
Trinity_River_S110	1.28	0.14	1.05	0.11	0.87	0.1	0.74	0.09
Big_Brown_Ck_S010	4.58	0.13	4.37	0.1	4.19	0.09	4.06	0.08
Trinity_River_S120	2.01	0.13	1.81	0.1	1.64	0.09	1.51	0.08
Trinity_River_S130	1.27	0.13	1.08	0.1	0.91	0.09	0.78	0.08
Upper_Keechi_Ck_S030	1.37	0.14	1.14	0.11	0.97	0.09	0.83	0.09
Upper_Keechi_Ck_S010	1.26	0.13	1.07	0.1	0.9	0.09	0.77	0.08
Upper_Keechi_Ck_S020	1.81	0.14	1.56	0.11	1.38	0.1	1.24	0.09
Upper_Keechi_Ck_S040	1.11	0.13	0.9	0.1	0.73	0.09	0.6	0.08
Trinity_River_S140	0.87	0.1	0.77	0.07	0.62	0.06	0.51	0.05
Little_Elkhart_S010	1.15	0.14	0.93	0.11	0.75	0.09	0.62	0.09
Houston_County_Lake_S010	4.85	0.14	4.62	0.11	4.44	0.1	4.3	0.09
Trinity_River_S150	1.07	0.12	0.9	0.09	0.73	0.08	0.61	0.07
Trinity_River_S160	1.04	0.12	0.86	0.09	0.7	0.08	0.58	0.07
Trinity_River_S170	1.19	0.14	0.97	0.11	0.79	0.1	0.66	0.09
Trinity_River_S180	1.04	0.12	0.87	0.09	0.7	0.08	0.58	0.07
Bedias_Ck_S010	3.07	0.12	2.91	0.09	2.75	0.08	2.63	0.07
Bedias_Ck_S020	1.03	0.12	0.86	0.09	0.69	0.08	0.57	0.07

Subbasin Name	50-yr	50-yr	100-yr	100-yr	250-yr	250-yr	500-yr	500-yr
	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)	Initial (in)	Constant (in/hr)
Trinity_River_S190	1.03	0.12	0.87	0.09	0.71	0.08	0.59	0.07
Livingston_S010	1.05	0.12	0.88	0.09	0.72	0.08	0.59	0.07
Livingston_S030	1	0.12	0.84	0.09	0.68	0.08	0.56	0.07
Livingston_S020	0.98	0.12	0.83	0.09	0.67	0.08	0.55	0.07
Trinity_River_S200	1.01	0.12	0.85	0.09	0.69	0.08	0.57	0.07
Long_King_Ck_S010	1.03	0.12	0.86	0.09	0.7	0.08	0.57	0.07
Long_King_Ck_S020	1.32	0.12	1.15	0.09	0.99	0.08	0.86	0.07
Trinity_River_S210	1.28	0.13	1.09	0.1	0.92	0.09	0.79	0.08
Menard_Ck_S010	1.93	0.13	1.74	0.1	1.57	0.09	1.44	0.08
Trinity_River_S220	1.05	0.12	0.87	0.09	0.71	0.08	0.58	0.07
Trinity_River_S230	0.93	0.11	0.8	0.08	0.65	0.07	0.53	0.06
Trinity_River_S240	0.95	0.11	0.81	0.08	0.66	0.07	0.54	0.06
Trinity_River_S250	2.7	0.11	2.59	0.08	2.44	0.06	2.33	0.06

1.6 POINT RAINFALL DEPTHS FOR THE FREQUENCY STORMS

Frequency point rainfall depths of various durations and recurrence intervals were collected for the Trinity River basin from NOAA Atlas 14 Volume 11: Precipitation Frequency Atlas of the United States, Texas, published in 2018 (NOAA, 2018). The point rainfall depths varied by county throughout the watershed. A precipitation depth was assigned to each county located within the Trinity River watershed. The depth was approximately taken from the center of each county. Watershed subbasins were assigned the point rainfall depth for the particular county containing the majority of that subbasins drainage area. Tables 30 through 59 show the point rainfall depths assigned to each county.

Table 30: Frequency Point Rainfall Depths (inches) for Archer County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.82	1.07	1.26	1.51	1.69	1.89	2.1	2.4
1hr	1.44	1.87	2.2	2.64	2.98	3.35	3.75	4.33
2hr	1.75	2.32	2.77	3.39	3.88	4.41	4.98	5.81
3hr	1.93	2.6	3.13	3.88	4.48	5.13	5.83	6.83
6hr	2.26	3.1	3.77	4.71	5.47	6.31	7.21	8.49
12hr	2.64	3.61	4.38	5.47	6.35	7.31	8.37	9.89
24hr	3.06	4.16	5.04	6.26	7.24	8.31	9.5	11.24
48hr	3.55	4.78	5.75	7.11	8.18	9.35	10.66	12.58

Table 31: Frequency Point Rainfall Depths (inches) for Young County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.81	1.07	1.26	1.52	1.71	1.9	2.11	2.4
1hr	1.42	1.88	2.22	2.67	3.01	3.35	3.73	4.26
2hr	1.73	2.32	2.77	3.37	3.84	4.32	4.83	5.54
3hr	1.92	2.59	3.11	3.82	4.38	4.97	5.58	6.41
6hr	2.26	3.07	3.71	4.61	5.34	6.11	6.89	7.96
12hr	2.63	3.58	4.34	5.42	6.29	7.23	8.23	9.64
24hr	3.04	4.14	5.02	6.27	7.28	8.38	9.6	11.36
48hr	3.53	4.78	5.77	7.17	8.29	9.52	10.9	12.92

Table 32: Frequency Point Rainfall Depths (inches) for Jack County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.83	1.09	1.28	1.53	1.72	1.91	2.11	2.38
1hr	1.48	1.93	2.27	2.73	3.06	3.41	3.77	4.27
2hr	1.81	2.38	2.81	3.41	3.89	4.38	4.88	5.55
3hr	2.02	2.65	3.15	3.85	4.42	5.02	5.62	6.41
6hr	2.39	3.16	3.78	4.66	5.41	6.19	6.97	8.02
12hr	2.81	3.76	4.53	5.62	6.53	7.5	8.5	9.88
24hr	3.27	4.43	5.35	6.65	7.71	8.86	10.09	11.82
48hr	3.78	5.12	6.17	7.65	8.82	10.1	11.5	13.53

Table 33: Frequency Point Rainfall Depths (inches) for Clay County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.85	1.1	1.29	1.54	1.73	1.93	2.14	2.44
1hr	1.48	1.93	2.26	2.71	3.04	3.4	3.79	4.35
2hr	1.79	2.36	2.81	3.42	3.9	4.41	4.97	5.79
3hr	1.97	2.63	3.15	3.87	4.45	5.09	5.78	6.77
6hr	2.31	3.11	3.75	4.66	5.41	6.23	7.12	8.39
12hr	2.69	3.63	4.38	5.45	6.32	7.27	8.31	9.81
24hr	3.13	4.21	5.07	6.28	7.26	8.32	9.49	11.19
48hr	3.63	4.86	5.83	7.17	8.24	9.39	10.68	12.56

Table 34: Frequency Point Rainfall Depths (inches) for Wise County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.87	1.13	1.33	1.58	1.76	1.95	2.13	2.38
1hr	1.56	2.03	2.38	2.83	3.17	3.5	3.85	4.33
2hr	1.92	2.51	2.96	3.56	4.02	4.49	4.97	5.64
3hr	2.13	2.81	3.33	4.03	4.57	5.14	5.72	6.51
6hr	2.53	3.35	4	4.88	5.59	6.33	7.1	8.13
12hr	2.96	3.97	4.76	5.87	6.76	7.7	8.66	9.97
24hr	3.44	4.65	5.61	6.94	8.02	9.15	10.33	11.95
48hr	3.98	5.38	6.49	8.02	9.24	10.53	11.91	13.85

Table 35: Frequency Point Rainfall Depths (inches) for Montague County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.87	1.13	1.32	1.56	1.73	1.91	2.1	2.37
1hr	1.55	2.02	2.37	2.81	3.12	3.44	3.81	4.34
2hr	1.9	2.51	2.97	3.58	4.03	4.51	5.04	5.81
3hr	2.11	2.81	3.35	4.08	4.63	5.23	5.88	6.82
6hr	2.49	3.35	4.03	4.96	5.7	6.49	7.36	8.59
12hr	2.93	3.95	4.76	5.9	6.8	7.77	8.83	10.35
24hr	3.41	4.61	5.56	6.88	7.93	9.07	10.32	12.12
48hr	3.94	5.29	6.36	7.84	9	10.27	11.68	13.73

Table 36: Frequency Point Rainfall Depths (inches) for Tarrant County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.88	1.14	1.34	1.6	1.8	2.01	2.21	2.5
1hr	1.57	2.05	2.41	2.89	3.25	3.62	4.02	4.56
2hr	1.94	2.56	3.03	3.67	4.16	4.67	5.22	5.99
3hr	2.15	2.87	3.43	4.18	4.76	5.37	6.02	6.94
6hr	2.56	3.45	4.14	5.08	5.82	6.59	7.43	8.6
12hr	3.02	4.09	4.92	6.05	6.93	7.86	8.85	10.23
24hr	3.52	4.78	5.75	7.07	8.1	9.18	10.33	11.93
48hr	4.07	5.46	6.54	8.04	9.23	10.5	11.83	13.68

