Identify, Interpret, Integrate

San Marcos HUC-8 Subshed, TX
Base Level Engineering (BLE) Results

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Executive Summary

FEMA Region VI contracted Compass to complete a Base Level Engineering (BLE) analysis for the Guadalupe Blanco Watershed in South Central Texas, to support FEMA's Discovery process and validation of effective Zone A Special Flood Hazard Area (SFHA). The BLE process involves using best available data and incorporating automated techniques with traditional model development procedures to produce regulatory quality flood hazard boundaries for the 1-percent annual chance event as well as estimates of flood hazard boundaries for multiple recurrence intervals.

The source digital terrain data used for surface model development in support of hydrologic and hydraulic (H&H) analysis as well as mapping activities were made available through coordination with the Guadalupe-Blanco River Authority (GBRA), Federal Emergency Management Agency (FEMA), Texas Natural Resources Information System (TNRIS), Halff Associates Inc, and United States Geological Survey (USGS). The terrain data used for this project area is the 3ft DEM from LiDAR.

Flood discharges for this study were calculated using USGS regression equations with a multiplier to calibrate to gage analysis. Regression Equations obtained from the Scientific Investigations Report (SIR) 2009-5087, Regression Equations for Estimation of Annual Peak-Streamflow Frequency for Undeveloped Watersheds in Texas Using an L-moment-Based, PRESS-Minimized, Residual-Adjusted Approach (2009) were used while PeakFQ version 7.1 was used to perform Flood Frequency Analysis (FFA). There is a concurrent Physical Map Revision (PMR) study covering portions of the BLE study area in the San Marcos Watershed. The discharges used in this study were prioritized over the adjusted regression discharges and also used in the BLE study.

The Hydrologic Engineering Center's River Analysis System (HEC-RAS) program version 4.1 was used to compute water surface elevations on a stream by stream basis. All hydraulic models were computed using 1-D steady state analysis.

The stream mile network that was validated for San Marcos Watershed was compiled using FEMA's Coordinated Needs Management Strategy (CNMS) inventory in conjunction with the National Hydrography Dataset (NHD) 24K High Resolution. Table ES-1 lists the stream miles identified by each source for this BLE validation analysis.

Table ES-1. Summary of Stream Miles

Source	San Marcos Stream Miles
CNMS	1012.0
NHD	582.9
Total	**1594.9**

The full CNMS inventory of Zone A studies (1,012 miles) in the San Marcos Watershed were evaluated. Within those miles, 1.4 miles were previously classified as VALID. Based on the validation assessment, CNMS has been updated to reflect 1,187.1 miles of and 122.8 miles of VALID. The valid miles reported below exclude the 1.4 miles which were previously valid.

Total miles validated in CNMS are summarized in Table ES-2 and illustrated in Figure ES-1 below.

Table ES-2: Zone A Validation Results

Validation Status	Status Type	Total Miles
VALID	NVUE COMPLIANT	134.6
UNVERIFIED	TO BE STUDIED	876.0

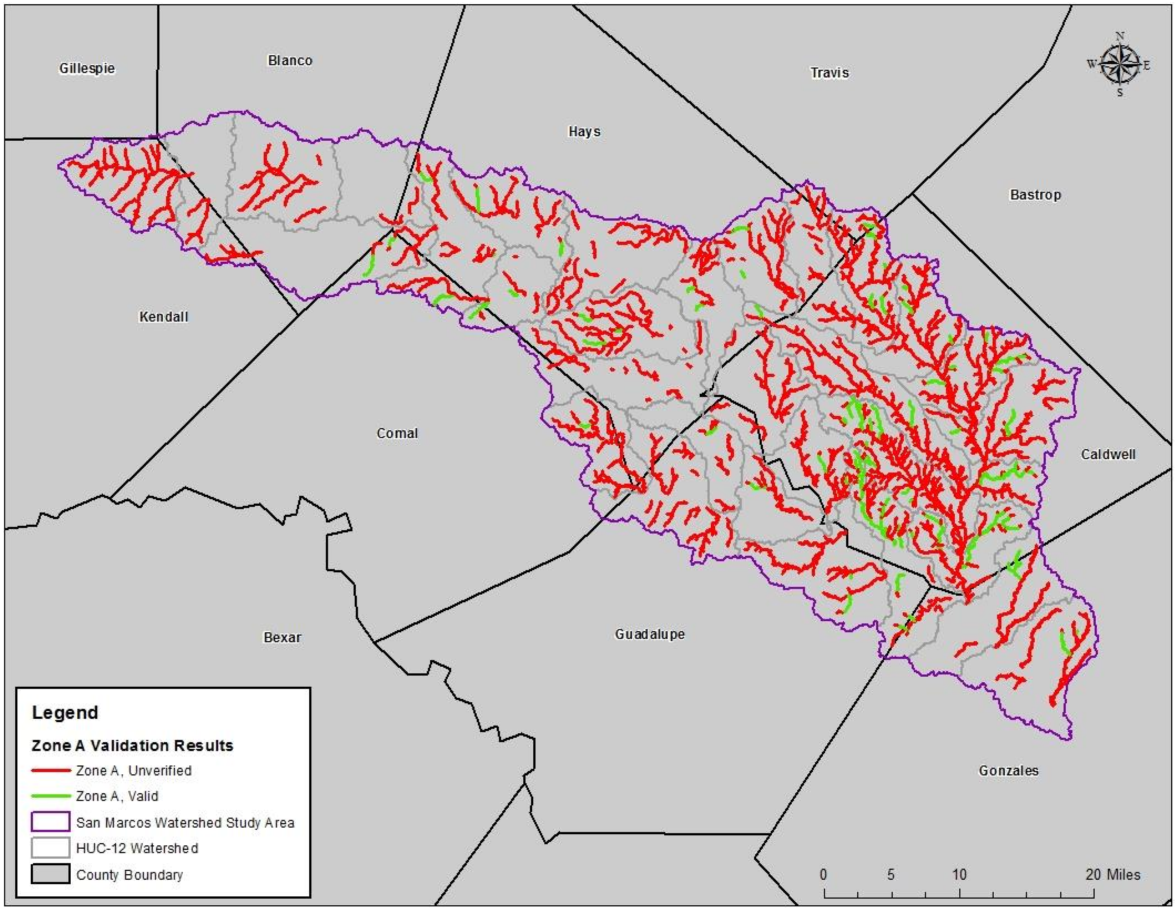

Figure ES-1. San Marcos HUC-8 Subshed CNMS Validation Results

Of the 134.6 validated miles, 25.7 miles are part of the concurrent PMR study. The validation performed for this project is focused on the BLE studies. Under FEMA Case Number 16-06-1113S, the PMR studies will validate additional miles in the vicinity of San Marcos. Please see the report for that project for more details.

An overall risk for each HUC-12 watershed was calculated using the National Flood Risk Percentages Dataset and its proportional area. The weighted risk was multiplied by the percentage of points in the watershed that failed the CNMS comparison to effective to determine the priority score. Figure ES-2 below shows the range of the San Marcos HUC-8 priority scores which can be used to initiate discussions during the Discovery phase. South Fork Blanco River-Blanco River HUC-12 was determined to have the highest priority score and the most need while Mule Creek-San Marcos River HUC-12 has the lowest score.

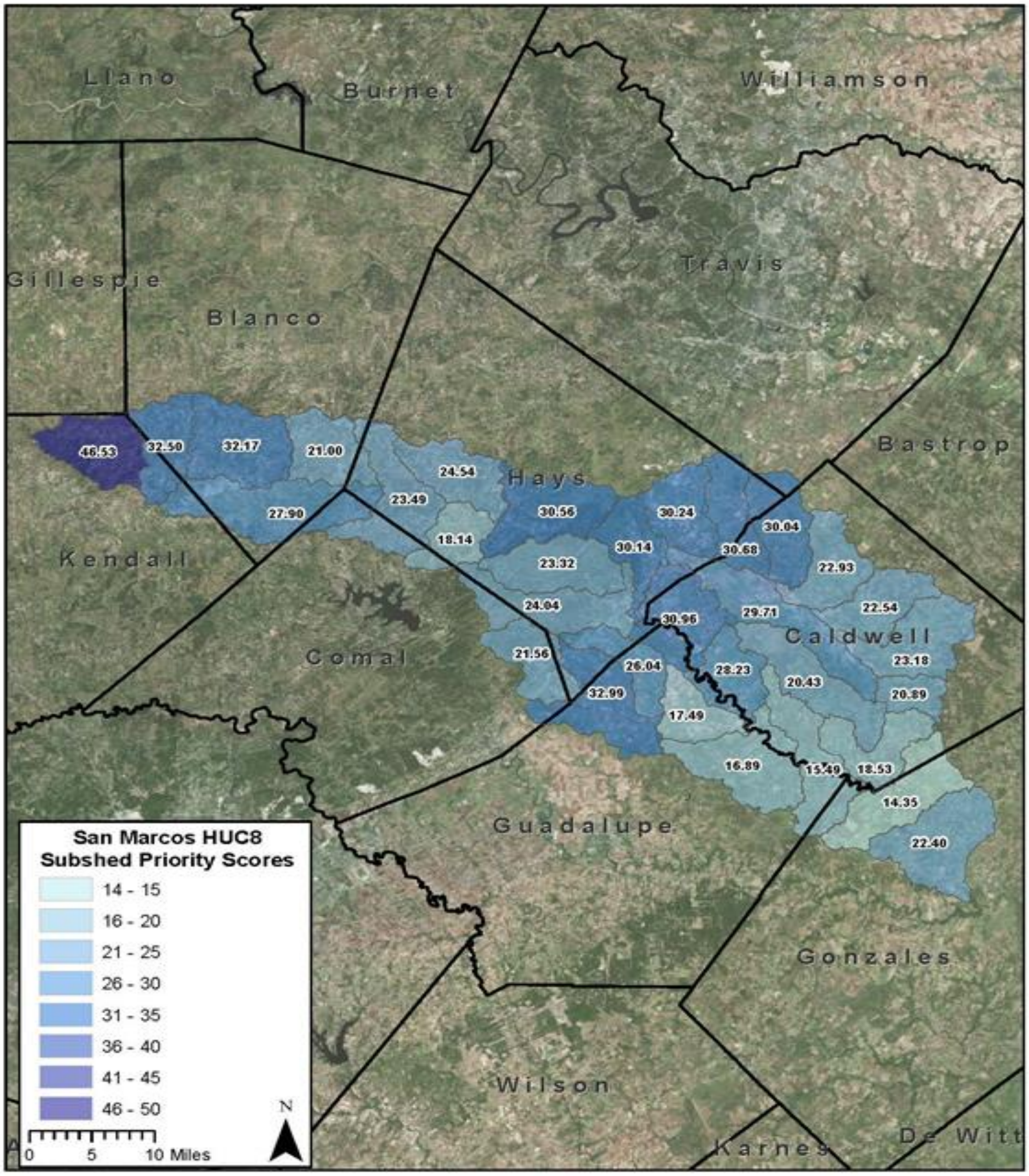

Figure ES-2. Ranking of San Marcos HUC-8 Subshed

Base Level Engineering (BLE) Methodology

Recent innovations and efficiencies in floodplain mapping have allowed the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) to develop a process called Base Level Engineering (BLE), which can be used to address current program challenges, including the validation of Zone A studies and the availability of flood risk data in the early stages of a Flood Risk Project. The BLE process involves using best available data and incorporating automated techniques with traditional model development procedures to produce regulatory quality flood hazard boundaries for the 1-percent annual chance event as well as estimates of flood hazard boundaries for multiple recurrence intervals. The cost for developing the data and estimates resulting from the BLE process are lower than standard flood production costs. The BLE results may be used for eventual production of regulatory and non-regulatory products.

As described in Title 42 of the Code of Federal Regulations, Chapter III, Section 4101(e), once every five years, FEMA must evaluate whether the information on Flood Insurance Rate Maps (FIRMs) reflects the current risks in floodprone areas. FEMA makes this determination of flood hazard data validity by examining flood study attributes and change characteristics, as specified in the Validation Checklist of the Coordinated Needs Management Strategy (CNMS) Technical Reference. The CNMS Validation Checklist provides a series of critical and secondary checks to determine the validity of flood hazard areas studied by detailed methods (e.g., Zone AE, AH, or AO). While the critical and secondary elements in CNMS provide a comprehensive method of evaluating the validity of Zone AE studies, a cost-effective approach for evaluating Zone A studies has been lacking.

In addition to the need for Zone A validation guidance, FEMA standards require flood risk data to be provided in the early stages of a Flood Risk Project. FEMA Program Standard SID #29 requires that during Discovery, data must be identified that illustrates potential changes in flood elevation and mapping that may result from the proposed project scope. If available data does not clearly illustrate the likely changes, an analysis is required that estimates the likely changes. This data and any associated analyses should be shared and results should be discussed with stakeholders.

An important goal of the BLE process is the scalability of the results. Scalability means that the results of a BLE analysis can not only be used for CNMS evaluations of Zone A studies, but can also be leveraged throughout the Risk MAP program. The data resulting from a BLE analysis can be updated as needed and used for the eventual production of regulatory and non-regulatory products, outreach and risk communication, and MT-1 processing. Leveraging this data outside the Risk MAP program may also be valuable to external stakeholders.

FEMA Region VI contracted Compass to complete a BLE analysis for the Guadalupe-Blanco Watershed in South Central Texas, to support FEMA's Discovery process and validation of effective Zone A Special Flood Hazard Area (SFHA). The study extents include portions of Bandera, Bastrop, Blanco, Caldwell, Comal, DeWitt, Fayette, Gillespie, Goliad, Gonzales, Guadalupe, Hays, Karnes, Kendall, Kerr, Travis, Victoria, and Wilson Counties and include the following communities: Cities of Blanco, Bulverde, Cuero, Garden Ridge, Gonzales, Ingram, Kerrville, Kyle, Lockhart, Luling, Martindale, Mountain City, Mustang Ridge, New Braunfels, Niederwald, Nixon, San Marcos, Schertz, Seguin, Smiley, Victoria, Waelder, Woodcreek and the Towns of Flatonia and Uhland. The study area consisted of four HUC-8 basins: Lower Guadalupe

River, San Marcos River, Middle Guadalupe River, and Upper Guadalupe River. Figure 1 shows the orientation of the Guadalupe-Blanco River HUC-8 basins with respect to the counties.

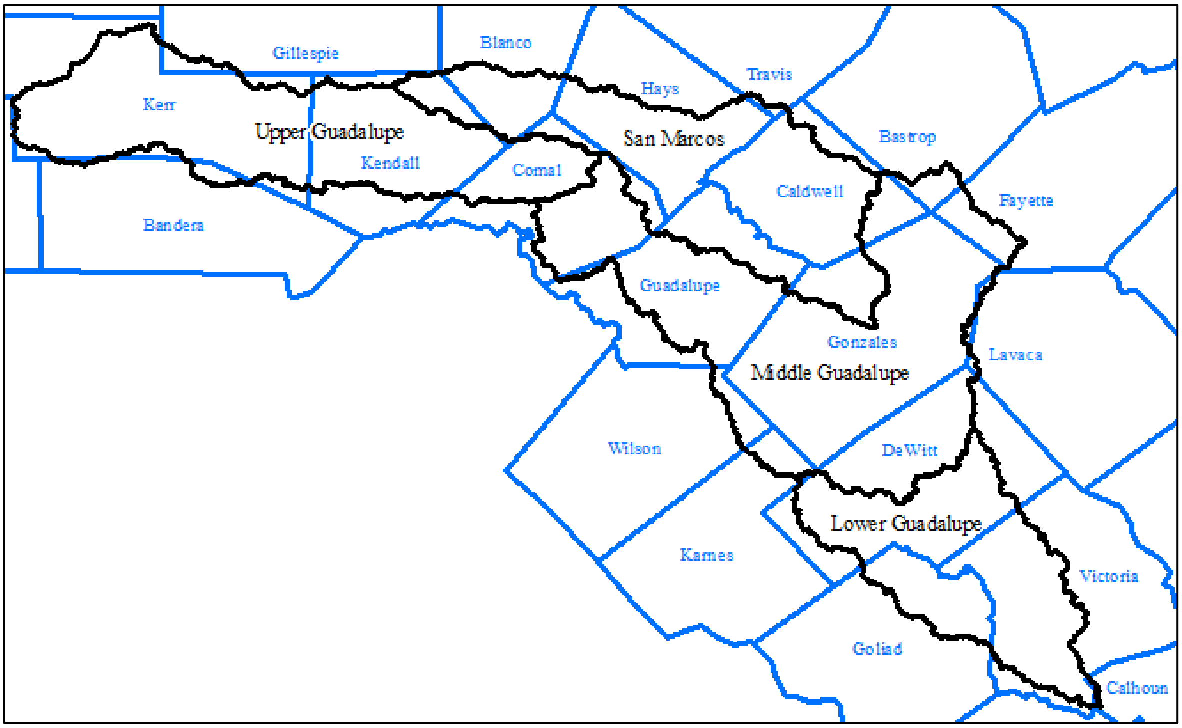

Figure 1. Guadalupe-Blanco Watershed HUC-8 Basins

Compass studied approximately 1,595 miles of stream reaches within the San Marcos Watershed. The selection and extent of stream reaches studied was based upon the number of stream miles with minimum drainage area of one square mile. Study reaches were extended above this one square mile threshold as appropriate to ensure all effective Zone A floodplain received an updated analysis. The following sections will summarize the BLE process and will discuss the results along with their recommended use.

1.1 Topographic Data

The primary topographic datasets were made available through coordination with the Guadalupe-Blanco River Authority (GBRA), Federal Emergency Management Agency (FEMA), Texas Natural Resources Information System (TNRIS), Halff Associates Inc, and United States Geological Survey (USGS). The four sets used for this project area were the 3ft DEM from LiDAR, DeWitt County 2016 LiDAR, TNRIS 2013 LiDAR, and (USGS) NED DEM. Figure 2 shows the extents of these terrain sources.

The 3ft DEM from LiDAR, was created by Halff Associates Inc. using existing topographic and elevation data (previously flown and processed). The result of this effort consisted of a basin wide terrain dataset. Multiple sources of data were utilized including, but not limited to data from U.S. Army Corps of Engineers (USACE), FEMA, Capital Area Council of Governments (CAPCOG), TNRIS, United States Geological Survey (USGS), and the City of Austin (COA).

The 3ft DEM from LiDAR was used as the main data source as it covered the entire San Marcos HUC. No other data sets were needed for this project area.

Source topographic data leveraged in the San Marcos BLE were LiDAR with orthometric heights (NAVD88) calculated from Geoid 03. Since the original LiDAR were collected, the National Geodetic Survey has updated the geoid model through several iterations. Newly collected structure survey, whose orthometric heights (NAVD88) were calculated from Geoid 12A, indicated a slight variation when compared to the Geoid 03-based LiDAR heights in the same location. In an effort to homogenize survey and source elevation data, a conversion from geoid 12A to 03 was completed using Trimble software and validated my manually assessing geoid heights through the National Geodetic Survey's geoid height computational tools. In the absence of Trimble software, the average difference can be assessed by comparing geoid heights of known locations using geoid 12A and 03 NGS computation tools https://www.ngs.noaa.gov/cgi-bin/GEOID_STUFF/geoid12A_prompt1.prl and https://www.ngs.noaa.gov/cgi-bin/GEOID_STUFF/geoid03_prompt1.prl, respectively.

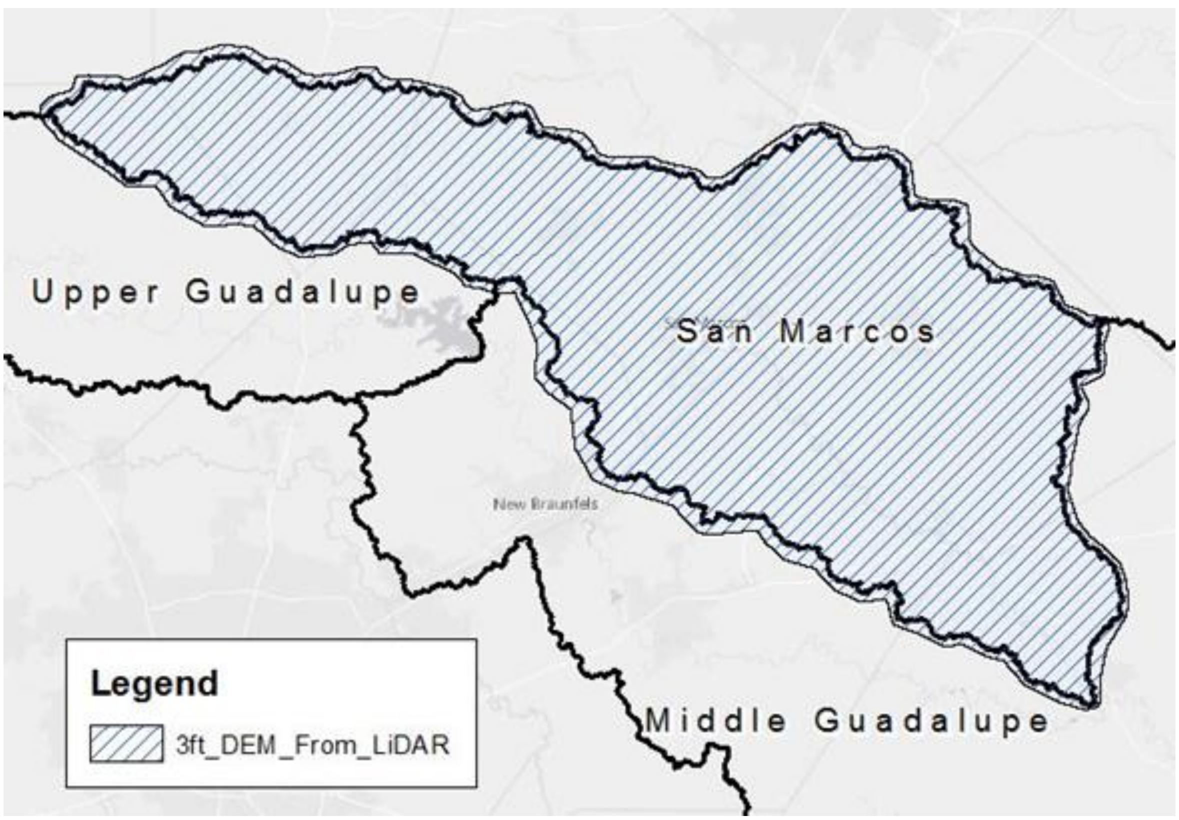

Figure 2. Extent of LiDAR Data

1.1.1 Leveraged Data Descriptions

1.1.1.1 3ft DEM from LiDAR

The 3ft DEM from LiDAR terrain data set utilizes the best available topographic information. Halff Associates Inc. compiled LiDAR data from previous studies and sources within the GBRA study area. Where there was overlapping LiDAR data, the LiDAR with the highest quality was used and USGS data was used in areas with no available LiDAR data. It was assumed that the LiDAR datasets obtained from the different sources had been previously evaluated for quality control by the contractor that collected the data. Any issues discovered after the LiDAR data was compiled in to a terrain dataset were reported to the respective source and addressed appropriately. Table 1 shows the multiple LiDAR sources that make up the 3ft DEM.

Table 1. LiDAR Sources for 3ft DEM

County	Age	Accuracy	Source & Contact	Approximate Footprint (sq mi)
Bastrop	2008	0.70m	CAPCOG	65
Caldwell	2007	1.40m	CAPCOG	750
	2008	0.70m	CAPCOG	150
Comal	2011	0.61m	FEMA	600
Dewitt		DEM	TNRIS	350
	2012	0.51m	USACE	50
Fayette	2008	0.70m	CAPCOG	120
Guadalupe	2008	1.40m	CAPCOG	10
	2007	1.40m	CAPCOG	90
	2011	0.61m	FEMA	600
Gonzales	2009	1.00m	TNRIS	1200
Hays	2008	0.70m	CAPCOG	750
	2003	1.70m	COA	130
	2011	0.61m	FEMA	25
Victoria	2006	1.40m	FEMA	650

The resulting dataset was a seamless 3ft DEM covering Lower Guadalupe, Middle Guadalupe, San Marcos and a small portion of the Upper Guadalupe HUCs. The portion of the 3ft DEM covering San Marcos was then extracted out for use in this project.

1.1.2 Data Processing

The Watershed Information System (WISE) software platform was utilized in order to create a digital surface model for the San Marcos HUC project area. This module allows source data from a variety of sources to be prioritized based on level of accuracy or preference of the user. For the San Marcos HUC, the 3ft DEM from LiDAR dataset was used as the primary data source for TIN surface creation. No other datasets were needed.

The TIN was developed using the 3ft DEM from LiDAR data to create a seamless surface. A DEM was sampled from the TIN based on the user defined grid resolution of minor cells (in this case a 3-foot DEM was sampled). Visual inspection of the 3-foot DEM was performed to ensure no voids and/or artifacts were present in the TIN. The TIN surface model was affirmed to be suitable for the creation of the 10ft and 50ft DEMs.

After TIN creation, a 10ft DEM was sampled for hydraulic takeoffs and supporting other hydraulic analyses. Lastly, a 50-foot DEM was sampled from the TIN for hydro enforcement of the project area. Proprietary software was used to identify natural sinks, peaks and flat areas in the 50-foot DEM surface. Elevations of the cells in the DEM were algorithmically calculated and the best path to route flow was determined without filling sinks in the DEM. Once all calculations were completed, the flow was checked confirming that all drainage flowed downstream correctly and routed to outside of the project area.

A new composite surface of the combined source topographic datasets, a seamless Triangular Irregular Network (TIN), was constructed using the WISE (Watershed Information System) Terrain Analyst tools. The TNRIS DEM data were used as the primary data source for the TIN while the 10-meter DEM was the secondary data source where TNRIS data did not exist for adequate buffer of the project area. A 10-foot DEM was sampled from the composite TIN and was used as the primary source for cross section takeoffs supporting hydraulic analyses. This 10-foot DEM was also used for visual QC and to support floodplain mapping tasks. A 50-foot DEM was sampled from the TIN for hydro enforcement to support hydrology tasks including flow vector and basin delineation.

Root Mean Square Error (RMSE) was calculated on the leveraged LiDAR-derivative DEM data used in this BLE analysis. The vertical accuracy of the source DEMs was calculated using QC checkpoints for the entire Chambers/Chambers project area from original LiDAR QC reports acquired with the TNRIS data. The entire project area tested at 3.77 centimeters (cm) RMSEz, well within the 12.5 cm FEMA requirement for leveraged topographic data.