Table 37: Frequency Point Rainfall Depths (inches) for Parker County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.85	1.12	1.32	1.6	1.8	2.02	2.23	2.51
1hr	1.52	2	2.37	2.85	3.23	3.6	3.99	4.52
2hr	1.88	2.48	2.94	3.57	4.06	4.57	5.09	5.79
3hr	2.09	2.77	3.29	4.02	4.6	5.2	5.8	6.62
6hr	2.49	3.31	3.96	4.86	5.59	6.36	7.13	8.17
12hr	2.94	3.95	4.75	5.86	6.75	7.7	8.66	9.98
24hr	3.45	4.67	5.63	6.96	8.01	9.12	10.29	11.91
48hr	4.03	5.44	6.54	8.04	9.21	10.46	11.8	13.7

Table 38: Frequency Point Rainfall Depths (inches) for Johnson County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.88	1.16	1.38	1.66	1.88	2.11	2.35	2.67
1hr	1.6	2.11	2.5	3.02	3.42	3.84	4.29	4.91
2hr	1.98	2.63	3.14	3.83	4.36	4.93	5.53	6.39
3hr	2.21	2.95	3.54	4.33	4.96	5.63	6.35	7.36
6hr	2.63	3.54	4.26	5.25	6.03	6.87	7.78	9.06
12hr	3.09	4.18	5.04	6.22	7.14	8.14	9.22	10.77
24hr	3.6	4.88	5.88	7.25	8.32	9.47	10.72	12.53
48hr	4.17	5.64	6.79	8.35	9.55	10.84	12.25	14.29

Table 39: Frequency Point Rainfall Depths (inches) for Dallas County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.92	1.19	1.39	1.64	1.83	2.01	2.2	2.46
1hr	1.68	2.17	2.53	3	3.35	3.7	4.06	4.57
2hr	2.07	2.7	3.19	3.83	4.31	4.81	5.34	6.07
3hr	2.29	3.03	3.59	4.35	4.93	5.54	6.19	7.1
6hr	2.71	3.61	4.32	5.29	6.04	6.85	7.71	8.91
12hr	3.15	4.24	5.09	6.26	7.19	8.18	9.26	10.78
24hr	3.66	4.93	5.93	7.31	8.4	9.58	10.86	12.71
48hr	4.25	5.71	6.86	8.43	9.66	10.98	12.46	14.61

Table 40: Frequency Point Rainfall Depths (inches) for Ellis County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.93	1.22	1.43	1.71	1.92	2.13	2.35	2.65
1hr	1.69	2.21	2.6	3.11	3.5	3.9	4.33	4.94
2hr	2.06	2.74	3.26	3.97	4.52	5.11	5.74	6.65
3hr	2.28	3.06	3.67	4.52	5.19	5.92	6.7	7.82
6hr	2.68	3.64	4.41	5.49	6.36	7.31	8.35	9.85
12hr	3.12	4.26	5.18	6.47	7.52	8.67	9.95	11.82
24hr	3.62	4.96	6.02	7.52	8.72	10.04	11.54	13.75
48hr	4.24	5.77	6.97	8.64	9.94	11.37	13.03	15.53

Table 41: Frequency Point Rainfall Depths (inches) for Cooke County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.89	1.15	1.35	1.61	1.8	1.99	2.19	2.45
1hr	1.63	2.07	2.42	2.9	3.27	3.66	4.06	4.59
2hr	2	2.6	3.08	3.74	4.27	4.84	5.42	6.23
3hr	2.22	2.93	3.5	4.29	4.94	5.63	6.35	7.37
6hr	2.62	3.52	4.24	5.26	6.08	6.98	7.94	9.29
12hr	3.08	4.16	5.02	6.23	7.2	8.26	9.39	11.02
24hr	3.58	4.86	5.86	7.25	8.37	9.57	10.88	12.76
48hr	4.15	5.59	6.73	8.32	9.57	10.93	12.42	14.57

Table 42: Frequency Point Rainfall Depths (inches) for Grayson County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.92	1.17	1.36	1.61	1.8	1.99	2.17	2.42
1hr	1.66	2.12	2.46	2.92	3.27	3.62	3.98	4.48
2hr	2.04	2.65	3.12	3.76	4.27	4.79	5.34	6.09
3hr	2.26	2.98	3.54	4.32	4.93	5.59	6.27	7.22
6hr	2.69	3.59	4.3	5.3	6.11	6.97	7.88	9.14
12hr	3.2	4.29	5.15	6.35	7.3	8.31	9.39	10.91
24hr	3.77	5.06	6.07	7.45	8.54	9.7	10.94	12.7
48hr	4.38	5.85	6.99	8.57	9.8	11.11	12.53	14.54

Table 43: Frequency Point Rainfall Depths (inches) for Denton County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.9	1.16	1.36	1.61	1.79	1.97	2.15	2.39
1hr	1.63	2.1	2.45	2.91	3.24	3.57	3.92	4.39
2hr	2	2.61	3.08	3.69	4.15	4.62	5.12	5.81
3hr	2.22	2.93	3.46	4.19	4.74	5.32	5.93	6.78
6hr	2.63	3.5	4.17	5.08	5.79	6.54	7.33	8.46
12hr	3.11	4.14	4.94	6.03	6.87	7.76	8.72	10.09
24hr	3.63	4.85	5.79	7.06	8.03	9.06	10.19	11.8
48hr	4.21	5.61	6.68	8.14	9.26	10.44	11.73	13.57

Table 44: Frequency Point Rainfall Depths (inches) for Collin County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.92	1.17	1.36	1.6	1.78	1.96	2.13	2.37
1hr	1.67	2.13	2.47	2.92	3.24	3.57	3.92	4.39
2hr	2.06	2.67	3.13	3.75	4.21	4.7	5.21	5.92
3hr	2.29	3	3.55	4.29	4.86	5.46	6.09	6.97
6hr	2.72	3.62	4.31	5.26	6	6.79	7.62	8.79
12hr	3.22	4.3	5.14	6.28	7.17	8.11	9.12	10.54
24hr	3.79	5.05	6.03	7.36	8.39	9.49	10.67	12.33
48hr	4.41	5.86	6.97	8.48	9.63	10.86	12.21	14.13

Table 45: Frequency Point Rainfall Depths (inches) for Rockwall County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.94	1.19	1.37	1.61	1.79	1.96	2.14	2.37
1hr	1.71	2.17	2.51	2.95	3.27	3.59	3.94	4.42
2hr	2.11	2.72	3.19	3.8	4.26	4.74	5.24	5.95
3hr	2.35	3.07	3.62	4.36	4.92	5.51	6.14	7.01
6hr	2.79	3.69	4.39	5.35	6.09	6.87	7.71	8.89
12hr	3.27	4.36	5.21	6.38	7.28	8.25	9.31	10.81
24hr	3.82	5.1	6.1	7.46	8.53	9.67	10.93	12.75
48hr	4.44	5.9	7.04	8.58	9.75	11.02	12.44	14.53

Table 46: Frequency Point Rainfall Depths (inches) for Kaufman County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.94	1.2	1.4	1.65	1.83	2.02	2.21	2.46
1hr	1.73	2.21	2.57	3.04	3.38	3.73	4.1	4.62
2hr	2.12	2.77	3.27	3.93	4.43	4.96	5.53	6.33
3hr	2.36	3.12	3.7	4.51	5.13	5.8	6.52	7.55
6hr	2.79	3.74	4.49	5.54	6.37	7.28	8.26	9.67
12hr	3.25	4.39	5.31	6.59	7.63	8.77	10.02	11.83
24hr	3.77	5.12	6.19	7.7	8.92	10.26	11.74	13.9
48hr	4.42	5.96	7.17	8.84	10.15	11.58	13.18	15.53

Table 47: Frequency Point Rainfall Depths (inches) for Henderson County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.95	1.24	1.46	1.75	1.97	2.2	2.45	2.79
1hr	1.75	2.28	2.69	3.23	3.65	4.08	4.57	5.28
2hr	2.15	2.85	3.4	4.17	4.77	5.43	6.16	7.22
3hr	2.38	3.19	3.85	4.77	5.51	6.33	7.24	8.56
6hr	2.81	3.81	4.63	5.8	6.77	7.86	9.05	10.8
12hr	3.27	4.46	5.42	6.81	7.96	9.25	10.7	12.83
24hr	3.79	5.16	6.27	7.85	9.15	10.6	12.26	14.72
48hr	4.42	5.98	7.22	8.95	10.33	11.86	13.65	16.35

Table 48: Frequency Point Rainfall Depths (inches) for Vanzandt County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.95	1.21	1.41	1.67	1.87	2.07	2.27	2.55
1hr	1.73	2.22	2.59	3.08	3.44	3.81	4.22	4.79
2hr	2.13	2.8	3.31	4.01	4.55	5.12	5.73	6.59
3hr	2.37	3.16	3.77	4.62	5.29	6.01	6.77	7.85
6hr	2.81	3.79	4.57	5.66	6.54	7.48	8.49	9.93
12hr	3.29	4.45	5.36	6.64	7.66	8.77	9.98	11.71
24hr	3.83	5.15	6.19	7.64	8.79	10.03	11.41	13.42
48hr	4.46	5.96	7.12	8.71	9.92	11.25	12.77	15.01

Table 49: Frequency Point Rainfall Depths (inches) for Navarro County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.94	1.22	1.43	1.72	1.94	2.16	2.39	2.7
1hr	1.71	2.23	2.63	3.16	3.56	3.98	4.44	5.09
2hr	2.08	2.78	3.34	4.09	4.69	5.33	6.05	7.1
3hr	2.29	3.12	3.78	4.71	5.44	6.24	7.16	8.53
6hr	2.68	3.72	4.56	5.75	6.71	7.78	9.01	10.86
12hr	3.12	4.34	5.33	6.75	7.89	9.19	10.66	12.88
24hr	3.63	5.03	6.16	7.78	9.09	10.56	12.23	14.72
48hr	4.27	5.87	7.14	8.92	10.33	11.89	13.66	16.29