In addition to the quantitative assessment of the source digital terrain, a qualitative visual inspection of the composite DEM was performed using a hillshade derived from the 10-foot DEM. The visual inspection indicated no unusual or non-terrestrial features were observed in the composite DEM assuring the surface files used for H&H and floodplain mapping activities are sufficient for BLE analysis.

1.2 Hydrology

Flood discharges for this study were calculated using USGS regression equations with multipliers to calibrate to gage analysis. USGS Scientific Investigations Report (SIR) 2009-5087, "Regression Equations for Estimation of Annual Peak-Streamflow Frequency for Undeveloped Watersheds in Texas Using an L-moment-Based, PRESS-Minimized, Residual-Adjusted Approach" (2009) contains the most recent regression equations for Texas and was used as the basis for regression calculations.

The WISE computer program was used to delineate drainage basins in shapefile format using the 50-foot resolution DEM. WISE was used to calculate the main-channel slope for each basin. The basin shapefile attribution was automated by WISE with drainage area and main-channel slope.

In order to perform the regression analysis and attribute each basin with appropriate discharge values, a script was written in Python and run in ESRI's ArcCatalog. This script required input of drainage area and main-channel slope (from WISE), as well as mean annual precipitation, OmegaEM and the calibration adjustment discussed below.

Regression equations were reviewed by comparing the results to updated flood frequency analyses for USGS stream gages in the Guadalupe-Blanco basin, as well as available USACE watershed modeling that was completed as of the time of this study. The completed USACE watershed modeling includes results for the San Marcos River basin from its headwater to its confluence with Plum Creek. These results are presented in a Technical Memorandum, dated March 30, 2016, from the USACE Fort Worth District to FEMA Region VI and titled "Preliminary Flow Frequency Analyses for the San Marcos River Basin".

The 19 gages used for comparison include 3 discontinued gages, Rebecca Creek near Spring Branch (08167600), San Marco River at Ottine (08173500), and Coleto Creek near Schroeder (08177000); the flood frequency estimates for these 3 gages were taken from USGS WRIR 96-4307, "Regional Equations for Estimation of Peak Streamflow Frequency for Natural Basins in Texas". The flood frequency estimates for most of the 16 active gages were updated using data through the 2015 water year, which ended in September 2015. The frequency analyses for 2 gages on the Blanco River, however, were updated using the peak flows recorded during the October 2015 flood, under the assumption that this flood will turn out to be annual maximum peak for the 2016 water year. The updated gage flood frequency analyses for 11 of 16 active gage locations were performed using the USGS PeakFQ software, following Bulletin 17B guidelines. Updated flood frequency analyses for 5 gages, however, were provided by the USACE. Flood frequency analyses for 3 gages in the San Marcos River basin were provided by the USACE in the previously referenced March 30, 2016 Technical Memorandum and flood frequency analyses for 2 gages on the Blanco River were provided in a Technical Memorandum, dated September 25, 2015 "Flow Frequency Analyses for the Blanco River at Wimberley and Kyle, Texas in Response to the May 2015 Flood Event".

The USGS regression equations exhibited a bias toward under-prediction when compared to the 19 USGS stream gages in the Guadalupe-Blanco River basin. As a result of this bias, use of the regression equations to develop the hydrology for the Guadalupe-Blanco BLE study resulted in discharges that were consistently less than the gage estimates for comparable drainage area streams. Regression multipliers were developed for each recurrence interval.

In order to develop a suitable adjustment or calibration to the discharge estimates at the 19 Guadalupe-Blanco River basin stream gages, the drainage area and discharge estimates were transformed to log10 units. The original SIR 2009-5087 regression analysis was performed in log10 space, which is standard practice in statistical hydrology because the log10-transform results in distributions of the variables that more closely resemble normal distributions and because the relations between peak discharge and the watershed characteristics are more linear in log10 space. A plot of log10 of drainage area versus the log10 of the 100-year recurrence interval peak discharges with linear best-fit lines for both the gage peak discharges and the regression peak discharges confirms the under-prediction bias of the regression estimates and indicates that the slopes of the best-fit line for the regression and the gage discharge estimates are similar (though not the same). This similarity in slope indicates that the under-prediction bias is relatively consistent across the range of observed drainage areas and therefore a simple multiplier adjustment would serve to correct the regression equation estimates and reduce the bias toward under-prediction.

The adjustment factor is computed by taking the average of the differences between log10 of the gage discharge estimates and the regression discharge estimates for each of the 19 stream gages. This average difference is added to the log10 of the regression discharge estimate, or equivalently, the average difference is converted back to arithmetic space and used as a simple multiplier adjustment factor on the computed regression discharge. The average difference between the gage and regression discharge estimates for the 100-year recurrence interval was 0.1942 log10 units, which translates to a multiplier of 1.564. Similar analyses were performed for the 10-, 25-, 50-, and 500-year recurrence interval regression equations with similar results.

It is important to note that the adjustment for each recurrence interval is less than the residual standard error reported for each recurrence interval in USGS SIR 2009-5087.

Any modeling at a higher level of detail than the base level engineering should utilize a more detailed method to determine hydrology, including hydrologic modeling or more detailed, site-specific gage comparison and adjustment.

Table 2 shows the published equations, the 1-percent-plus and 1-percent-minus equations and regression multipliers that were used for this study. In these equations, Qi represents peak streamflow for i-recurrence interval (annual chance exceedance (a.c.e.)) in cubic feet per second, P represents mean annual precipitation in inches, S represents dimensionless main-channel slope, Ω represents the OmegaEM parameter, and A is cumulative drainage area in square miles.

Discharges for the 1-percent plus and 1-percent minus a.c.e. were calculated by applying the mean residual standard error for the $Q_{1\%}$ equation.

The mean annual precipitation values were determined based on shapefile coverage obtained from the Texas Water Development Board and available for download from the following location: http://www.twdb.texas.gov/mapping/gisdata/doc/Precipitation_Shapefile.zip

The annual precipitation values reflect data for the climatological period 1981-2010 as recorded by the Natural Resources Conservation Service (NRCS).

Main channel slope was calculated in WISE. An automated routine was used to determine the longest flowpath from the upstream of a reach to the outlet of the sub-basin of interest based on flowpaths developed from the 50-foot DEM. Once the length of the flowpath was delineated, elevations for the endpoints were determined based on the TIN developed from the LiDAR. The slope was calculated by dividing the fall by the reach distance and the result was reported in foot/foot.

Table 2. Summary of Regression Equations (SIR 2009-5087)

Recurrence Interval	Equation[1]	Regression Multiplier
$Q_{10\%}$	$P^{1.203}S^{0.403} \times 10^{[0.918\,\Omega +13.62-11.97A^\wedge(-0.0289)]}$	1.121
$Q_{4\%}$	$P^{1.140}S^{0.446} \times 10^{[0.945\,\Omega +11.79-9.819A^\wedge(-0.0374)]}$	1.321
$Q_{2\%}$	$P^{1.105}S^{0.476} \times 10^{[0.961\,\Omega +11.17-8.997A^\wedge(-0.0424)]}$	1.454
$Q_{1\%}$	$P^{1.071}S^{0.507} \times 10^{[0.969\,\Omega +10.82-8.448A^\wedge(-0.0467)]}$	1.564
$Q_{0.2\%}$	$P^{0.988}S^{0.569} \times 10^{[0.976\,\Omega +10.40-7.605A^\wedge(-0.0554)]}$	1.789
$Q_{1\%plus}$	$10^{(LOG(Q_{1\%})\,/\,LOG(10)+0.3)}$	*
$Q_{1\%minus}$	$10^{(LOG(Q_{1\%})\,/\,LOG(10)-0.3)}$	*

[1] Variables:

Q_i peak flow for i recurrence interval (a.c.e.), in cubic feet per second;
P, Mean Annual Precipitation in Inches;
S, Main-channel slope (dimensionless);
Ω, OmegaEM parameter;
A, Cumulative Drainage Area in square miles

From USGS SIR 2009-5087, the OmegaEM parameter is a generalized terrain and climate index that expresses relative differences in peak-streamflow potential. A shapefile was developed and populated with OmegaEM values based on Figure 2 in SIR 2009-5087. This shapefile was used, along with a python script in ArcCatalog, to determine OmegaEM values on a sub-basin basis. For sub-basins that are split, the dominant OmegaEM value for the sub-basin was used.

Drainage area for each sub-basin was determined based on automated basin delineations performed in WISE. Basin break points were set by the user with a sub-basin target of one square mile in size. This criterion was adjusted for streams with larger drainage areas in order to avoid excessive and unnecessary discharge breaks. Break points were also set just upstream of stream confluences. Cumulative drainage area was determined based on these automated delineations performed by WISE in combination with a stream connectivity routine that defined the stream reach segments with upstream and downstream neighbors.

As discussed in previously, a Python script in ArcCatalog was used to compute discharges for each sub-basin. The sub-basin shapefile was attributed with the computed discharges as part of the automated script. From the sub-watershed basin shapefile the discharges were incorporated into the HEC-RAS models using an automated routine in WISE. Discharges, as well as water surface elevation results, were associated with the hydraulic cross sections prior to generation of floodplain boundaries and grid mapping. Those results are available in GIS format as part of this BLE submittal package.

BLE analysis was compared with effective discharge data where available. At these locations, the general trend showed that the effective discharges match considerably well with the discharges computed for this study.

The adjusted regression equations described above were used to determine peak flood discharges for the previously unstudied reaches in the San Marcos River basin. In some tributary watersheds, however, there are recently completed or ongoing rainfall-runoff modeling studies that have been developed to support several ongoing studies, including a Physical Map Revision (PMR) study and a joint study by the Guadalupe-Blanco River Authority (GBRA) and the U.S. Army Corps of Engineers (USACE). For streams where reviewed and approved rainfall-runoff methods are available, the modeled peak flood discharges were adopted for use for the San Marcos BLE study. The streams for which rainfall-runoff modeled peak discharges were used include all or a portion of the following streams: Blanco River, Cottonwood Creek, Cypress Creek, Little Blanco River, Plum Creek, Purgatory Creek, San Marcos River, Sink Creek, Stream074, Stream075, Stream101, Stream115, Stream CC-1, Stream CC-IH35, Stream PC-1, Tenney Creek, and York Creek.

The plus and minus standard error for the 1-percent a.c.e. discharges computed using the rainfall-runoff methods were calculated by using the methods described in Appendix 9 of Bulletin 17B, as well as in USACE EM1110-2-1619 and ETL 1110-2-537.

1.3 Hydraulics

The hydraulic approach for BLE analysis for the San Marcos watershed consisted of using the terrain model described in section 1.1 in combination with hydrology input computed as described in section 1.2 to establish water surface elevations using 1-D steady state analysis. The Hydrologic Engineering Center's River Analysis System (HEC-RAS) program version 4.1 was chosen as the computer model to compute water surface elevations on a stream by stream basis. The WISE computer program was used to establish model stream orientation, initial hydraulic cross section layout and stationing, assign n-values to cross sections, and to develop all input files for the HEC-RAS program. ESRI's ArcMap program was used to review and refine cross section layout orientation.

First pass cross section layout was performed using an automated routine in WISE based on the drainage area at the cross section location. A first draft model was created based on this initial cross section layout and draft boundaries were developed. At this stage, a second pass inspection for cross section placement occurred. Significant refinement occurred during this step. To improve the hydraulic models, additional cross sections were added as needed to better define the BLE floodplain boundary. Cross sections were extended in locations where overtopping occurred. Orientation of cross sections was refined to improve on the perpendicular orientation to flow. Additional cross sections were added at floodplain constrictions and at downstream portions of tributaries to ensure a proper tie-in with receiving streams. Cross sections were adjusted to remove sections that intersected hydraulic crossings in the floodplain. For some of the largest studied streams, cross sections were laid out manually in order to have more reasonable spacing and better capture the constrictions in the floodplain.

Cross sections were not drawn on top of roadways or railroads. Cross sections were placed at the upstream and downstream face of major roads and railroads. Major roads are those designated in the Texas DOT road coverage as On System Highways. The road coverage can be acquired in shapefile format from the TNRIS website at the following link: https://tnris.org/data-catalog/entry/txdot-roadways/. Ineffective flow stations were placed in the hydraulic models as appropriate to account for flow constrictions at crossings as well as at locations deemed by the engineer to be ineffective at conveying flow downstream.

Cross sections were drawn on dam tops for significant dams with well defined spillways in order to better represent ponded water upstream of the structures. It was assumed in doing this that the vast majority of the flow during a flood event would pass the spillway and that the hydraulic model would reasonably estimate flow across the spillway as represented in the hydraulic cross section.

Significant effort was made to start all tributaries below the receiving water surface elevations but this was not always achieved, particularly in wide, flat floodplains where small tributaries ran parallel to large streams or where road crossings or dams interfered with cross section alignments.

The relationship between drainage area and assigned channel geometry is shown in Table 3. These default values for dimensions and spacing are subject to change based on the details noted above as well as the judgment of the responsible engineer. Channel widths were spot checked against aerial imagery and adjusted accordingly.

Table 3: Cross Section Default Parameters

Drainage area (upper limit)	XS Spacing	Channel Top Width	Channel Bottom Width	Channel Depth
1.0	500	4	2.5	0.5
2.0	500	6	3	1
4.0	500	8	5	1
8.0	500	13	9	1.5
10.0	500	15	10	1.5
15.0	600	20	14	2
20.0	600	25	17	2.5
25.0	600	28	20	2.5
30.0	600	30	21	2.5
40.0	600	30	21	2.5
50.0	600	35	26	2.5
75.0	750	38	30	2.5
100.0	750	40	30	3
150.0	1000	48	40	3
250.0	1000	50	43	3
500.0	1500	60	43	3
1000.0	2500	70	55	3.5
2000.0	4000	100	80	4
5000.0	4000	600	350	5
>5000.0	4000	2000	1990	5

Manning's roughness coefficients (n-values) were determined using the 2011 National Land Cover Data (NLCD) dataset in combination with n-values from Chow (1959) and Calenda, et al. (2005). The association between the n-values and the NLCD Classification is shown in Table 4. Manning's n-value takeoffs were performed by WISE and the n-values were adjusted in some locations based on engineering judgment. N-values within channel banks were limited by the automated routine to a range of 0.030 to 0.050.

Table 4: Manning's "n" Roughness Based on 2001 NLCD Classification (Moore, 2011)

NLCD Classification	Minimum	Normal	Maximum	Source
Open Water	.025	.03	.033	Chow 1959
Developed, Open Space	.01	.013	.016	Calenda, et al. 2005
Developed, Low Intensity	.038	.05	.063	Calenda, et al. 2005
Developed, Medium Intensity	.056	.075	.094	Calenda, et al. 2005
Developed, High Intensity	.075	.1	.125	Calenda, et al. 2005
Barren Land	.025	.03	.035	Chow 1959
Deciduous Forest	.1	.12	.16	Chow 1959
Evergreen Forest	.1	.12	.16	Chow 1959
Mixed Forest	.1	.12	.16	Chow 1959
Scrub/Shrub	.035	.05	.07	Chow 1959
Grassland/Herbaceous	.025	.03	.035	Chow 1959
Pasture/Hay	.03	.04	.05	Chow 1959
Cultivated Crops	.025	.035	.045	Chow 1959
Woody Wetlands	.08	.1	.12	Chow 1959
Emergent Herbaceous Wetland	.075	.1	.15	Chow 1959

The boundary condition used for the majority of the study streams was normal depth with a default value of 0.005 ft/ft. For streams with names in the National Flood Hazard Layer (NFHL) and streams with large drainage areas (generally greater than 8 square miles), the normal depth slope was calculated based on the HEC-RAS profile invert.

1.4 Quality Control

Following the initial BLE analysis in each watershed, the flood hazard area delineations created by the BLE process were reviewed for areas where the results were not ideal.

QC results indicated that some of the models should be extended to cover the scope of effective flood hazard data. Those streams were extended farther upstream to match the extents of the SFHA data.

Typical manual editing resulting from reasonability checks included adding cross-sections, adjusting orientation of cross sections, trimming cross sections and reduction of the default "V" angle of cross sections. It is estimated that 50 percent of cross-sections were adjusted in some work areas while other areas did not require as much editing. Other examples of manual editing included adding cross-sections at confluence areas, modification to improve perpendicular orientation at the channel, adjustment of discharge breaks to better represent flow addition points, revisions to dam spillways and dam tops, and revisions to n-values.

A major component of the QC process was an automated check that identified locations where the 1-percent a.c.e profile was crossed by another frequency or by the 1-percent plus or 1-percent minus profile. Significant effort was made to reasonably resolve all of these instances. Another automated check identified locations where there was a drawdown of greater than 0.5 feet on the 1-percent a.c.e. water surface profile. This check is particularly useful for identifying errors in the model such as a channel that is too wide, a poorly placed cross section, or a need for additional cross sections. Again, significant effort was made to reasonable resolve these drawdown situations.

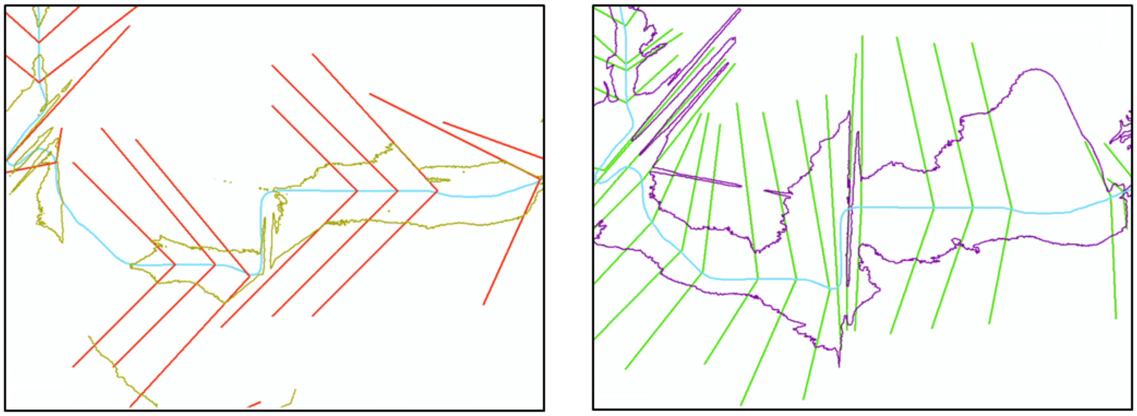

Figure 3: Default "V" angle cross-sections automated by WISE (left). Manually edited cross-sections to more accurately capture terrain (right). Resulting flood boundaries shown in gold (left) or purple (right) for clarity.

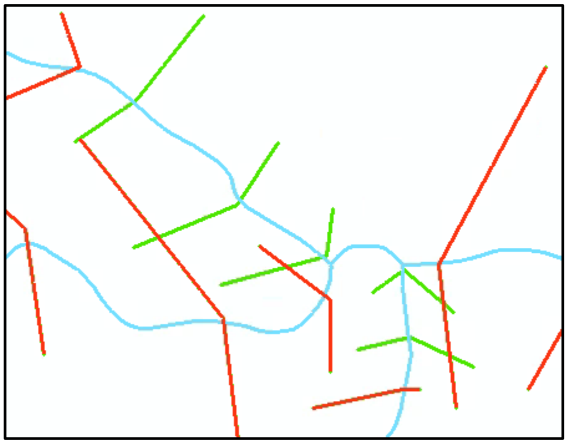

Figure 4: Manually added cross-sections (green) to improve accuracy of tie-ins at confluences.

1.5 One-percent Special Flood Hazard Area Delineation

The 1-percent and 0.2-percent boundaries were mapped using a routine that develops water surface elevation grids based on the 10-foot cell size DEM developed from the TNRIS LiDAR. This product was converted to a polygon for cleaning. The cleaning routine involved manual inspection of the polygons to identify and remove areas of disconnected flooding. In general, areas with a size of less than 5,000 square feet were removed and all others were investigated to determine whether they should be considered as potentially part of the special flood hazard area (SFHA). This investigation was aided by the ground DEM and aerial imagery. Manual adjustments to the polygons were made to account for spillways on dams which could not be accurately modeled using HEC-RAS as well as disconnected areas along the flooding source that should reasonably be connected.

Following the removal of disconnected flooding areas and other boundary adjustments, the small islands in the floodplain were filled. Islands with a size between roughly 5,000 and 30,000 square feet were inspected and, in general, islands that were less than 10,000 square feet were filled.

Once the island filling process was complete, the water surface raster mapping routine was run and set to conform to the polygon boundary. This ensures that the water surface raster and the flood plain boundary are consistent with each other. The depth raster product was created at the end of the process by performing a raster subtraction with the water surface elevation raster and the ground DEM.

Challenges

Challenges encountered during BLE analyses will vary based on available data on which to run the analysis. The San Marcos Watershed analysis presented challenges as summarized in the following paragraphs.

As noted in Section 1.2 above, regression equations under-predicted discharges compared to gage estimates. Regression multipliers were developed to calibrate each recurrence interval.

As noted in Section 1.4 above, multiple streamlines did not extend far enough to fully capture effective flood hazard data. The streamlines generated in the development of the one square mile basins were extended in order to more closely match the effective areas and CNMS streams.

There are a few locations where there are bypass or overflow channels. These areas can be difficult to model using BLE and 1D methodologies, but these areas are also included in the concurrent detailed PMR study. The discharges calculated for the PMR study were used in this study. Cross-sections were extended and re-oriented as needed in a manner to most reasonably model and map these areas.

Results and Recommendations

The BLE results for the San Marcos Watershed produced an SFHA that compares reasonably well with the effective SFHA in most cases, and provides an additional estimated SFHA in areas that do not currently have an SFHA mapped. These results provide context for flood risk communication as part of the Discovery process, and should be verified through community work map meetings before being applied to a regulatory product.

A map showing the BLE results are included as Appendix B.

3.1 Validation of Effective Zone A SFHA

From the full inventory of Zone A studies (1,012 miles) in the San Marcos Watershed, 1,010.6 miles were classified with a validation status of “UNKNOWN” and 1.4 miles were classified with a validation status of “VALID.” The following is a summary of the results of the CNMS validation assessment for the effective Zone A studies in the study area. Initial Assessment checks A1-A3 were evaluated for the CNMS inventory of Zone A studies.

INITIAL ASSESSMENT A1 – SIGNIFICANT TOPOGRAPHY UPDATE CHECK

This check involves determining whether a topographic data source is available that is significantly better than what was used for the effective Zone A modeling and mapping. For the San Marcos Watershed study area, the effective Zone A topographic data leveraged a variety of sources, but primarily based upon USGS 24K map products. The TNRIS 2007-2008 and 2011 LiDAR, 2011 FEMA LiDAR, and 2012 City of Austin LiDAR within the study area represent a significant improvement from the assumed effective Zone A topographic source, and therefore check A1 was set to fail for the full inventory of CNMS Zone A studies with the exception of one reach that is part of a Letter of Map Revision.

INITIAL ASSESSMENT A2 – CHECK FOR SIGNIFICANT HYDROLOGY CHANGES

This check involves first determining whether regression equations were used in the effective study. If they were then it was determined if new regression equations have become available from the USGS since the date of the effective Zone A study. If newer regression equations exist for the area of interest, then an engineer must determine whether these regression equations would significantly affect the 1-percent-annual-chance flow. Scientific Investigations Report 2009-5087 (SIR 2009-5087), Regression Equations for Estimation of Annual Peak-Streamflow Frequency for Undeveloped Watersheds in Texas Using an L-moment-Based, PRESS-Minimized, Residual-Adjusted Approach (2009) contains the most recent regression equations for Texas. Comal & Guadalupe Counties are the only effective studies that used regression equations. The equations published in 2009 would significantly affect the 1-percent-annual-chance flow. Therefore, the reaches inside Comal & Guadalupe County failed the A2 check. Because the hydrology methods used for all other effective Zone A studies are unknown or not regression equations, assessment check A2 was passed for these reaches.

INITIAL ASSESSMENT A3 – CHECK FOR SIGNIFICANT DEVELOPMENT

This check involves using the National Urban Change Indicator (NUCI) dataset to assess increased urbanization in the watershed of the Zone A study. If the percentage of urban area within the HUC-12 watershed containing the effective Zone A study is 15% or more, and has increased by 50% or more since the effective analysis, the study would fail this check. Although the NUCI data provide year-to-year changes in urbanization, the NLCD also is needed to establish a baseline of urban land cover for this analysis. Because none of the HUC12 watersheds within the San Marcos Watershed study area can be classified as urban, check A3 was set to pass for all studies.

Table 5: Zone A Initial Assessment Results

Assessment Check	Pass / Fail	Notes
A1 – Topography	Fail	Several LiDAR sources are available and significantly better than effective USGS topo source.
A2 – Hydrology	Pass/Fail	Effective Hydrology methods unknown with the exception of Comal & Guadalupe County reaches, which used older regression equations
A3- Development	Pass	No increase of 50% or more since effective study (non-urban watersheds)

VALIDATION CHECK A4 – CHECK OF STUDIES BACKED BY TECHNICAL DATA

Zone A studies that pass all initial assessment checks described above may be categorized as "Valid" in the CNMS Inventory only if the effective Zone A study is supported by modeling or sound engineering judgment and all regulatory products are in agreement. If the effective Zone A study passes all initial assessment checks, but is not supported by modeling, or if the original engineering method used is unsupported or undocumented, a comparison of the BLE results and effective Zone A's is performed. Due to lack of complete documentation of the original engineering methods for most of the effective Zone A studies in the San Marcos Watershed, check A4 has been marked as failing in CNMS for 979.4 of the miles included in the validation assessment. Only Comal, Gonzales, and Kendall Counties had defined methods in their effective studies and, therefore, those reaches were set to pass assessment check A4.

VALIDATION CHECK A5 – COMPARISON OF BLE AND EFFECTIVE ZONE A

The BLE /effective Zone A comparison method leverages the existing Floodplain Boundary Standard (FBS) certification procedures described in FEMA SID 113, but with a slight modification. This modified FBS comparison approach uses the 1-percent plus and 1-percent minus flood profiles and horizontal and vertical tolerances described in the First Order Approximation—Methodology, Validation, and Scalability Guidance Procedures (Version 1.5). For the comparison of BLE and effective Zone A in the Texas study area, the following vertical and horizontal tolerances were used to conduct the modified FBS procedure. One point was placed every 200 feet along the floodplain boundaries for comparison.

Vertical Tolerance: +/- 5 feet (one-half contour interval of assumed effective topographic source).
Horizontal Tolerance: +/-75 feet (standard horizontal tolerance for BLE comparison testing).