Table 50: Frequency Point Rainfall Depths (inches) for Hill County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.92	1.21	1.43	1.72	1.94	2.16	2.4	2.72
1hr	1.68	2.21	2.62	3.15	3.56	3.97	4.42	5.06
2hr	2.05	2.72	3.25	3.97	4.53	5.13	5.79	6.71
3hr	2.26	3.02	3.63	4.47	5.15	5.89	6.68	7.82
6hr	2.65	3.58	4.32	5.38	6.24	7.2	8.23	9.71
12hr	3.09	4.2	5.09	6.34	7.36	8.48	9.71	11.51
24hr	3.58	4.9	5.94	7.4	8.55	9.81	11.23	13.32
48hr	4.16	5.71	6.92	8.58	9.87	11.27	12.86	15.2

Table 51: Frequency Point Rainfall Depths (inches) for Freestone County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.94	1.25	1.49	1.79	2.02	2.25	2.5	2.86
1hr	1.71	2.29	2.72	3.29	3.7	4.14	4.63	5.34
2hr	2.1	2.84	3.42	4.2	4.8	5.45	6.17	7.23
3hr	2.33	3.18	3.85	4.78	5.51	6.31	7.21	8.53
6hr	2.74	3.76	4.59	5.75	6.7	7.75	8.92	10.64
12hr	3.18	4.35	5.3	6.66	7.77	9.02	10.43	12.52
24hr	3.67	5	6.08	7.61	8.86	10.26	11.86	14.24
48hr	4.27	5.81	7.02	8.71	10.06	11.54	13.22	15.7

Table 52: Frequency Point Rainfall Depths (inches) for Anderson County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.94	1.23	1.45	1.77	2.03	2.31	2.59	2.96
1hr	1.74	2.27	2.7	3.29	3.78	4.29	4.84	5.59
2hr	2.15	2.87	3.45	4.26	4.91	5.63	6.39	7.48
3hr	2.4	3.24	3.92	4.87	5.65	6.5	7.42	8.75
6hr	2.84	3.88	4.72	5.9	6.87	7.93	9.11	10.84
12hr	3.31	4.5	5.46	6.83	7.95	9.19	10.6	12.68
24hr	3.82	5.17	6.25	7.8	9.05	10.45	12.04	14.4
48hr	4.44	5.98	7.21	8.93	10.29	11.8	13.5	16.01

Table 53: Frequency Point Rainfall Depths (inches) for Leon County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.97	1.28	1.51	1.83	2.08	2.34	2.6	2.97
1hr	1.76	2.33	2.77	3.36	3.81	4.29	4.81	5.54
2hr	2.15	2.88	3.46	4.27	4.91	5.61	6.36	7.42
3hr	2.37	3.21	3.88	4.84	5.62	6.47	7.38	8.68
6hr	2.78	3.78	4.61	5.79	6.78	7.88	9.06	10.75
12hr	3.21	4.36	5.3	6.66	7.81	9.1	10.52	12.59
24hr	3.71	5	6.05	7.59	8.87	10.3	11.91	14.26
48hr	4.31	5.82	7.02	8.72	10.08	11.58	13.25	15.69

Table 54: Frequency Point Rainfall Depths (inches) for Houston County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.98	1.3	1.55	1.9	2.18	2.47	2.77	3.17
1hr	1.82	2.4	2.87	3.52	4.06	4.62	5.2	5.99
2hr	2.25	2.99	3.6	4.47	5.19	5.97	6.78	7.91
3hr	2.49	3.35	4.04	5.05	5.9	6.83	7.8	9.16
6hr	2.94	3.98	4.83	6.06	7.1	8.24	9.46	11.2
12hr	3.42	4.63	5.62	7.02	8.17	9.45	10.87	12.94
24hr	3.95	5.35	6.47	8.04	9.3	10.7	12.28	14.62
48hr	4.54	6.17	7.46	9.28	10.73	12.3	14.02	16.47

Table 55: Frequency Point Rainfall Depths (inches) for Madison County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	0.98	1.27	1.5	1.81	2.05	2.29	2.54	2.87
1hr	1.8	2.35	2.78	3.35	3.79	4.25	4.74	5.44
2hr	2.2	2.94	3.53	4.34	4.98	5.67	6.42	7.47
3hr	2.44	3.3	3.99	4.97	5.77	6.64	7.57	8.9
6hr	2.86	3.93	4.81	6.06	7.1	8.26	9.51	11.3
12hr	3.31	4.57	5.6	7.09	8.32	9.7	11.24	13.49
24hr	3.82	5.27	6.46	8.17	9.57	11.16	12.96	15.62
48hr	4.41	6.1	7.47	9.44	11.04	12.82	14.81	17.74

Table 56: Frequency Point Rainfall Depths (inches) for Sanjacinto County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	1.05	1.38	1.63	1.97	2.22	2.49	2.76	3.14
1hr	1.97	2.6	3.09	3.73	4.22	4.73	5.33	6.22
2hr	2.41	3.31	4.03	5.03	5.82	6.69	7.71	9.22
3hr	2.66	3.75	4.63	5.91	6.95	8.12	9.46	11.48
6hr	3.12	4.53	5.7	7.42	8.88	10.54	12.44	15.28
12hr	3.63	5.32	6.74	8.84	10.64	12.71	15.06	18.6
24hr	4.19	6.18	7.86	10.35	12.5	14.97	17.77	21.97
48hr	4.77	7.14	9.15	12.16	14.78	17.78	21.07	25.89

Table 57: Frequency Point Rainfall Depths (inches) for Walker County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	1	1.32	1.55	1.87	2.1	2.34	2.58	2.91
1hr	1.87	2.45	2.9	3.49	3.93	4.39	4.89	5.6
2hr	2.29	3.09	3.72	4.59	5.27	6	6.8	7.95
3hr	2.53	3.48	4.24	5.31	6.18	7.13	8.16	9.66
6hr	2.96	4.17	5.15	6.56	7.73	9.04	10.47	12.56
12hr	3.44	4.87	6.04	7.74	9.16	10.76	12.55	15.19
24hr	3.96	5.63	7	8.99	10.67	12.56	14.69	17.84
48hr	4.56	6.52	8.14	10.51	12.53	14.79	17.23	20.75

Table 58: Frequency Point Rainfall Depths (inches) for Polk County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	1.05	1.37	1.61	1.94	2.19	2.45	2.73	3.12
1hr	1.98	2.58	3.04	3.67	4.15	4.65	5.22	6.04
2hr	2.42	3.26	3.91	4.82	5.53	6.31	7.17	8.45
3hr	2.68	3.67	4.46	5.57	6.46	7.45	8.55	10.17
6hr	3.15	4.41	5.43	6.9	8.1	9.45	10.95	13.17
12hr	3.66	5.18	6.42	8.21	9.7	11.37	13.26	16.05
24hr	4.21	6.01	7.48	9.63	11.42	13.45	15.71	19.06
48hr	4.78	6.91	8.68	11.29	13.52	16.01	18.68	22.49

Table 59: Frequency Point Rainfall Depths (inches) for Liberty County Subbasins

Duration	Recurrence Interval							
	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
15min	1.11	1.47	1.73	2.08	2.35	2.62	2.9	3.29
1hr	2.13	2.81	3.33	4.03	4.54	5.08	5.71	6.63
2hr	2.62	3.6	4.38	5.49	6.38	7.37	8.48	10.12
3hr	2.89	4.09	5.07	6.51	7.72	9.09	10.61	12.85
6hr	3.4	4.97	6.31	8.32	10.06	12.09	14.34	17.7
12hr	3.97	5.93	7.61	10.13	12.32	14.91	17.93	22.56
24hr	4.6	6.99	9.03	12.1	14.75	17.91	21.66	27.53
48hr	5.27	8.19	10.67	14.38	17.57	21.33	25.74	32.56

All of the above sets of frequency precipitation depths were utilized as point rainfall depths in the frequency storms for the final HEC-HMS rainfall-runoff model. The appropriate point rainfall depth table was assigned to each subbasin within the HEC-HMS frequency storm editor. The final frequency results were then computed in HEC-HMS through the depth-area analysis of the applied frequency storms.

1.7 FREQUENCY STORM RESULTS – UNIFORM RAINFALL METHOD

The frequency flow values were then calculated in HEC-HMS by applying the frequency rainfall depths to the final watershed model through a depth-area analysis. This rainfall pattern is known as the uniform rainfall method because the same rainfall depths are applied uniformly over the entire watershed. The final HEC-HMS frequency flows for significant locations throughout the watershed model can be seen in Table 60. These results will later be compared, in the main report, to elliptical shaped storm results from HEC-HMS along with other methods from this study.

In some cases, one may observe that the simulated discharge decreases in the downstream direction. It is not an uncommon phenomenon to see decreasing frequency peak discharges for some river reaches as flood waters spread out into the floodplain and the hydrograph becomes dampened as it moves downstream. This can be due to a combination of peak attenuation due to river routing as well as the difference in timing between the peak of the main stem river versus the runoff from the local tributaries and subbasins.