Of the 491 modeled BLE streams in the study area, 76 were found to correspond (within the tolerance limits) with effective Zone A flood zones. Comparison results for these streams were grouped at the HUC-12 level and are summarized in Table 7 below to better understand the general health of the HUC-12 watershed, but the validation check was performed at the stream level. Streams where the percentage of passing FBS sample points is greater than or equal to 85% are marked as "Pass", otherwise marked as "Fail".

VALIDATION RESULTS

Based on the validation assessments and BLE comparison results described above, the CNMS inventory of Zone A studies in the San Marcos Watershed study area has been updated, with 876.0 miles categorized as UNVERIFIED and 134.6 miles categorized as VALID. Total miles in each of these categories are summarized in Table 6 and illustrated in Figure 5 below.

Table 6: Zone A Validation Results

Validation Status	Status Type	Total Miles
VALID	NVUE COMPLIANT	134.6
UNVERIFIED	TO BE STUDIED	876.0

Table 7: BLE Comparison Results

HUC-12 Watershed		Total FBS points	Fail	Pass	%Pass	BLE Comparison Pass? (>85%)	Priority Score
Watershed Name	Watershed Number						
San Marcos	All Streams	20623	6148	14475	29.81%	Fail	n/a
Blanco River	121002030205	313	109	204	34.82%	Fail	30.14
Boardhouse Creek-Blanco River	121002030105	103	25	78	24.27%	Fail	21.00
Brushy Creek-Plum Creek	121002030402	502	178	324	35.46%	Fail	30.68
Brushy Creek-San Marcos River	121002030501	574	112	462	19.51%	Fail	16.89
Bunton Branch-Plum Creek	121002030401	744	260	484	34.95%	Fail	30.24
Callihan Creek-San Marcos River	121002030308	466	152	314	32.62%	Fail	28.23
Clear Fork Plum Creek	121002030407	1005	345	660	34.33%	Fail	29.71
Copperas Creek-Plum Creek	121002030408	319	77	242	24.14%	Fail	20.89
Crabapple Creek-Blanco River	121002030102	213	80	133	37.56%	Fail	32.50
Daniels Creek-Plum Creek	121002030406	672	180	492	26.79%	Fail	23.18

HUC-12 Watershed		Total FBS points	Fail	Pass	%Pass	BLE Comparison Pass? (>85%)	Priority Score
Dry Creek-Plum Creek	121002030404	819	217	602	26.50%	Fail	22.93
Elm Creek-Plum Creek	121002030403	1325	460	865	34.72%	Fail	30.04
Flat Creek-Blanco River	121002030103	702	261	441	37.18%	Fail	32.17
Little Blanco River	121002030104	397	128	269	32.24%	Fail	27.90
Lone Man Creek-Blanco River	121002030204	756	267	489	35.32%	Fail	30.56
Lone Woman Mountain-Cypress Creek	121002030202	670	190	480	28.36%	Fail	24.54
Lower York Creek	121002030307	282	57	225	20.21%	Fail	17.49
McNeil Creek-Plum Creek	121002030410	677	145	532	21.42%	Fail	18.53
Middle York Creek	121002030306	606	231	375	38.12%	Fail	32.99
Morrison Creek-San Marcos River	121002030304	531	190	341	35.78%	Fail	30.96
Mule Creek-San Marcos River	121002030503	404	67	337	16.58%	Fail	14.35
Pecan Branch-Plum Creek	121002030405	960	250	710	26.04%	Fail	22.54
Purgatory Creek-San Marcos River	121002030302	252	70	182	27.78%	Fail	24.04
Redwood Cemetery-Cottonwood Creek	121002030305	206	62	144	30.10%	Fail	26.04
Seals Creek-San Marcos River	121002030502	1056	189	867	17.90%	Fail	15.49
Sink Creek	121002030301	898	242	656	26.95%	Fail	23.32
Smith Creek-San Marcos River	121002030504	765	198	567	25.88%	Fail	22.4
South Fork Blanco River-Blanco River	121002030101	1127	606	521	53.77%	Fail	46.53

HUC-12 Watershed		Total FBS points	Fail	Pass	%Pass	BLE Comparison Pass? (>85%)	Priority Score
Upper York Creek	121002030303	586	146	440	24.91%	Fail	21.56
Wanslow Creek-Blanco River	121002030201	652	177	475	27.15%	Fail	23.49
West Fork Plum Creek-Plum Creek	121002030409	1855	438	1417	23.61%	Fail	20.43
Wilson Creek-Blanco River	121002030203	186	39	147	20.97%	Fail	18.14

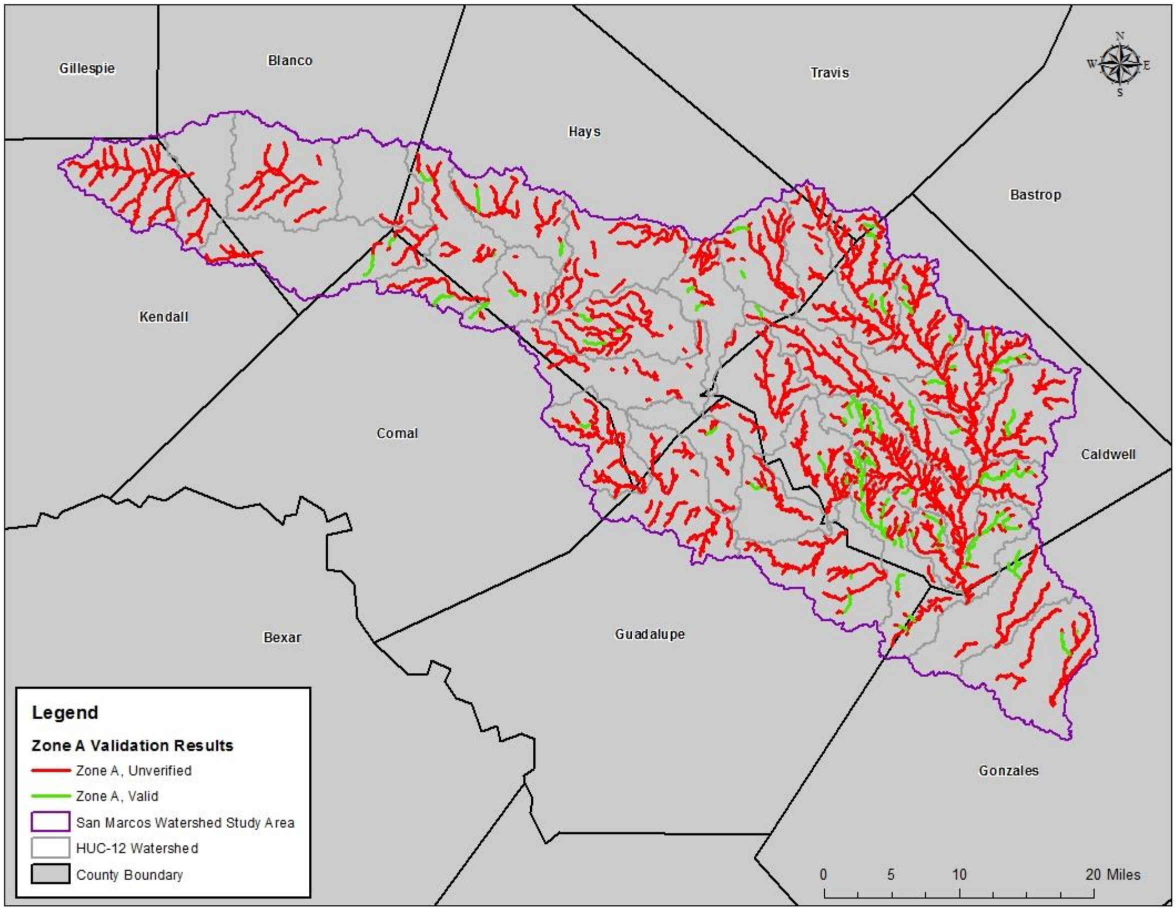

Figure 5. San Marcos Watershed CNMS Validation Results

Of the 122.8 validated miles, 25.7 miles are part of the concurrent PMR study. The validation performed for this project is focused on the BLE studies. Under FEMA Case Number 16-06-1113S, the PMR studies will validate additional miles in the vicinity of San Marcos. Please see the report for that project for more details.

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Appendix A Summary of Peak Qs

Table A-1. Summary of Hydrology

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Access Road Diversion	1.04	1,722	863	3,435
Access Road Diversion	1.63	2,405	1,205	4,799
Access Road Diversion	2.11	2,978	1,493	5,942
Access Road Diversion	2.82	3,584	1,796	7,151
Access Road Diversion	4.05	4,252	2,131	8,485
Access Road Diversion	4.70	4,807	2,409	9,591
ARTESIA CREEK	1.27	2,206	1,106	4,401
ARTESIA CREEK	2.04	3,217	1,612	6,418
ARTESIA CREEK	2.65	3,607	1,808	7,197
ARTESIA CREEK	5.60	6,276	3,145	12,522
ARTESIA CREEK	6.11	6,405	3,210	12,781
ARTESIA CREEK	7.00	6,949	3,483	13,864
ARTESIA CREEK	7.68	7,266	3,642	14,498
ARTESIA CREEK	8.40	7,671	3,844	15,305
ARTESIA CREEK	9.48	7,747	3,883	15,457
Big Creek	1.01	2,741	1,374	5,470
Big Creek	1.90	4,823	2,417	9,623
Big Creek	2.77	6,236	3,125	12,442
Big Creek	3.66	6,806	3,411	13,580
Big Creek	4.68	8,230	4,125	16,421
Big Creek	9.53	13,945	6,989	27,823
Big West Fork	0.28	487	244	973
Big West Fork	2.00	3,083	1,545	6,151
Big West Fork	2.38	3,513	1,760	7,009
Big West Fork	3.11	3,891	1,950	7,765
BLACKBERRY CREEK	0.75	2,158	1,082	4,306
BLACKBERRY CREEK	1.43	3,872	1,941	7,725
BLACKBERRY CREEK	2.09	4,527	2,269	9,032
BLACKBERRY CREEK	3.04	5,878	2,946	11,728
Blanco River	1.08	2,694	1,350	5,375
Blanco River	1.62	3,747	1,878	7,477
Blanco River	4.19	6,899	3,458	13,766
Blanco River	7.56	10,756	5,391	21,460
Blanco River	9.93	12,772	6,401	25,483
Blanco River	11.19	13,304	6,668	26,546

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Blanco River	12.64	14,683	7,359	29,297
Blanco River	14.64	15,933	7,985	31,790
Blanco River	19.72	19,130	9,588	38,169
Blanco River	26.82	24,269	12,163	48,424
Blanco River	28.37	25,260	12,660	50,401
Blanco River	33.15	26,799	13,431	53,471
Blanco River	35.07	27,755	13,910	55,378
Blanco River	42.77	33,149	16,614	66,140
Blanco River	53.36	36,799	18,443	73,424
Blanco River	67.69	43,419	21,761	86,633
Blanco River	78.71	48,351	24,233	96,472
Blanco River	79.98	49,010	24,563	97,787
Blanco River	82.67	50,086	25,103	99,935
Blanco River	87.28	51,960	26,042	103,673
Blanco River	95.41	53,819	26,973	107,383
Blanco River	103.92	56,637	28,386	113,006
Blanco River	108.30	56,368	28,251	112,469
Blanco River	109.65	56,786	28,461	113,304
Blanco River	110.55	57,124	28,630	113,978
Blanco River	110.79	56,828	28,482	113,387
Blanco River	114.36	57,940	29,039	115,605
Blanco River	116.10	58,580	29,360	116,883
Blanco River	123.37	60,757	30,451	121,227
Blanco River	133.96	61,534	30,840	122,776
Blanco River	139.13	62,816	31,483	125,335
Blanco River	143.71	64,194	32,173	128,083
Blanco River	146.78	64,981	32,568	129,654
Blanco River	151.36	64,738	32,446	129,169
Blanco River	155.04	65,171	32,663	130,032
Blanco River	158.59	65,122	32,639	129,936
Blanco River	163.21	65,684	32,920	131,056
Blanco River	169.13	106,900	69,300	183,000
Blanco River	238.41	141,300	90,300	246,000
Blanco River	238.93	141,100	90,200	246,000
Blanco River	261.58	144,800	92,300	253,000
Blanco River	272.55	146,100	93,200	255,000
Blanco River	274.36	145,200	92,600	254,000
Blanco River	300.39	148,700	94,600	261,000

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Blanco River	309.36	148,200	94,200	259,000
Blanco River	310.49	147,900	94,400	259,000
Blanco River	316.76	148,200	94,400	260,000
Blanco River	355.91	152,600	97,400	266,000
Blanco River	367.20	152,800	97,700	267,000
Blanco River	370.26	151,300	96,500	265,000
Blanco River	387.74	153,100	97,500	268,000
Blanco River	392.51	152,900	97,300	268,000
Blanco River	408.27	154,700	98,300	272,000
Blanco River	413.73	153,900	97,800	271,000
Blanco River	420.30	155,200	98,700	273,000
Blanco River	432.62	154,955	98,500	272,000
Blanco River	433.58	149,382	95,000	262,000
Blanco River	434.71	139,373	88,400	245,000
Blanco River	434.84	125,294	78,800	222,000
Blanco River	435.33	106,364	65,400	192,000
Boardhouse Creek	0.79	2,363	1,184	4,715
Boardhouse Creek	1.78	4,945	2,479	9,868
Boardhouse Creek	2.45	5,588	2,801	11,150
Boardhouse Creek	3.59	6,556	3,286	13,081
Boggy Creek	0.81	1,162	583	2,319
Boggy Creek	2.74	3,209	1,608	6,403
Boggy Creek	4.18	4,018	2,014	8,017
Boggy Creek	5.84	5,341	2,677	10,657
Brushy Branch	1.01	1,425	714	2,843
Brushy Branch	1.59	2,364	1,185	4,717
Brushy Branch	2.50	3,728	1,868	7,438
Brushy Creek	0.53	1,169	586	2,333
Brushy Creek	1.00	1,668	836	3,328
Brushy Creek	1.99	2,828	1,417	5,643
Brushy Creek	2.57	3,326	1,667	6,637
Brushy Creek	3.65	3,890	1,950	7,762
Brushy Creek	4.29	4,152	2,081	8,284
Brushy Creek	9.85	8,160	4,090	16,281
Brushy Creek	11.33	8,737	4,379	17,433
Brushy Creek	13.06	9,569	4,796	19,092
Brushy Creek	19.00	13,594	6,813	27,124
Brushy Creek	22.54	15,690	7,864	31,306