Table 60: Summary of Discharges (cfs) from the HEC-HMS Uniform Rainfall Method

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
West Fork Trinity River below Brushy Creek	West_Fork_J010	191.1	3,600	10,200	16,700	24,700	31,400	39,500	46,900	57,300
West Fork Trinity River at Hwy 281 (TRWB's Antelope Gage)	West_Fork_J020	231.5	3,200	10,200	17,900	27,900	36,500	46,900	56,300	69,000
West Fork Trinity River above Cameron Creek	West_Fork_abv_CameronCk	263.3	1,600	5,600	11,200	19,600	28,100	40,100	51,300	66,200
West Fork Trinity River below Cameron Creek	West_Fork_J030	332.4	3,600	8,800	14,000	25,400	37,100	53,300	68,100	87,700
West Fork Trinity River above Turkey Creek	West_Fork_abv_TurkeyCk	403.1	2,300	7,600	14,200	25,200	36,800	53,600	69,200	91,700
West Fork Trinity River below Turkey Creek	West_Fork_J050	439.2	2,600	8,100	15,000	26,500	39,000	57,200	73,900	98,300
West Fork Trinity River above Big Cleveland Creek	WestFork_abv_Big_Cleveland	549.4	2,100	6,400	11,800	20,800	30,900	47,400	63,100	86,400
West Fork Trinity River below Big Cleveland Creek	West_Fork_J070	648.1	3,600	7,100	12,400	21,200	32,000	50,700	68,400	95,400
West Fork Trinity River near Jacksboro, TX USGS gage	West_Fork_J080	668.7	2,100	6,100	11,400	20,300	30,600	48,200	65,100	91,500
Lost Creek Reservoir Outflow (Lost Creek Res nr Jacksboro USGS gage)	Lost Creek Reservoir	28.8	240	890	1,600	4,500	7,200	10,200	12,700	15,900
Lost Creek above the West Fork	Lost_Ck_abv_WestFork	42.5	220	1,600	3,600	4,800	5,900	7,200	9,600	13,000
West Fork Trinity River below Lost Creek	West Fork + Lost Ck	711.2	2,200	6,400	12,000	21,300	31,600	49,600	67,100	94,500
West Fork Trinity River above Carroll Creek	West_Fork_abv_CarrollCk	750.8	2,200	6,500	12,300	21,500	31,900	49,900	67,400	94,800
West Fork Trinity River below Carroll Creek	West_Fork_J090	792.1	2,200	7,200	18,700	27,700	35,300	50,300	67,800	95,400
West Fork Trinity River above Beans Creek	WestFork_abv_Beans_Ck	827.7	2,200	7,600	20,700	31,000	39,900	50,700	68,200	95,800
West Fork Trinity River below Beans Creek	West Fork + Beans Ck	874.6	2,200	9,000	25,400	38,100	49,300	62,800	74,000	96,800
Bridgeport Reservoir Inflow	Bridgeport Inflow	1095.7	3,900	22,200	59,200	86,200	109,300	136,800	161,200	194,600
Bridgeport Reservoir Outflow	Bridgeport Reservoir	1095.7	2,700	5,500	11,700	12,700	20,400	28,800	37,700	69,200

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
West Fork Trinity River above Dry Creek	West_Fork_abv_DryCk	1136.2	2,500	5,500	11,700	12,800	16,600	28,900	37,900	69,400
West Fork Trinity River below Dry Creek	West_Fork_J100	1162.9	2,500	5,500	12,200	17,200	21,200	29,000	38,000	69,500
West Fork Trinity River above Big Sandy Creek	WestFork_abv_Big_Sandy_Ck	1169.5	2,500	5,500	11,800	16,900	21,700	29,000	38,000	69,600
Amon G Carter Lake Outflow	Amon G Carter Lake	109.5	170	620	1,200	1,500	4,600	10,300	14,800	24,800
Big Sandy Creek at Route 101 bridge near Sunset	Big_Sandy_Ck_J010	151.5	1,900	4,600	7,000	10,200	12,800	15,700	18,400	31,000
Big Sandy Creek above Brushy Creek	Big_Sandy_Ck_abv_Brushy_Ck	192.2	1,400	3,700	5,900	10,100	14,200	19,400	23,800	33,600
Big Sandy Creek below Brushy Creek	Big Sandy Ck + Brushy Ck	262.8	2,400	6,500	10,300	17,300	24,200	33,400	41,500	53,100
Big Sandy Creek about 2 miles upstream of FM 1810	Big_Sandy_Ck_J020	287.7	2,300	6,300	10,300	17,300	24,600	34,600	43,700	56,600
Big Sandy Creek nr Bridgeport USGS Gage at Hwy 114 bridge	Big_Sandy_Ck_J030	334.3	2,700	7,100	11,600	19,100	26,600	37,800	48,100	65,000
Big Sandy Creek above the West Fork Trinity River	Big_Sandy_Ck_abv_WestFork	353.9	2,500	7,000	11,200	19,000	26,700	37,900	48,400	65,400
West Fork Trinity River below Big Sandy Creek	West Fork + Big Sandy Ck	1523.5	4,100	10,400	19,300	28,700	37,400	50,400	62,400	82,200
West Fork Trinity River at FM 3259 near Paradise, TX	West_Fork_J110	1551.8	4,000	10,200	17,100	27,300	37,400	51,100	63,700	82,600
West Fork Trinity River above Salt Creek	WestFork_abv_Salt_Ck	1573.7	3,800	9,700	15,200	24,300	33,600	47,300	59,700	78,500
West Fork Trinity River below Salt Creek	West Fork + Salt Ck	1680.4	3,800	10,000	17,100	28,500	40,700	58,900	75,700	98,800
West Fork Trinity River near Boyd, TX - USGS Gage at FM 730 bridge	West_Fork_J120	1710.8	3,600	10,000	17,000	28,500	40,600	58,700	76,400	101,100
West Fork Trinity River about 0.8 miles upstream of FM 4757 in Wise County	West_Fork_J130	1751.9	3,600	9,900	16,900	28,200	40,000	57,700	74,200	98,800
Walnut Creek at Reno, TX USGS gage at FM1542 bridge in Parker County	Walnut_Ck_J010	62.7	5,000	13,000	19,800	29,100	34,900	41,400	47,200	54,900
Walnut Creek above Eagle Mountain Lake in Tarrant County	Walnut_Ck_abv_Eagle Mountain	81.4	2,600	8,300	14,300	25,000	32,000	40,100	46,800	55,400
Eagle Mountain Reservoir Inflow	Eagle Mountain Inflow	1956.6	5,100	20,100	38,600	67,900	85,400	106,600	125,300	149,700

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
Eagle Mountain Reservoir Outflow	Eagle Mountain Reservoir	1956.6	3,700	7,300	14,100	19,000	23,300	30,400	38,900	56,000
Lake Worth Inflow	Lake Worth Inflow	2050.8	3,800	9,200	14,400	25,100	31,000	38,000	44,300	56,500
Lake Worth Outflow	Lake Worth	2050.8	3,500	7,400	14,300	19,300	23,400	30,700	39,200	56,400
West Fork Trinity River above the Clear Fork	WestFork_abv_Clear_Fork	2078.7	3,600	7,500	14,600	19,600	23,800	31,100	39,600	56,800
Lake Weatherford Outflow	Lake Weatherford	108.7	820	2,100	3,000	5,100	8,600	18,500	26,300	38,800
Clear Fork at Kelly Rd nr Aledo USGS gage	Clear_Fork_J010	245.1	2,100	6,200	11,000	17,600	23,100	34,800	49,700	72,100
Clear Fork above Bear Creek	Clear_Fork_abv_Bear_Ck	263.8	2,100	6,400	11,200	17,900	23,400	35,000	49,900	72,300
Benbrook Lake Inflow	Benbrook Inflow	429.2	16,300	43,700	61,600	82,500	99,100	118,000	135,900	163,700
Benbrook Lake Outflow (Clear Fork nr Benbrook)	Benbrook Lake	429.2	0	0	0	1,800	4,200	7,600	12,300	22,600
Clear Fork above Marys Creek	Clear_Fork_abv_Marys_Ck	9.4	4,300	7,800	10,000	12,500	14,300	16,200	18,100	20,800
Marys Creek at Benbrook USGS gage	Marys_Ck_S010	54.2	2,500	12,400	25,100	43,500	52,700	63,100	77,000	92,500
Clear Fork below Marys Creek	Clear Fork + Marys Creek	63.6	4,000	13,200	26,700	46,800	56,700	68,700	83,500	100,800
Clear Fork Trinity River at Fort Worth USGS gage	Clear_Fork_J020	89.0	5,700	17,000	31,500	53,200	62,600	72,100	83,800	99,400
Clear Fork Trinity River above the West Fork	Clear_Fork_abv_WestFork	93.9	6,200	17,100	30,800	50,200	59,700	69,500	80,000	93,900
West Fork Trinity River below the Clear Fork (West Fork at Fort Worth USGS gage)	West Fork + Clear Fork	2172.5	7,300	19,900	35,600	57,400	68,600	80,500	92,900	113,400
West Fork Trinity River above Marine Creek	WestFork_abv_MarineCk	2173.7	7,200	19,800	35,400	57,100	67,900	79,800	92,800	113,100
West Fork Trinity River below Marine Creek	West Fork + Marine Ck	2195.4	8,000	20,600	36,400	58,700	70,000	82,200	95,600	116,300
West Fork Trinity River above Sycamore Creek	West_Fork_J140	2204.6	8,300	19,800	36,100	56,900	66,300	80,600	95,700	115,800
West Fork Trinity River below Sycamore Creek (West Fork Trinity River at Beach	West_Fork_J150	2243.8	8,600	19,700	34,500	58,200	69,400	82,300	97,500	119,400