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Brushy Creek	25.29	15,385	7,711	30,697
Brushy Creek West	0.21	513	257	1,023
Brushy Creek West	0.58	1,153	578	2,301
Brushy Creek West	1.53	2,520	1,263	5,028
Brushy Creek West	2.38	3,693	1,851	7,369
Brushy Creek West	3.14	4,396	2,203	8,770
Brushy Creek West	4.74	6,233	3,124	12,437
Brushy Creek West	6.05	7,113	3,565	14,192
Brushy Creek West	6.67	7,355	3,686	14,675
Brushy Creek West	8.30	8,580	4,300	17,118
Brushy Creek West	9.96	9,793	4,908	19,539
Brushy Creek West	10.73	9,947	4,985	19,847
Brushy Creek West	12.00	10,642	5,334	21,233
Brushy Creek West	14.47	11,430	5,729	22,806
BRUSHY TRIBUTARY 12	1.24	2,736	1,371	5,459
BRUSHY TRIBUTARY 2	1.10	2,147	1,076	4,283
BRUSHY TRIBUTARY 2	1.91	3,415	1,712	6,814
BRUSHY TRIBUTARY 2	2.73	4,318	2,164	8,616
BRUSHY TRIBUTARY 2	3.32	4,644	2,327	9,265
BRUSHY TRIBUTARY 8	1.28	2,367	1,186	4,723
Bullhead Hollow	0.86	2,804	1,406	5,596
Bullhead Hollow	1.48	4,576	2,293	9,130
Bullhead Hollow	2.23	6,127	3,071	12,224
Bullhead Hollow	3.00	6,682	3,349	13,333
Bunton Branch	0.52	1,162	583	2,319
Bunton Branch	0.87	1,864	934	3,720
Bunton Branch	1.89	2,431	1,218	4,850
Bunton Branch	3.85	3,840	1,924	7,661
Bunton Branch	5.70	5,304	2,658	10,583
Bunton Branch	7.45	5,819	2,916	11,610
Bunton Branch	8.42	6,686	3,351	13,340
Bunton Branch	9.57	7,723	3,871	15,410
Bunton Branch	10.35	7,973	3,996	15,908
Bunton Branch	11.31	8,564	4,292	17,088
Bunton Branch	19.80	13,353	6,692	26,642
Bypass Creek	1.01	1,467	735	2,927
Bypass Creek	1.18	1,652	828	3,295
Bypass Creek	1.41	1,863	933	3,716

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Bypass Creek	2.53	2,757	1,382	5,502
Bypass Creek	3.73	3,826	1,918	7,635
Bypass Creek	4.45	4,289	2,150	8,558
Bypass Creek	5.39	5,008	2,510	9,992
Bypass Creek	6.36	5,465	2,739	10,904
Bypass Creek	6.46	5,854	2,934	11,680
Callihan Creek	1.63	2,759	1,383	5,506
Callihan Creek	2.34	3,602	1,805	7,188
Callihan Creek	3.24	4,525	2,268	9,029
Callihan Creek	3.66	4,857	2,434	9,690
Callihan Creek	4.55	5,366	2,689	10,707
Callihan Creek	7.17	7,120	3,569	14,207
Callihan Creek	8.03	7,130	3,574	14,227
Callihan Creek	11.79	9,486	4,755	18,928
Campbell Creek	1.18	2,846	1,427	5,679
Campbell Creek	1.71	3,775	1,892	7,532
Campbell Creek	2.84	5,201	2,606	10,377
Campbell Creek	3.45	5,220	2,616	10,416
Campbell Creek	5.57	7,151	3,584	14,268
Caney Creek	0.74	2,113	1,059	4,215
Caney Creek	1.62	3,660	1,834	7,302
Caney Creek	2.38	4,571	2,291	9,120
Caney Creek	2.58	4,608	2,309	9,194
CANOE CREEK	1.42	3,189	1,598	6,363
CANOE CREEK	1.76	3,574	1,791	7,131
CANOE CREEK	2.57	4,274	2,142	8,528
CANOE CREEK	3.31	5,025	2,518	10,026
CANOE CREEK	4.19	5,855	2,934	11,681
CANOE CREEK	4.77	5,993	3,004	11,958
CANOE CREEK	5.48	6,557	3,286	13,084
CANOE CREEK	7.32	7,926	3,972	15,814
CANOE CREEK	7.93	8,078	4,049	16,118
CANOE CREEK	8.97	8,604	4,312	17,167
Carpers Creek	0.78	2,137	1,071	4,264
Carpers Creek	1.53	3,926	1,967	7,833
Carpers Creek	2.69	5,668	2,841	11,308
Carpers Creek	3.42	6,823	3,420	13,614
Carpers Creek	5.17	9,233	4,628	18,423

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Carpers Creek	7.30	11,914	5,971	23,772
Carpers Creek	9.10	14,564	7,299	29,059
Carpers Creek	9.94	15,388	7,712	30,702
Carpers Creek	13.65	19,176	9,611	38,261
Carpers Creek	15.34	20,298	10,173	40,500
Carpers Tributary 4	1.24	3,443	1,726	6,870
Carpers Tributary 4	2.09	5,236	2,624	10,447
Carpers Tributary 8	1.00	3,443	1,725	6,869
Carpers Tributary 8	1.04	3,272	1,640	6,529
Cedar Fork	0.87	2,355	1,180	4,700
Cedar Fork	1.84	4,598	2,305	9,175
Cedar Fork	4.48	7,728	3,873	15,419
Cedar Fork	4.62	7,769	3,894	15,501
Clear Fork Plum Creek	0.35	455	228	907
Clear Fork Plum Creek	0.94	991	497	1,978
Clear Fork Plum Creek	3.13	3,208	1,608	6,401
Clear Fork Plum Creek	4.13	3,876	1,943	7,734
Clear Fork Plum Creek	5.49	4,472	2,241	8,923
Clear Fork Plum Creek	8.69	6,079	3,047	12,129
Clear Fork Plum Creek	10.32	6,997	3,507	13,962
Clear Fork Plum Creek	12.13	8,111	4,065	16,183
Clear Fork Plum Creek	14.69	9,781	4,902	19,516
Clear Fork Plum Creek	24.99	15,356	7,696	30,640
Clear Fork Plum Creek	33.41	19,388	9,717	38,685
Clear Fork Plum Creek	39.32	22,902	11,478	45,696
Clear Fork Plum Creek	43.50	24,699	12,379	49,282
Clear Fork Plum Creek	46.70	25,597	12,829	51,072
Clear Fork Plum Creek	47.55	26,123	13,092	52,121
Clear Fork Plum Creek	49.28	26,738	13,401	53,348
Clear Fork Plum Creek	53.12	27,299	13,682	54,469
Copperas Creek	0.71	1,661	832	3,313
Copperas Creek	1.87	3,997	2,003	7,975
Copperas Creek	2.64	4,716	2,364	9,411
Copperas Creek	4.61	6,532	3,274	13,033
Copperas Creek	6.20	6,910	3,463	13,787
Copperas Creek	8.10	8,221	4,120	16,402
Copperas Creek	14.13	12,783	6,407	25,506
Cottonwood Creek	0.87	2,370	1,523	3,688

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Cottonwood Creek	1.07	2,790	1,758	4,427
Cottonwood Creek	1.27	780	521	1,177
Cottonwood Creek	1.35	1,380	979	1,946
Cottonwood Creek	1.58	2,840	2,200	3,667
Cottonwood Creek	2.53	3,920	2,693	5,707
Cottonwood Creek	2.78	4,460	3,047	6,529
Cottonwood Creek	2.83	5,500	3,416	8,855
Cottonwood Creek	3.50	4,940	3,162	7,718
Cottonwood Creek	5.65	8,850	5,439	14,401
Cottonwood Creek	6.41	9,320	5,422	16,021
Cottonwood Creek	6.59	10,360	6,142	17,813
Cottonwood Creek	7.81	8,304	4,162	16,568
Cottonwood Creek	9.71	9,048	4,535	18,054
Cottonwood Creek	11.69	10,373	5,199	20,697
Cottonwood Creek	14.03	11,134	5,580	22,216
Cottonwood Creek	18.22	13,137	6,584	26,212
Cottonwood Creek	21.87	14,533	7,284	28,997
Cottonwood Creek	24.45	15,397	7,717	30,722
Cottonwood Creek	26.78	16,287	8,163	32,497
Cottonwood Creek 2	1.34	3,573	1,791	7,129
Cottonwood Creek 2	2.01	5,030	2,521	10,035
Cottonwood Creek 2	2.77	6,150	3,082	12,271
Cottonwood Creek 2	3.62	7,116	3,566	14,198
Cottonwood Creek 2	4.48	7,545	3,781	15,054
Cottonwood Creek_Caldwell Co	1.12	1,643	823	3,277
Cottonwood Creek_Caldwell Co	1.76	2,400	1,203	4,788
Cottonwood Creek_Caldwell Co	2.30	2,911	1,459	5,807
Cottonwood Creek_Caldwell Co	2.83	3,400	1,704	6,784
Cottonwood Creek_Caldwell Co	3.50	3,894	1,951	7,769
Cottonwood Creek_Caldwell Co	4.91	4,895	2,453	9,767
Cove Branch	0.95	2,082	1,044	4,155
Cove Branch	1.67	3,456	1,732	6,896
Cove Branch	2.03	4,615	2,313	9,208
Cove Branch	3.17	6,238	3,127	12,447
Cowpen Creek	1.10	1,947	976	3,884
Cowpen Creek	1.97	3,188	1,598	6,362
Cowpen Creek	2.52	3,851	1,930	7,684
Cowpen Creek	4.44	5,380	2,696	10,735

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Cowpen Creek	5.03	5,540	2,777	11,054
Cowpen Creek	5.23	5,717	2,865	11,406
Cowpen Creek	6.21	6,416	3,216	12,802
Cowpen Creek	6.93	6,941	3,479	13,849
Cowpen Creek	7.92	7,022	3,519	14,011
Cowpen Creek	8.86	8,003	4,011	15,968
Cowpen Creek	9.82	8,386	4,203	16,733
Cowpen Creek	13.49	10,599	5,312	21,147
Cowpen Creek	14.50	11,111	5,569	22,169
CRABAPPLE CREEK	1.12	3,625	1,817	7,233
CRABAPPLE CREEK	2.05	5,422	2,717	10,818
CRABAPPLE CREEK	2.85	6,330	3,173	12,630
CRABAPPLE CREEK	3.23	6,577	3,296	13,123
CRABAPPLE CREEK	4.92	8,767	4,394	17,492
CRABAPPLE CREEK	7.03	11,505	5,766	22,955
Crabapple Creek 2	0.82	2,482	1,244	4,953
Crabapple Creek 2	1.68	4,724	2,368	9,426
Crabapple Creek 2	2.37	5,973	2,993	11,917
Crabapple Creek 2	2.67	6,248	3,131	12,466
Crabapple Creek 2	3.44	7,476	3,747	14,917
Crabapple Creek 2	12.07	16,140	8,089	32,203
Crabapple Creek 2	13.93	17,167	8,604	34,253
Crooked Branch	1.45	2,240	1,123	4,470
Crooked Branch	1.98	2,693	1,350	5,373
Cypress Branch	0.93	2,295	1,150	4,579
Cypress Branch	1.72	4,003	2,006	7,988
Cypress Branch	2.42	4,839	2,425	9,656
Cypress Branch	3.34	5,860	2,937	11,693
Cypress Branch	4.27	6,272	3,144	12,515
Cypress Creek	1.82	2,050	1,296	3,242
Cypress Creek	2.91	3,690	2,250	6,052
Cypress Creek	3.53	5,950	3,621	9,777
Cypress Creek	6.67	8,580	5,190	14,184
Cypress Creek	7.71	12,340	7,605	20,023
Cypress Creek	11.30	17,640	10,851	28,677
Cypress Creek	16.06	23,570	14,501	38,310
Cypress Creek	17.64	26,590	16,324	43,313
Cypress Creek	19.55	29,110	17,911	47,312