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
West Fork above Big Fossil	WestFork_abv_BigFossil	2256.8	7,700	17,700	31,900	55,400	67,400	80,800	95,500	117,000
West Fork Trinity River and Big Fossil Creek Confluence	West_Fork_J160	2333.4	12,900	23,800	38,000	66,200	81,300	98,300	116,800	143,600
Village Creek at Everman USGS gage	Village_Ck_S010	90.4	7,400	14,300	20,200	27,200	33,000	39,700	46,100	54,800
Lake Arlington Inflow	Lake Arlington Inflow	143.1	13,000	24,600	31,700	40,900	48,500	56,400	64,300	75,100
Lake Arlington Outflow	Lake Arlington	143.1	2,300	3,500	3,600	4,900	10,500	18,700	26,800	37,500
Village Creek above West Fork	Village_Ck_abv_WestFork	191.7	3,300	7,200	11,000	17,300	20,400	23,900	27,200	38,700
West Fork Trinity River below Village Creek	West Fork + Village Ck	2554.0	11,900	21,300	35,600	60,400	77,400	100,300	124,600	161,100
West Fork Trinity River below Johnson Creek	West_Fork_J170	2618.6	9,000	17,700	26,500	49,100	65,600	88,400	115,000	147,600
West Fork Trinity River at Grand Prairie USGS gage	West_Fork_J180	2623.4	9,000	17,700	26,500	49,300	65,700	88,200	113,800	146,400
West Fork Trinity River above Big Bear Creek	West_Fork_abv_Big_Bear_Ck	2625.5	8,900	17,000	25,900	47,700	62,900	84,000	108,000	141,800
West Fork Trinity River below Big Bear Creek	West Fork + Bear Ck	2718.8	10,300	18,300	29,200	56,300	74,300	96,800	125,600	163,000
West Fork Trinity River above Mountain Creek	West_Fork_abv_Mountain_Ck	2727.4	10,300	18,300	28,700	52,400	70,200	92,500	117,300	154,000
Walnut Creek near Mansfield, TX USGS gage	Joe_Pool_S030	62.9	4,100	8,100	11,600	17,100	20,900	25,300	29,800	35,100
Walnut Creek above Joe Pool Lake	Walnut Ck + Joe Pool	67.2	4,000	7,900	11,300	16,700	20,500	25,000	29,400	34,700
Mountain Ck near Venus, TX USGS Gage	Joe_Pool_S010	26.0	3,600	6,700	8,800	11,600	13,900	16,500	18,900	22,300
Joe Pool Lake Inflow	Joe Pool Inflow	224.2	14,100	27,500	38,500	54,600	67,300	82,500	97,400	116,200
Joe Pool Lake Outflow	Joe Pool Lake	224.2	0	0	0	0	0	0	0	0
Mountain Creek Lake Inflow	Mountain Creek Inflow	70.6	20,600	32,800	40,400	50,200	57,800	66,000	74,300	85,300
Mountain Creek Lake Outflow	Mountain Creek Reservoir	70.6	11,900	21,700	29,700	40,500	48,000	56,600	63,800	69,400

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
Mountain Creek above the West Fork Trinity River	Mountain_Ck_abv_West_Fork	80.2	8,800	15,500	20,400	26,700	31,900	38,300	44,600	52,600
West Fork Trinity River below Mountain Creek	West Fork + Mountain Ck	2807.6	14,400	24,800	32,500	54,100	72,000	94,400	119,600	157,500
West Fork Trinity River above the Elm Fork Trinity River	West_Fork_abv_Elm_Fork	2820.9	14,700	24,700	32,000	53,600	71,600	94,000	119,000	156,700
Elm Fork Trinity River above Brushy Elm Creek	Elm_Fork_abv_Brushy_Elm_Ck	67.4	2,600	5,200	7,900	12,800	17,700	24,100	30,500	38,900
Muenster Lake Outflow	Muenster Lake	14.0	200	330	340	360	370	510	790	1,200
Brushy Elm Creek above the Elm Fork Trinity River	Brushy_Elm_Ck_abv_Elm_Fork	25.5	1,800	3,600	4,900	6,500	7,700	9,100	10,500	12,400
Elm Fork Trinity River below Brushy Elm Creek	Elm_Fork_J010	92.9	3,300	6,800	10,000	15,600	20,800	27,500	34,500	43,800
Elm Fork Trinity River below Dry Elm Creek	Elm_Fork_J020	137.0	6,200	13,200	19,500	28,500	36,400	45,600	54,800	67,300
Elm Fk Trinity Rv at Gainesville, TX USGS gage	Elm_Fork_J030	177.2	8,300	18,100	26,500	38,300	48,400	60,400	71,900	87,500
Elm Fork Trinity River below Pecan Creek	Elm Fork + Pecan Ck	216.8	8,100	18,100	27,000	39,700	50,800	64,200	77,200	94,200
Elm Fork Trinity River above Ray Roberts Lake	Elm_Fork_abv_Ray_Roberts	265.0	7,600	17,200	25,800	38,400	49,700	64,100	77,800	95,600
Lake Kiowa Inflow	Lake_Kiowa_S010	16.8	1,900	5,000	6,900	9,200	11,000	13,000	15,000	17,600
Lake Kiowa Outflow	Kiowa Lake	16.8	450	1,500	2,300	3,600	4,700	5,900	7,200	8,900
Timber Ck nr Collinsville, TX USGS gage	Timber_Ck_S010	39.0	2,600	7,500	10,800	14,900	18,200	22,000	25,600	30,500
Timber Creek above Ray Roberts Lake	Timber_Ck_abv_Ray_Roberts	64.2	4,000	10,300	15,000	20,800	25,500	31,100	36,200	43,100
Range Creek nr Collinsville, TX USGS gage	Range_Ck_S010	29.3	2,700	8,300	12,900	20,400	24,000	28,000	31,700	36,700
Range Creek above Ray Roberts Lake	Range_Ck_abv_Ray_Roberts	50.6	2,800	6,900	10,400	17,400	21,200	25,600	29,400	34,700
Ray Roberts Lake Inflow	Ray Roberts Inflow	692.6	48,000	90,200	118,800	157,300	189,000	226,700	262,400	310,800
Ray Roberts Lake Outflow (Elm Fork at Greenbelt nr Pilot Point USGS gage)	Ray Roberts Lake	692.6	0	0	0	0	210	1,100	2,000	3,200

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
Elm Fork Trinity River above Clear Creek	Elm_Fork_abv_Clear_Ck	36.9	1,200	4,800	9,000	12,000	14,400	17,200	19,700	23,200
Clear Creek above Bingham Creek	Clear_Ck_abv_Bingham_Ck	83.9	2,500	4,700	8,800	15,200	21,100	28,400	35,500	44,200
Clear Creek below Bingham Creek	Clear_Ck_J010	99.9	2,600	5,100	9,700	17,200	24,000	32,500	40,700	50,800
Clear Creek above Williams Creek	Clear_Ck_abv_Williams_Ck	151.6	3,200	5,300	10,100	18,600	26,800	37,300	47,300	60,000
Clear Creek below Williams Creek	Clear_Ck_J020	187.2	4,400	7,400	13,500	24,000	34,000	46,800	59,200	74,700
Clear Creek below Flat Creek	Clear_Ck_J030	214.5	4,600	8,700	16,300	28,300	39,300	53,400	67,100	84,400
Clear Creek above Duck Creek	Clear_Ck_abv_Duck_Ck	259.5	5,100	9,200	17,000	29,700	41,500	56,900	71,900	90,400
Clear Ck nr Sanger, TX USGS gage	Clear_Ck_J040	294.6	6,000	10,400	19,000	32,800	45,700	62,600	78,900	99,300
Clear Creek above Moores Branch	Clear_Ck_abv_Moores_Br	309.9	5,600	9,500	16,500	29,500	42,500	59,700	76,300	97,200
Clear Creek below Moores Branch	Clear_Ck_J050	322.8	5,700	9,600	16,700	29,800	43,000	60,400	77,400	98,600
Clear Creek above the Elm Fork Trinity River	Clear_Ck_abv_Elm_Fork	351.2	5,300	9,100	15,800	28,900	42,500	60,600	78,300	100,600
Elm Fork Trinity River below Clear Creek	Elm Fork + Clear Ck	388.1	5,300	9,300	16,100	29,400	43,300	62,100	80,500	104,000
Little Elm Ck nr Aubrey, TX USGS gage	Little_Elm_Ck_J010	72.9	3,400	7,400	10,400	15,200	19,500	24,700	29,500	35,700
Little Elm Creek below Mustang Creek	Little_Elm_Ck_J020	95.8	4,100	8,700	12,300	18,000	23,100	29,300	35,100	42,500
Doe Br at Hwy 380 nr Prosper, TX USGS gage	Doe_Branch_S010	38.4	4,200	7,200	9,500	12,500	14,900	17,700	20,300	23,800
Doe Branch above Little Elm Creek	Doe_Branch_abv_Lewisville	71.0	6,500	11,600	15,400	20,700	24,800	29,600	34,000	40,100
Little Elm below Doe Branch	Doe Branch + Lewisville	231.3	8,900	17,900	24,800	34,100	41,800	51,200	60,000	72,500
Hickory Creek below North & South Hickory Creek confluence	Hickory_Ck_J010	80.7	7,700	16,400	22,600	30,000	36,000	42,700	48,800	57,200
Hickory Creek at Denton, TX USGS gage	Hickory_Ck_J030	128.9	6,200	13,600	19,100	26,400	32,700	40,300	46,900	55,800

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
Hickory Creek at Old Alton Rd above Lewisville Lake	Hickory_Ck_abv_Lewisville	148.9	5,900	12,500	18,000	25,200	31,700	39,400	46,600	55,900
Lewisville Lake Inflow	Lewisville Inflow	968.2	38,700	69,000	91,400	119,300	143,100	169,500	193,800	227,400
Lewisville Lake Outflow (Elm Fork nr Lewisville USGS gage)	Lewisville Lake	968.2	0	0	0	0	1,500	5,500	10,100	17,400
Elm Fork Trinity River above Indian Creek	Elm_Fork_abv_Indian_Ck	21.4	1,200	2,900	4,400	7,200	8,500	10,000	11,300	13,300
Elm Fort Trinity River below Indian Creek	Elm Fork + Indian Ck	37.5	3,000	6,200	9,200	14,400	16,900	19,700	22,300	26,000
Elm Fork Trinity River below Timber Creek	Elm Fork + Timber Ck	61.5	3,700	6,900	9,700	14,800	17,500	21,200	24,700	29,400
Elm Fork Trinity River above Denton Creek	Elm_Fork_abv_Denton_Ck	79.9	5,200	9,100	12,900	19,300	22,900	27,500	31,900	37,900
Denton Creek above FM 1655	Denton_Ck_S010	116.0	3,700	8,700	14,000	20,700	26,800	32,900	41,500	52,600
Denton Creek above Sweetwater Creek	Denton_Ck_J010	285.1	5,400	12,600	20,200	29,500	38,300	46,800	58,800	71,800
Denton Creek below Sweetwater Creek	Denton_Ck_J020	346.6	6,200	14,200	22,900	34,200	44,900	55,600	70,000	86,500
Denton Creek nr Justin, TX USGS gage	Denton_Ck_J030	400.0	4,100	9,700	16,000	26,000	35,900	47,300	62,900	81,700
Denton Creek below Oliver Creek	Denton_Ck_J040	475.3	6,100	15,500	24,100	35,400	44,600	54,800	70,100	92,700
Denton Creek above Elizabeth Creek	Denton_Ck_abv_Elizabeth_Ck	506.1	6,800	15,500	23,300	35,200	45,600	57,200	70,400	94,200
Denton Creek below Elizaveth Creek	Denton_Ck_J050	599.7	12,200	26,600	38,500	55,900	71,200	88,600	105,500	127,600
Grapevine Lake Inflow	Grapevine_Inflow	694.4	14,800	29,100	38,900	55,000	70,300	89,500	107,300	131,300
Grapevine Lake Outflow (Denton Creek nr Grapevine USGS gage)	Grapevine Lake	694.4	0	0	0	0	0	3,900	9,500	19,500
Denton Creek above the Elm Fork Trinity River	Denton_Ck_abv_Elm_Fork	24.3	2,100	4,100	6,100	10,400	12,200	14,300	16,400	19,000
Elm Fork Trinity River near Carrollton USGS gage	Elm Fork + Denton Ck	104.2	6,700	11,700	17,100	26,700	31,500	37,200	43,200	51,200
Elm Fork Trinity River at Interstate 635	Elm_Fork_J060	143.4	11,400	17,500	21,900	30,500	36,600	43,300	50,100	59,600

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
Elm Fork Trinity River above Hackleberry Creek	Elm_Fork_abv_Hackberry_Ck	143.4	8,300	13,300	18,300	29,100	35,200	42,100	49,000	57,200
Elm Fk Trinity Rv at Spur 348 in Irving; TX USGS gage	Elm_Fork_J070	180.4	10,000	15,000	19,100	30,300	37,100	45,100	52,800	62,400
Elm Fork Trinity River above Bachman Branch	Elm_Fork_abv_Bachman_Branch	202.6	9,100	14,100	17,900	27,100	33,700	41,700	48,500	57,700
Bachman Lake Outflow	Bachman Lake	12.7	3,100	6,000	8,100	11,200	13,400	16,000	18,600	21,600
Bachman Branch above the Elm Fork Trinity River	Bachman_Branch_abv_Elm_Fork	14.1	1,600	3,000	4,000	5,300	6,400	7,800	9,200	11,200
Elm Fork Trinity River below Bachman Branch (at Frasier Dam USGS gage)	Elm Fork + Bachman Branch	216.7	10,000	15,600	19,200	27,500	34,400	42,600	49,600	58,900
Elm Fork Trinity River above the West Fork Trinity River	Elm_Fork_abv_West_Fork	222.8	8,100	13,400	18,100	26,800	33,700	41,800	48,800	58,700
Trinity River below the West Fork and Elm Fork confluence	West Fork + Elm Fork	3043.7	20,700	33,700	43,700	77,900	100,900	129,200	163,700	210,600
Trinity River at Dallas, TX USGS gage	Trinity_River_J010	3056.1	18,800	31,600	42,800	76,800	100,200	128,500	162,400	209,500
Trinity River at the Corinth Street bridge in Dallas, TX	Trinity_River_J020	3099.0	19,200	32,200	43,300	77,000	100,600	129,000	163,000	210,400
White Rock Creek at Greenville Ave USGS gage	White_Rock_Ck_S010	66.7	16,300	24,400	30,800	39,500	45,900	52,900	59,600	68,700
White Rock Lake Inflow	White Rock Inflow	95.0	13,200	20,400	25,300	33,300	39,600	46,600	53,200	62,200
White Rock Lake Outflow	White Rock Lake	95.0	9,800	15,300	19,800	26,400	31,900	38,000	43,800	51,900
White Rock Creek above the Trinity River	White_Rock_Ck_abv_Trinity_Rv	134.9	9,100	16,300	20,800	26,100	30,400	35,000	39,600	46,100
Trinity River below White Rock Creek	Trinity River + White Rock	3233.9	23,400	38,200	51,300	78,800	103,500	134,300	167,800	218,800
Trinity River below Honey Springs Branch (Trinity River below Dallas, TX USGS gage)	Trinity_Rv + Honey_Springs	3256.5	23,400	38,300	51,400	78,900	103,500	134,300	167,800	219,000
Trinity River below Five Mile Creek	Trinity_River + Five_Mile_Ck	3328.8	22,200	36,900	49,800	78,200	102,100	132,400	164,300	213,200
Trinity River above Ten Mile Creek	Trinity_River_abv_Tenmile_Ck	3367.7	20,600	31,500	43,300	70,800	95,100	120,500	148,800	189,900
Trinity River below Ten Mile Creek	Trinity River + Tenmile Ck	3469.8	20,800	32,100	44,000	71,700	96,200	121,900	150,400	191,900

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
Trinity River above the East Fork Trinity River	Trinity_River_abv_East_Fork	3529.4	20,300	30,200	40,200	68,200	91,200	119,700	145,700	185,300
East Fork Trinity River below Honey Creek	East_Fork+Honey_Ck	167.9	4,100	7,600	11,300	17,700	23,600	31,000	38,000	47,200
East Fork Trinity River near McKinney, TX USGS gage	East_Fork_nr_McKinney	190.1	4,600	8,500	12,500	19,300	25,600	33,800	41,400	51,400
East Fork Trinity River above Wilson Creek	East_Fork_abv_Wilson_Ck	214.8	4,600	8,600	12,500	19,100	25,300	33,500	41,200	51,400
East Fork Trinity River below Wilson Creek	East_Fork + Wilson_Ck	292.3	7,100	12,600	18,000	26,700	34,800	45,500	55,500	68,900
Sister Grove Creek near Blue Ridge USGS gage	Sister_Grove_S010	83.2	1,400	2,800	4,100	6,400	8,400	11,000	13,400	16,500
Sister Grove Creek above Indian Creek	Sister_Grove_abv_Indian_Ck	121.2	2,400	4,600	6,400	8,900	11,000	13,500	15,900	19,600
Indian Creek at SH 78 nr Farmersville, TX USGS gage	Indian_Ck_S010	104.6	2,400	4,200	6,000	8,800	11,200	14,300	17,300	21,200
Indian Creek below Pilot Grove Creek	Indian_Ck + Pilot_Grove_Ck	205.8	4,400	8,800	12,600	18,400	23,400	29,800	35,800	43,800
Indian Creek above Sister Grove Creek	Indian_Ck_abv_Sister_Grove	235.9	4,700	9,300	13,300	19,500	24,900	32,100	38,600	47,300
Indian Creek below Sister Grove Creek	Sister Grove + Indian Ck	357.1	6,200	12,300	17,600	26,200	33,800	44,100	53,500	66,100
Lavon Lake Inflow	Lavon Inflow	768.2	20,300	35,200	47,100	64,200	78,700	100,800	121,900	150,500
Lake Lavon Outflow	Lavon Lake	768.2	0	0	0	0	6,200	14,600	24,800	51,800
Rowlett Creek near Sachse, TX USGS gage	Rowlett_Ck_S010	119.9	13,500	25,400	35,200	46,600	54,600	63,600	72,100	83,800
Ray Hubbard Lake Inflow	Ray Hubbard Inflow	301.8	24,600	42,200	56,900	75,600	90,300	107,300	123,300	145,100
Ray Hubbard Lake Outflow (East Frk blw Ray Hubbard Data)	Ray Hubbard Reservoir	301.8	8,900	16,500	26,000	38,000	47,400	59,800	83,300	101,300
East Fork Trinity River near Forney USGS gage	East_Fork_nr_Forney	349.9	10,500	19,500	30,300	44,100	55,000	69,300	95,500	117,100
East Fork Trinity River above Buffalo Creek	East_Fork_abv_Buffalo_Ck	359.5	9,300	17,800	26,500	40,800	52,700	67,400	91,700	115,500
East Fork Trinity River below Buffalo Creek	East_Fork + Buffalo_Ck	393.9	9,900	18,900	28,300	42,900	55,800	71,900	97,900	123,600