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Cypress Creek	24.06	31,740	19,696	51,149
Cypress Creek	24.29	33,990	20,620	56,030
Cypress Creek	30.43	40,520	23,562	69,806
Cypress Creek	31.28	40,690	23,891	69,302
Cypress Creek	34.15	41,520	24,678	69,857
Cypress Creek	34.63	41,900	25,170	69,751
Cypress Creek	37.44	42,670	25,936	70,201
Cypress Creek	37.97	42,840	26,107	70,299
Cypress Creek	38.02	42,860	26,127	70,310
Daniels Creek	1.23	2,094	1,050	4,179
Daniels Creek	2.28	3,225	1,616	6,435
Daniels Creek	2.89	3,835	1,922	7,651
Daniels Creek	3.81	4,568	2,289	9,114
Daniels Creek	4.61	5,049	2,531	10,074
Daniels Creek	5.59	5,892	2,953	11,755
Daniels Creek	6.63	6,416	3,216	12,802
Daniels Creek	8.36	7,140	3,578	14,246
DELAWARE CREEK	1.29	3,342	1,675	6,669
DELAWARE CREEK	1.89	3,932	1,971	7,845
DELAWARE CREEK	2.73	4,618	2,314	9,214
DELAWARE CREEK	3.74	6,269	3,142	12,508
Dickerson Creek	1.16	2,642	1,324	5,272
Dickerson Creek	2.04	4,255	2,133	8,490
Dickerson Creek	2.57	4,322	2,166	8,623
Dickerson Creek	3.79	5,150	2,581	10,276
Dickerson Creek	5.42	6,112	3,063	12,195
Dickerson Creek	7.43	7,718	3,868	15,399
Dickerson Creek	8.35	7,723	3,871	15,410
Dickerson Creek	9.32	7,718	3,868	15,399
Dickerson Creek	9.70	7,563	3,790	15,089
Dickerson Creek	11.75	8,469	4,244	16,897
Dry Branch	1.44	1,361	682	2,716
Dry Branch	2.11	1,995	1,000	3,980
Dry Branch	3.52	3,134	1,571	6,253
Dry Branch	5.35	4,553	2,282	9,084
Dry Branch	6.65	5,332	2,672	10,639
Dry Branch	7.63	5,704	2,859	11,381
Dry Branch	9.51	7,282	3,650	14,530

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Dry Creek	1.25	1,543	773	3,079
Dry Creek	2.16	2,493	1,249	4,973
Dry Creek	3.71	4,108	2,059	8,197
Dry Creek	4.79	4,990	2,501	9,956
Dry Creek	5.84	5,572	2,792	11,117
Dry Creek	9.76	8,382	4,201	16,725
Dry Creek	12.37	9,485	4,754	18,925
Dry Creek	13.20	9,506	4,764	18,966
Dry Creek	18.15	12,138	6,083	24,218
Dry Creek	20.07	12,805	6,417	25,548
Dry Creek	24.74	15,152	7,594	30,232
Dry Creek 2	0.55	1,097	550	2,189
Dry Creek 2	0.90	1,664	834	3,321
Dry Creek 2	1.66	2,402	1,204	4,792
Dry Creek 2	2.54	3,437	1,722	6,857
Dry Creek 2	3.32	3,522	1,765	7,028
Dry Creek 2	6.13	6,714	3,365	13,396
Dry Creek 2	8.30	8,104	4,062	16,170
Dry Creek 2	9.27	8,782	4,401	17,522
Dry Creek 2	12.86	10,172	5,098	20,296
Dry Creek 2	18.05	12,770	6,400	25,479
Dry Creek 2	18.83	13,218	6,625	26,373
Dry Creek 2	22.43	13,453	6,743	26,843
DRY FORK	1.21	2,026	1,016	4,043
DRY FORK	1.69	2,571	1,288	5,130
DRY FORK	2.21	2,997	1,502	5,981
DRY FORK	2.70	3,625	1,817	7,233
DRY FORK	3.04	3,698	1,853	7,379
DRY FORK	3.32	3,840	1,924	7,661
Durham Branch	0.24	627	314	1,252
Durham Branch	0.82	2,012	1,008	4,014
Durham Branch	1.44	3,362	1,685	6,708
Durham Branch	2.39	5,181	2,597	10,337
Durham Branch	2.58	5,152	2,582	10,280
Durham Branch	3.26	6,314	3,164	12,598
Dutch Branch	0.57	1,772	888	3,535
Dutch Branch	1.63	4,585	2,298	9,149
Dutch Branch	2.89	8,312	4,166	16,585

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Dutch Branch	3.57	9,153	4,588	18,263
Dutch Tributary 1	0.98	3,510	1,759	7,004
East Fork Hines Branch	1.43	3,965	1,987	7,912
East Fork Hines Branch	2.78	6,307	3,161	12,583
East Fork Hines Branch	3.47	6,867	3,442	13,702
East Fork Hines Branch	3.97	7,710	3,864	15,383
East Fork Hines Branch	7.53	12,314	6,171	24,569
East Prong Big Creek	1.02	2,814	1,410	5,614
East Prong Big Creek	1.58	4,181	2,095	8,341
East Prong Big Creek	2.55	6,136	3,075	12,244
East Prong Big Creek	3.42	6,806	3,411	13,580
Elm Creek	0.35	925	464	1,847
Elm Creek	1.35	3,241	1,625	6,467
Elm Creek	2.60	5,185	2,598	10,345
Elm Creek	5.25	6,821	3,419	13,610
Elm Creek	6.42	8,116	4,068	16,194
Elm Creek	9.11	9,822	4,923	19,598
Elm Creek	10.91	10,612	5,318	21,173
Elm Creek	26.84	16,780	8,410	33,480
Elm Creek	29.46	17,207	8,624	34,333
Elm Creek	31.94	17,720	8,881	35,356
Elm Creek	33.09	18,210	9,127	36,334
Elm Creek 2	1.13	3,995	2,002	7,972
Flat Creek	0.83	2,269	1,137	4,528
Flat Creek	1.89	4,775	2,393	9,527
Flat Creek	2.67	6,069	3,042	12,109
Flat Creek	4.05	7,642	3,830	15,248
Flat Creek	5.75	9,576	4,800	19,107
Flat Creek	8.70	12,799	6,415	25,537
Halifax Creek	0.55	1,302	653	2,598
Halifax Creek	1.46	3,153	1,580	6,292
Halifax Creek	2.51	4,549	2,280	9,076
Halifax Creek	4.76	7,301	3,659	14,568
Halifax Creek	5.08	7,704	3,861	15,372
Halifax Creek	9.94	11,832	5,930	23,608
Halifax Creek	12.72	14,700	7,367	29,330
Haw Branch	0.39	780	391	1,557
Haw Branch	0.88	1,672	838	3,336

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Haw Branch	1.52	2,370	1,188	4,729
Haw Branch	2.23	2,942	1,475	5,870
Hemphill Creek	1.23	1,883	944	3,758
Hemphill Creek	2.01	2,884	1,446	5,755
Hemphill Creek	2.47	3,560	1,784	7,103
Hemphill Creek	3.23	4,445	2,228	8,868
Hemphill Creek	4.04	4,994	2,503	9,964
Hemphill Creek	5.46	6,260	3,137	12,490
Hemphill Creek	8.22	8,518	4,269	16,995
Hemphill Creek	12.25	10,498	5,262	20,947
Highsmith Creek	1.23	2,654	1,330	5,295
Highsmith Creek	2.11	3,573	1,791	7,128
Highsmith Creek	3.09	4,679	2,345	9,337
Highsmith Creek	3.46	4,886	2,449	9,748
Highsmith Creek	4.87	6,379	3,197	12,727
Highsmith Creek	8.51	10,731	5,378	21,411
Highsmith Creek	9.45	10,640	5,332	21,229
Highsmith Creek	14.80	13,753	6,893	27,441
Highsmith Creek	18.50	15,408	7,722	30,743
Highsmith Creek	24.45	19,071	9,558	38,051
HIGHSMITH TRIBUTARY 1	0.88	1,460	732	2,914
HIGHSMITH TRIBUTARY 1	1.50	2,360	1,183	4,709
HIGHSMITH TRIBUTARY 1	2.45	3,551	1,780	7,085
HIGHSMITH TRIBUTARY 1	3.41	4,278	2,144	8,536
HIGHSMITH TRIBUTARY 3	1.33	2,457	1,231	4,902
HIGHSMITH TRIBUTARY 3	1.93	3,189	1,598	6,363
HIGHSMITH TRIBUTARY 3	2.84	4,163	2,087	8,307
HIGHSMITH TRIBUTARY 3	3.79	4,692	2,352	9,363
HIGHSMITH TRIBUTARY 3	4.43	5,125	2,569	10,225
HIGHSMITH TRIBUTARY 5	0.81	1,602	803	3,196
HIGHSMITH TRIBUTARY 5	1.41	2,646	1,326	5,280
HIGHSMITH TRIBUTARY 5	2.14	3,814	1,912	7,611
HIGHSMITH TRIBUTARY 5	2.74	4,464	2,237	8,906
HIGHSMITH TRIBUTARY 6	1.29	2,138	1,072	4,266
Hines Branch	0.37	1,031	517	2,056
Hines Branch	1.22	3,042	1,524	6,069
Hines Branch	1.79	4,072	2,041	8,124
Hines Branch	2.69	5,025	2,518	10,026

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Hines Branch	3.69	5,750	2,882	11,473
Hines Branch	4.75	6,379	3,197	12,729
Hines Branch	5.94	6,480	3,248	12,930
House Log Branch	0.59	1,420	711	2,832
House Log Branch	0.90	1,617	811	3,227
Jerry Creek	0.59	1,184	594	2,363
Jerry Creek	1.02	1,952	978	3,895
Jerry Creek	1.82	2,768	1,387	5,523
Jerry Creek	2.92	4,004	2,007	7,989
Jerry Creek	3.48	4,324	2,167	8,627
Jerry Creek	4.62	5,189	2,600	10,353
Koch Branch	0.45	1,312	658	2,619
Koch Branch	0.96	2,644	1,325	5,275
Koch Branch	1.10	2,980	1,493	5,945
Koch Branch	1.81	4,202	2,106	8,384
Koch Branch	2.28	5,111	2,562	10,198
Koch Branch	4.06	7,765	3,892	15,493
Linscome Creek	0.24	425	213	847
Linscome Creek	0.85	1,398	701	2,790
Linscome Creek	1.50	2,345	1,175	4,679
Linscome Creek	2.02	2,625	1,315	5,237
Linscome Creek	2.65	3,254	1,631	6,493
Linscome Creek	3.55	3,920	1,965	7,822
Linscome Creek	4.41	4,444	2,227	8,867
Little Blanco River	0.95	2,760	1,384	5,508
Little Blanco River	2.39	5,817	2,915	11,606
Little Blanco River	5.29	11,269	5,648	22,484
Little Blanco River	6.58	11,793	5,911	23,530
Little Blanco River	13.68	20,040	10,044	39,985
Little Blanco River	15.12	21,135	10,592	42,169
Little Blanco River	21.87	32,476	16,277	64,798
Little Blanco River	24.00	28,670	14,369	57,204
Little Blanco River	26.46	29,496	14,783	58,853
Little Blanco River	27.25	35,085	17,584	70,004
Little Blanco River	29.98	35,846	17,966	71,522
Little Blanco River	42.08	35,482	17,783	70,795
Little Blanco River	47.46	37,975	19,032	75,769
Little Blanco River	51.27	38,609	19,350	77,035

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Little Blanco River	54.65	41,560	20,829	82,923
Little Blanco River	56.28	40,770	20,433	81,347
Little Blanco River	60.61	40,358	20,227	80,525
Little Blanco River	68.65	45,852	22,981	91,487
Little Blanco Tributary 1	0.97	2,921	1,464	5,828
Little Blanco Tributary 1	1.74	4,923	2,467	9,823
Little Blanco Tributary 1	2.25	4,770	2,390	9,517
Little Blanco Tributary 1	2.73	5,432	2,723	10,839
Little Blanco Tributary 1	3.55	6,355	3,185	12,679
Little Blanco Tributary 1	3.72	6,475	3,245	12,919
Little Blanco Tributary 1	6.16	9,695	4,859	19,344
Little Blanco Tributary 18	0.36	892	447	1,779
Little Blanco Tributary 18	1.03	2,392	1,199	4,773
Little Blanco Tributary 18	1.50	3,368	1,688	6,720
Little Blanco Tributary 2	0.66	2,062	1,033	4,114
Little Blanco Tributary 2	1.57	3,748	1,878	7,478
Lone Man Creek	1.33	3,491	1,750	6,966
Lone Man Creek	1.96	4,551	2,281	9,080
Lone Man Creek	2.72	5,581	2,797	11,135
Lone Man Creek	4.62	8,056	4,037	16,073
Lone Man Creek	5.93	9,471	4,747	18,898
Lone Man Creek	10.62	14,713	7,374	29,357
Lone Man Creek	12.36	16,027	8,033	31,978
LONG CREEK	1.33	1,814	909	3,619
LONG CREEK	2.43	3,027	1,517	6,039
LONG CREEK	3.30	3,699	1,854	7,380
LONG CREEK	4.28	4,527	2,269	9,033
LONG CREEK	5.26	5,720	2,867	11,413
LONG CREEK	6.11	6,489	3,252	12,948
LONG CREEK	7.37	7,590	3,804	15,144
LONG CREEK	8.58	8,348	4,184	16,657
LONG TRIBUTARY 7	1.04	1,765	885	3,522
MANAHAN CREEK	0.59	2,048	1,027	4,087
MANAHAN CREEK	2.41	5,902	2,958	11,775
Martindale Diversion	19.41	15,067	7,551	30,063
Martindale Diversion	23.04	15,329	7,683	30,586
McKinney Creek	1.44	3,751	1,880	7,483
McKinney Creek	2.21	4,674	2,343	9,327