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
East Fork Trinity River above South Mesquite Creek	East_Fork_abv_S_Mesquite_Ck	416.9	7,700	15,500	24,000	36,000	48,100	64,000	82,200	111,600
East Fork Trinity River below South Mesquite Creek	East_Fork+South_Mesquite_Ck	446.4	8,100	16,300	25,200	37,500	50,300	67,000	86,800	117,600
East Fork Trinity River above Mustang Creek	East_Fork_abv_Mustang_Ck	465.5	8,000	15,100	23,000	32,600	43,400	57,200	72,200	96,100
East Fork Trinity River near Crandall, TX USGS gage	East_Fork_nr_Crandall	484.8	8,200	15,500	23,500	33,200	44,300	58,400	73,900	98,300
East Fork Trinity River above the Trinity River	East_Fork_abv_Trinity_River	484.8	8,000	14,100	20,600	28,700	37,100	48,600	59,700	75,100
Trinity River below the East Fork Trinity River	Trinity River + East Fork	4014.2	28,300	43,400	58,200	95,900	126,700	166,200	202,000	254,900
Trinity River below Red Oak Creek	Trinity_River + Red_Oak_Ck	4245.5	30,100	53,800	70,600	97,300	128,500	168,600	205,000	258,700
Trinity River near Rosser, TX USGS gage	Trinity_River_nr_Rosser	4349.6	27,200	40,600	54,900	91,600	126,100	166,200	200,800	253,900
Trinity River above Cedar Creek	Trinity_River_abv_Cedar_Ck	4349.6	26,100	39,600	53,900	72,500	101,900	154,800	190,400	246,400
Kings Creek at SH34 near Kaufman, TX USGS gage	Kings_Ck_nr_Kaufman	222.6	3,800	7,400	10,500	15,300	19,900	25,900	31,500	39,500
Kings Creek above Cedar Creek Reservoir	Kings_Ck_abv_Cedar_Ck_Inflow	343.1	6,000	10,600	15,000	22,600	29,200	37,200	45,200	56,200
Cedar Creek near Kemp, TX USGS gage	Cedar_Ck_nr_Kemp	190.1	5,400	8,400	10,900	14,600	17,100	22,200	27,100	34,100
Cedar Creek above Cedar Creek Reservoir	Cedar_Ck_abv_Cedar_Ck_Inflow	283.5	5,900	11,600	16,300	22,400	27,500	33,800	39,700	48,000
Cedar Creek Reservoir Inflow	Cedar Creek Inflow	1010.8	30,300	61,600	88,900	129,700	163,900	204,900	245,300	301,600
Cedar Creek Reservoir Outflow	Cedar Creek Reservoir	1010.8	21,700	42,300	57,900	81,700	106,500	126,600	133,800	145,600
Trinity River below Cedar Creek	Trinity River + Cedar Creek	5360.4	28,200	43,200	60,200	78,600	114,600	174,100	220,200	295,100
Trinity River at Trinidad, TX USGS gage	Trinity_River_at_Trinidad	5759.3	28,000	43,300	59,800	86,700	112,400	168,400	209,900	286,400
Trinity River above Richland Creek	Trinity_Rv_abv_Richland_Ck	6042.8	28,100	43,800	60,200	82,600	107,600	167,700	211,800	286,800
Waxahachie Creek at Waxahachie	Waxahachie_Ck_S010	60.4	1,500	4,400	8,900	15,500	20,900	27,500	34,000	42,800

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
Lake Waxahachie Outflow	Lake Waxahachie	30.6	1,700	3,900	5,900	8,700	12,000	15,600	17,400	26,400
Waxahachie Creek below Lake Waxahachie	Waxahachie Ck+Lk Waxahachie	91.0	2,600	6,400	11,700	19,400	25,500	33,500	42,000	52,000
Mustang Creek above Bardwell Lake	Mustang_Ck_S010	29.9	3,600	6,600	8,700	11,600	14,000	16,700	19,400	23,200
Bardwell Lake Inflow	Bardwell Inflow	174.4	9,200	16,700	22,000	29,200	35,200	42,300	49,400	62,400
Bardwell Lake Outflow	Bardwell Lake	174.4	0	0	1,100	3,500	5,400	8,000	10,600	14,300
Chambers Creek below North Fork and South Fork Chambers Creek	Chambers_Ck_J010	308.4	11,000	20,600	29,700	41,200	53,900	69,700	84,700	104,400
Chambers Creek below Mill Creek	Chambers_Ck_J020	511.9	11,600	21,700	31,700	47,100	66,400	93,100	118,200	153,600
Chambers Creek below Waxahachie Creek	Chambers Ck + Waxahachie Ck	621.0	11,300	21,400	31,400	46,300	65,900	94,400	122,600	162,500
Chambers Creek near Rice, TX USGS gage	Chambers_Ck_J030	650.1	11,200	21,300	29,900	46,200	65,600	90,900	119,500	159,000
White Rock Creek at FM 308 near Irene, TX USGS gage	Navarro_Mills_S010	65.8	3,600	8,100	12,400	19,000	24,600	31,300	37,800	46,300
Navarro Mille Lake Inflow	Navarro Mills Inflow	319.9	11,600	23,900	34,200	49,900	63,200	79,900	96,100	121,700
Navarro Mills Lake Outflow	Navarro Mills Lake	319.9	0	0	0	0	1,400	4,800	8,200	15,000
Richland Creek below Pin Oak Creek	Richland_Ck_J010	395.0	12,700	26,700	39,700	60,700	78,700	100,800	123,100	155,900
Richland Chambers Reservoir Inflow	Richland-Chambers Inflow	1465.5	27,000	52,500	74,900	111,000	143,000	183,400	223,200	281,800
Richland Chambers Reservoir Outflow	Richland-Chambers Reservoir	1465.5	10,200	21,600	34,300	63,700	93,800	136,200	177,300	234,700
Trinity River below Richland Creek	Trinity River + Richland Ck	7508.3	35,500	61,900	86,500	133,000	178,600	247,900	303,700	380,800
Trinity River above Tehuacana Creek	Trinity_Rv_abv_Tehuacana_Ck	7508.3	35,200	61,200	85,800	131,200	176,500	243,400	301,300	377,400
Tehuacana Creek near Streetman, TX USGS gage	Tehuacana_Ck_nr_Streetman	141.3	7,100	15,000	20,400	34,100	43,700	55,100	66,200	81,900
Tehuacana Creek above the Trinity River	Tehuacana_Ck_abv_Trinity_Rv	386.4	7,900	15,100	22,400	38,200	52,900	72,500	91,900	118,800

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
Trinity River below Tehuacana Creek	Trinity River + Tehuacana Ck	7894.7	35,600	62,500	87,900	135,300	183,600	256,200	332,100	436,300
Trinity River above Big Brown Creek	Trinity_Rv_abv_Big_Brown_Ck	7965.3	35,600	62,400	87,900	134,900	182,000	253,300	326,700	431,700
Trinity River below Big Brown Creek	Trinity River + Big Brown Ck	8001.5	35,700	62,600	88,200	135,500	183,800	254,600	330,900	437,500
Trinity River above Catfish Creek	Trinity_River_abv_Catfish_Ck	8306.6	35,900	63,600	89,700	136,500	186,400	265,000	350,100	467,800
Trinity River below Catfish Creek	Trinity_River + Catfish_Ck	8353.0	35,900	63,700	89,800	136,800	187,000	266,800	352,900	472,100
Trinity River near Oakwood, TX USGS gage	Trinity_River_nr_Oakwood	8593.0	35,700	62,700	86,400	126,100	164,600	261,200	327,200	438,500
Trinity River above Upper Keechi Creek	TrinityRv_abv_UpperKeechi_Ck	8849.7	33,700	57,500	80,300	122,100	153,600	201,400	269,200	359,700
Upper Keechi Creek near Oakwood, TX USGS gage	Upper_Keechi_Ck_nr_Oakwood	150.3	3,400	11,400	19,500	31,100	39,200	48,900	58,300	72,000
Upper Keechie Creek above Buffalo Creek	UpperKeechi_Ck_abv_BuffaloCk	186.8	3,000	10,500	18,000	29,100	37,200	47,100	56,800	70,900
Upper Keechie Creek below Buffalo Creek	Upper_Keechi_Ck+Buffalo_Ck	459.5	5,800	21,000	35,000	54,400	69,900	89,300	109,400	135,700
Upper Keechie Creek above the Trinity River	UpperKeechi_Ck_abv_TrinityRv	509.2	5,700	20,100	33,400	51,900	66,900	86,100	106,000	132,200
Trinity River below Upper Keechi Creek	Trinity River + Upper Keechi	9358.9	33,900	58,100	81,500	124,000	156,500	208,600	279,100	373,400
Trinity River above Big Elkhart Creek	Trinity_Rv_abv_Big_Elkhart	9359.5	33,900	57,900	81,300	124,000	156,400	208,100	278,300	372,500
Houston County Lake Outflow	Houston County Lake	48.0	110	220	420	900	1,600	4,700	7,900	12,700
Big Elkhart Creek above the Trinity River	Big_Elkhart_abv_Trinity_Rv	143.0	2,000	6,500	10,000	14,700	18,900	25,300	33,100	43,500
Trinity River below Big Elkhart Creek	Trinity River+ Big Elkhart	9502.5	33,900	58,000	81,700	124,500	157,300	209,800	280,500	375,100
Trinity River near Crockett, TX USGS gage	Trinity_River_nr_Crockett	9615.0	34,000	58,100	81,900	124,900	157,800	210,600	281,500	376,400
Trinity River above Lower Keechi Creek	Trinity_Rv_abv_LowerKeech_Ck	9791.7	34,000	53,700	71,100	116,900	149,600	189,200	252,500	342,700
Trinity River below Lower Keechi Creek	Trinity_River+LowerKeechi_Ck	9979.3	34,000	53,700	71,200	117,100	149,900	190,000	253,700	344,400

Location Description	HEC-HMS Element Name	Drainage Area	50%	20%	10%	4%	2%	1%	0.50%	0.20%
		sq mi	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	200-YR	500-YR
Trinity River above Bedias Creek	Trinity_River_abv_Bedias_Ck	10374.3	36,400	52,700	70,200	114,800	147,400	186,200	246,300	336,500
Bedias Creek near Madisonville, TX USGS gage	Bedias_Ck_S010	330.6	8,200	16,200	24,400	38,000	47,500	65,100	82,300	105,800
Bedias Creek above the Trinity River	Bedias_Ck_abv_Trinity_River	604.3	11,900	25,800	38,600	59,000	74,700	100,900	126,500	162,400
Trinity River below Bedias Creek	Trinity River + Bedias Ck	10978.5	38,000	71,100	98,700	136,000	161,300	200,700	250,000	341,400
Trinity River at Riverside, TX USGS gage	Trinity_River_at_Riverside	11306.7	34,000	63,500	81,400	128,400	157,500	202,600	251,500	341,000
Lake Livingston Inflow	Lake Livingston Inflow	12301.1	67,800	119,800	161,500	221,900	276,400	346,400	418,100	523,500
Lake Livingston Outflow	Lake Livingston	12301.1	35,400	74,000	94,600	130,100	179,200	248,200	316,400	415,400
Trinity River above Long King Creek	Trinity_Rv_abv_Long_King_Ck	12340.5	35,300	73,500	94,200	126,500	171,000	235,800	301,400	396,700
Long King Creek at Livingston, TX USGS gage	Long_King_Ck_S010	141.1	5,700	13,600	19,700	28,700	36,500	46,300	55,800	69,400
Long King Creek above the Trinity River	Long_King_Ck_abv_Trinity_Rv	226.4	7,500	17,000	25,000	37,300	48,200	62,000	75,200	94,300
Trinity River at Goodrich, TX USGS gage	Trinity River + Long King Ck	12566.9	36,100	75,700	96,500	129,300	176,300	245,800	315,500	416,000
Trinity River above Menard Creek	Trinity_River_abv_Menard_Ck	12628.0	36,100	69,100	85,900	107,800	137,000	184,600	244,400	337,600
Menard Creek near Rye, TX USGS gage	Menard_Ck_S010	148.1	2,300	6,300	10,000	15,600	20,800	27,900	34,700	44,400
Trinity River below Menard Creek	Trinity River + Menard Ck	12776.2	37,000	69,900	86,600	108,900	137,300	186,900	246,900	338,900
Trinity River at Romayor, TX USGS gage	Trinity_River_at_Romayor	12873.7	37,500	69,200	85,700	108,000	136,900	185,000	245,100	338,400
Trinity River near Moss Hill, TX	Trinity_River_nr_MossHill_TX	12945.7	36,800	67,200	84,200	105,900	136,400	184,700	244,700	337,600
Trinity River at Liberty, TX USGS gage	Trinity_River_at_Liberty	13176.5	33,000	66,000	84,100	106,300	136,500	185,200	245,500	338,600
Trinity River at Wallisville, TX USGS gage	Trinity Bay	13618.4	32,300	61,800	80,900	104,800	135,000	185,700	246,400	339,700

2 References and Resources

2.1 REFERENCES

Minshall

Nelson, Thomas L. (1979). Synthetic Unit Hydrograph Relationships Trinity River Tributaries, Fort Worth-Dallas Urban Area.

NOAA, Hydrometeorological Design Studies Center, Precipitation Frequency Data Server (PFDS).
<https://hdsc.nws.noaa.gov/hdsc/pfds/> Accessed Oct 2018.

NOAA. (2018). *NOAA Atlas 14 Precipitation Frequency Atlas of the United States: Volume 11 Version 2.0: Texas*.

Rodman, Paul K. (1977). Effects of Urbanization on Various Frequency Peak Discharges.

Snyder

U.S. Army Corps of Engineers. (2015). Corps Water Management System (CWMS) Final Report for the Trinity River Watershed.

U.S. Army Corps of Engineers. (1991). ER 1110-8-2(FR). Inflow Design Floods for Dams and Reservoirs.

U.S. Army Corps of Engineers. (1989). SWFHYD “NUDALLAS” Documentation.

2.2 SOFTWARE

Environmental Systems Research Institute, Inc., ArcGIS 10.5. (2016). Retrieved from <http://www.esri.com/>.

University of Colorado Boulder, Center of Advanced Decision Support for Water and Environmental System, Riverware 7.1. (2017). Retrieved from <http://www.riverware.org>.

U.S. Army Corps of Engineers, Corps Water Management System, CWMS 2.1. (2012). Retrieved from <http://www.hec.usace.army.mil>.

U.S. Army Corps of Engineers, Hydrologic Engineering Center Data Storage System Visual Utility Engine, HEC-DSSVue 2.0.1. (2009). Retrieved from <http://www.hec.usace.army.mil>.

U.S. Army Corps of Engineers, Hydrologic Engineering Center Geospatial Hydrologic Modeling Extension, HEC-GeoHMS 10.2. (2014). Retrieved from <http://www.hec.usace.army.mil>.

U.S. Army Corps of Engineers, Hydrologic Engineering Center Hydrologic Modeling System, HEC-HMS 4.2.1. (2017). Retrieved from <http://www.hec.usace.army.mil>.

U.S. Army Corps of Engineers, Hydrologic Engineering Center Meteorological Visualization Utility Engine, HEC-MetVue 3.0. (2019). Retrieved from <http://www.hec.usace.army.mil>.

U.S. Army Corps of Engineers, Hydrologic Engineering Center River Analysis System, HEC-RAS 5.0.7. (2017). Retrieved from <http://www.hec.usace.army.mil>.

U.S. Army Corps of Engineers, Risk Management Center Reservoir Frequency Analysis, RMC-RFA 1.0.0. (2017). Obtained from RMC.

U.S. Army Corps of Engineers, Statistical Software Package, HEC-SSP 2.1.1. (2017). Retrieved from <http://www.hec.usace.army.mil>.

2.3 DATA SOURCES, GUIDANCE & PROCEDURES

Environmental Systems Research Institute, Inc. (ESRI). United States National Boundary, County Boundaries, Street Centerlines.

Available from: <http://www.esri.com/software/arcgis/arcgisonline/services/map-services>

Environmental Systems Research Institute, Inc. (ESRI),

http://www.esri.com/software/arcgis/arcgisonline/map_services.html

ESRI Streetmap2D Image Service - ESRI basemap data, DeLorme basemap layers, Automotive Navigation Data (AND) road data, U.S. Geological Survey (USGS) elevation data, UNEP-WCMC parks and protected areas for the world, Tele Atlas Dynamap® and Multinet® street data for North America and Europe and First American (CoreLogic) parcel data for the United States.

ESRI World Imagery Service - Imagery from NASA, icubed, U.S. Geological Survey (USGS), U.S. Department of Agriculture Farm Services Agency (USDA FSA), GeoEye, and Aerials Express.

ESRI. ArcGIS software. Application reference available from: <http://www.esri.com/>

Federal Emergency Management Agency (FEMA). Publication 64, "Federal Guidelines for Dam Safety, Emergency Action Planning for Dam Owners," Federal Emergency Management Agency (FEMA) U.S. Department of Homeland Security (DHS), Washington, D.C., 2004.

Available from: <http://www.fema.gov/library/viewRecord.do?id=1672>

Gesch, D., Oimoen, M., Greenlee, S., Nelson, C., Steuck, M., and Tyler, D. "The National Elevation Dataset: Photogrammetric Engineering and Remote Sensing," v. 68, no. 1, p. 5-11, 2002.

USACE. Engineering and Construction Bulletin 2008-10, CECW-CE, March 24, 2008.

USACE. Guideline RD-13, "Flood Emergency Plans – Guidelines for Corps Dams," USACE Hydrologic Engineering Center, Davis, CA, June 1980.

Available from: http://www.hec.usace.army.mil/publications/pub_download.html

USACE, HEC. "HEC-GeoRAS User's Manual," Davis, CA, September 2005.

USACE, HEC. "HEC-HMS Hydrologic Modeling System User's Manual," USACE, Davis, CA, November 2006.

USACE, HEC. "HEC-RAS River Analysis System, Hydraulic Reference Manual," Davis, CA, November 2002.

USACE, HEC. "HEC-RAS River Analysis System User's Manual," Davis, CA, November 2006.

U.S. Department of Agriculture, Farm Service Agency. National Agriculture Imagery Program Images.
Available from: <http://www.fsa.usda.gov/FSA/apfoapp?area=home&subject=prog&topic=nai>

U.S. Geological Survey (USGS). National Elevation Dataset. Available from: <http://ned.usgs.gov/>

U.S. Geological Survey (USGS). National Hydrography Dataset. Available from: <http://nhd.usgs.gov/data.html>

3 Terms of Reference

AEP	Annual Exceedance Probability
BLE	Base Level Engineering
cfs	cubic feet per second
CWMS	Corps Water Management System
DEM	Digital Elevation Model
DSMMX	Dam Safety Modification Mandatory Center of Expertise
EM	Engineering Manual
FEMA	Federal Emergency Management Agency
GeoHMS	Geospatial Hydrologic Model System extension
HEC	Hydrologic Engineering Center
HMS	Hydrologic Modeling System
InFRM	Interagency Flood Risk Management
LiDAR	Light Detection and Ranging
NA14	NOAA Atlas 14
NED	National Elevation Dataset
NEXRAD	Next-Generation Radar
NFIP	National Flood Insurance Program
NLCD	National Landcover Database
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
PFDS	Precipitation Frequency Data Server
RAS	River Analysis System
RMC	Risk Management Center
sq mi	square miles
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WGRFC	West Gulf River Forecasting Center