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
McNeil Creek	0.54	1,308	655	2,609
McNeil Creek	0.89	1,691	848	3,375
McNeil Creek	1.43	2,133	1,069	4,256
McNeil Creek	6.81	8,295	4,157	16,551
McNeil Creek	8.13	8,696	4,358	17,350
McNeil Creek	10.12	9,755	4,889	19,464
McNeil Creek	11.83	10,686	5,356	21,322
McNeil Creek	15.21	11,773	5,901	23,490
Mebane Creek	0.73	816	409	1,628
Mebane Creek	1.33	1,468	736	2,929
Mebane Creek	1.92	2,205	1,105	4,400
Mebane Creek	2.65	3,415	1,712	6,814
MEIER CREEK	0.71	2,282	1,144	4,552
MEIER CREEK	1.36	3,351	1,679	6,686
MESQUITE CREEK	1.28	2,886	1,447	5,759
MESQUITE CREEK	3.15	6,349	3,182	12,668
MESQUITE CREEK	4.12	7,092	3,555	14,151
MESQUITE CREEK	4.99	8,061	4,040	16,084
MESQUITE CREEK	6.14	9,337	4,680	18,630
MESQUITE CREEK	7.17	9,228	4,625	18,412
Morrison Creek	1.01	2,551	1,279	5,091
Morrison Creek	1.53	3,038	1,523	6,061
Morrison Creek	2.37	3,913	1,961	7,807
Morrison Creek	3.35	4,251	2,131	8,483
Morrison Creek	6.82	6,615	3,315	13,198
MULE CREEK	1.10	2,352	1,179	4,693
MULE CREEK	1.68	3,435	1,722	6,854
MULE CREEK	2.24	4,057	2,033	8,094
MULE CREEK	2.93	4,677	2,344	9,332
MULE CREEK	3.95	5,783	2,898	11,539
MULE CREEK	4.56	6,226	3,121	12,423
MULE CREEK	10.15	11,661	5,844	23,267
MULE CREEK	11.73	12,203	6,116	24,348
MULE CREEK	13.84	12,915	6,473	25,769
MULE CREEK	14.97	12,653	6,342	25,246
MULE CREEK	17.45	13,284	6,658	26,504
MULE CREEK	20.26	14,199	7,116	28,330
MULE CREEK	30.10	19,036	9,541	37,982

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
NORTH FORK SMITH CREEK	0.85	1,498	751	2,989
NORTH FORK SMITH CREEK	1.33	2,263	1,134	4,516
NORTH FORK SMITH CREEK	1.90	3,015	1,511	6,015
NORTH FORK SMITH CREEK	2.21	3,276	1,642	6,536
Pecan Branch	1.06	1,481	742	2,956
Pecan Branch	1.86	2,454	1,230	4,897
Pecan Branch	2.64	3,523	1,766	7,029
Pecan Branch	3.19	4,174	2,092	8,328
Pecan Branch	6.80	7,210	3,614	14,386
Pierce Creek	1.10	4,005	2,007	7,991
Pierce Creek	2.26	6,569	3,292	13,107
Pierce Creek	3.49	8,596	4,308	17,152
Pin Oak Creek	0.51	1,175	589	2,345
Pin Oak Creek	0.71	1,550	777	3,094
Pin Oak Creek	1.54	2,623	1,314	5,233
Pin Oak Creek	1.98	2,991	1,499	5,969
Pin Oak Creek	3.58	4,669	2,340	9,316
Pin Oak Creek	4.29	5,138	2,575	10,253
Pin Oak Creek	5.35	6,049	3,032	12,070
Pin Oak Creek	6.11	6,540	3,278	13,049
Pin Oak Creek	6.74	6,816	3,416	13,600
Pinoak Creek	1.08	3,288	1,648	6,561
Pinoak Creek	1.69	4,572	2,292	9,123
Pinoak Creek	3.10	6,939	3,478	13,845
Plum Creek	0.14	359	180	716
Plum Creek	0.52	1,234	618	2,461
Plum Creek	1.32	2,887	1,447	5,760
Plum Creek	2.04	3,829	1,919	7,641
Plum Creek	2.89	4,813	2,412	9,602
Plum Creek	5.88	8,074	4,046	16,109
Plum Creek	8.78	11,128	5,577	22,204
Plum Creek	11.46	11,930	5,979	23,803
Plum Creek	13.74	12,661	6,346	25,262
Plum Creek	15.71	14,097	7,065	28,128
Plum Creek	35.73	21,030	10,540	41,961
Plum Creek	38.45	21,895	10,973	43,686
Plum Creek	41.51	22,157	11,105	44,209
Plum Creek	45.04	23,323	11,689	46,535

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Plum Creek	78.08	46,901	33,600	72,700
Plum Creek	193.40	53,343	38,200	83,700
Plum Creek	349.86	60,662	41,600	99,600
Plum Creek	387.83	80,693	50,800	148,000
Purgatory Creek	1.02	2,678	1,342	5,343
Purgatory Creek	1.52	3,846	1,927	7,673
Purgatory Creek	2.67	5,985	3,000	11,943
Purgatory Creek	3.59	6,977	3,497	13,920
Purgatory Creek	4.97	9,026	4,524	18,010
Purgatory Creek	7.36	11,847	5,938	23,638
Purgatory Creek	11.25	16,506	8,272	32,933
Purgatory Creek	17.72	21,100	12,977	34,309
Purgatory Creek	20.08	30,400	18,792	49,178
Purgatory Creek	20.15	480	406	590
Purgatory Creek	20.93	9,500	5,790	18,800
Purgatory Creek	21.73	11,300	7,560	19,400
Purgatory Creek	24.26	12,000	7,640	21,500
Purgatory Creek	26.26	13,600	8,384	22,062
Purgatory Creek	26.67	16,000	9,684	26,436
Purgatory Creek	29.14	22,200	13,461	36,612
Purgatory Creek	34.26	32,100	19,541	52,731
Purgatory Creek	34.50	940	808	1,140
Purgatory Creek	35.37	10,000	7,100	16,000
Purgatory Creek	36.17	5,000	3,870	7,130
Purgatory Creek	36.89	5,100	4,030	6,990
Purgatory Tributary 1	1.31	3,126	1,567	6,237
Purgatory Tributary 1	2.11	4,612	2,312	9,203
Purgatory Tributary 1	2.83	5,755	2,884	11,482
Purgatory Tributary 1	6.23	10,956	5,491	21,860
Purgatory Tributary 5	0.61	1,642	823	3,277
Purgatory Tributary 5	1.40	3,497	1,753	6,978
Purgatory Tributary 5	1.75	4,035	2,022	8,051
Purgatory Tributary 5	2.63	5,402	2,707	10,778
Purgatory Tributary 6	0.76	2,193	1,099	4,375
Purgatory Tributary 6	1.52	4,097	2,053	8,175
Purgatory Tributary 6	2.04	4,674	2,343	9,326
Purgatory Tributary 6	2.53	4,882	2,447	9,741
Purgatory Tributary 7	1.11	3,589	1,799	7,161

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Purgatory Tributary 7	1.63	4,447	2,229	8,874
Rabbit Branch	1.15	2,489	1,247	4,966
Rabbit Branch	2.10	4,069	2,039	8,119
Rochou Creek	0.61	1,821	912	3,632
Rochou Creek	1.31	3,667	1,838	7,316
Rochou Creek	1.90	5,080	2,546	10,137
Rocky Creek	0.46	1,480	742	2,952
Rocky Creek	0.95	2,876	1,442	5,739
Rocky Creek	1.55	4,471	2,241	8,921
Rocky Creek	2.41	4,573	2,292	9,125
Rocky Creek	2.98	5,285	2,649	10,545
Rogers Branch	0.99	2,524	1,265	5,035
Rogers Branch	1.85	4,407	2,209	8,793
Rogers Branch	2.64	4,932	2,472	9,840
Rogers Branch	4.42	7,042	3,529	14,050
Salt Branch	0.78	1,447	725	2,887
Salt Branch	1.84	2,788	1,397	5,563
Salt Branch	3.26	4,184	2,097	8,349
Salt Branch	3.96	4,694	2,353	9,366
Salt Branch	9.33	8,799	4,410	17,557
Salt Branch	10.55	8,309	4,164	16,578
Salt Branch	12.10	9,082	4,552	18,121
San Marcos River	49.18	11,300	7,910	17,700
San Marcos River	50.00	11,200	8,000	17,200
San Marcos River	87.75	15,900	11,700	23,800
San Marcos River	94.21	19,300	14,100	29,100
San Marcos River	94.55	19,800	14,400	30,100
San Marcos River	94.69	20,000	14,500	30,500
San Marcos River	532.22	20,500	14,700	31,500
San Marcos River	613.77	136,500	81,200	270,000
San Marcos River	838.03	144,100	103,000	226,000
San Marcos River	843.61	142,400	89,800	262,000
San Marcos River	1356.61	189,200	100,000	432,000
SAN MARCOS TRIBUTARY	1.27	1,675	840	3,342
SAN MARCOS TRIBUTARY	1.63	2,158	1,082	4,306
SAN MARCOS TRIBUTARY 13	0.67	1,065	534	2,125
SAN MARCOS TRIBUTARY 13	1.60	2,334	1,170	4,656
SAN MARCOS TRIBUTARY 13	2.26	2,669	1,338	5,326

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
SAN MARCOS TRIBUTARY 13	3.71	4,100	2,055	8,180
SAN MARCOS TRIBUTARY 13	4.47	4,881	2,446	9,739
SAN MARCOS TRIBUTARY 4	1.63	2,575	1,290	5,138
SAN MARCOS TRIBUTARY 4	2.13	2,959	1,483	5,905
SAND HILL CREEK	1.18	2,384	1,195	4,756
SAND HILL CREEK	1.48	2,600	1,303	5,187
Schuetz Creek	0.69	2,110	1,057	4,210
Schuetz Creek	1.72	4,810	2,411	9,598
Schuetz Creek	2.34	5,633	2,823	11,239
Schuetz Creek	3.20	7,177	3,597	14,319
Schuetz Creek	4.01	7,719	3,869	15,401
Seals Creek	0.34	807	405	1,611
Seals Creek	0.76	1,515	759	3,022
Seals Creek	2.40	3,299	1,653	6,581
Seals Creek	2.71	3,625	1,817	7,232
Seals Creek	3.13	3,775	1,892	7,532
Seals Creek	4.28	4,462	2,236	8,902
Seals Creek	5.40	5,265	2,639	10,504
Seals Creek	6.32	5,723	2,869	11,420
Seals Creek	6.80	6,046	3,030	12,040
Seals Creek	6.81	6,034	3,024	12,040
Seals Creek	7.08	6,090	3,052	14,085
Seals Creek	9.14	7,059	3,538	14,085
Seals Creek	11.28	7,994	4,007	15,951
Seals Creek Tributary	0.58	1,147	575	2,289
Seals Creek Tributary	1.04	1,781	892	3,553
Seals Creek Tributary	1.44	2,252	1,129	4,494
Seals Creek Tributary	1.86	2,828	1,417	5,642
Seals Creek Tributary	2.40	3,242	1,625	6,468
Sink Creek	1.03	2,745	1,376	5,476
Sink Creek	1.52	3,908	1,959	7,797
Sink Creek	2.02	4,466	2,238	8,910
Sink Creek	2.67	5,532	2,772	11,038
Sink Creek	4.74	8,712	4,366	17,382
Sink Creek	5.63	9,759	4,891	19,471
Sink Creek	6.18	13,200	8,119	21,461
Sink Creek	8.82	15,400	9,504	24,953
Sink Creek	9.03	16,100	9,926	26,115

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Sink Creek	12.87	22,000	13,449	35,987
Sink Creek	13.02	22,100	13,505	36,166
Sink Creek	14.73	23,600	14,179	39,280
Sink Creek	20.79	31,900	19,154	53,128
Sink Creek	22.01	34,300	20,720	56,781
Sink Creek	32.64	48,300	29,041	80,331
Sink Creek	33.56	370	338	417
Sink Creek	33.84	8,100	4,940	16,000
Sink Creek	34.11	10,600	6,590	20,400
Sink Creek	39.00	11,400	7,530	20,100
Sink Creek	42.82	11,700	7,280	21,500
Sink Creek	43.42	15,900	9,677	26,251
Sink Creek	43.44	1,060	936	1,240
Sink Creek	43.93	10,900	7,300	18,900
Sink Creek	44.42	11,000	8,000	17,000
Sink Creek	45.69	11,300	7,910	18,000
Sixmile Branch	1.11	1,493	748	2,979
Sixmile Branch	1.96	2,580	1,293	5,147
Sixmile Branch	2.64	3,647	1,828	7,277
Sixmile Branch	5.64	6,857	3,437	13,682
SMITH CREEK	0.74	1,339	671	2,673
SMITH CREEK	1.52	2,560	1,283	5,107
SMITH CREEK	1.99	3,011	1,509	6,009
SMITH CREEK	3.25	4,402	2,206	8,783
SMITH CREEK	4.72	5,975	2,994	11,921
SMITH CREEK	6.39	6,991	3,504	13,949
SMITH CREEK	8.30	8,586	4,303	17,130
SMITH CREEK	11.34	10,047	5,035	20,046
SMITH CREEK	14.14	11,472	5,750	22,890
SMITH CREEK	15.21	11,760	5,894	23,464
Smith Creek_Hays Co	0.50	1,764	884	3,519
Smith Creek_Hays Co	1.56	4,005	2,007	7,992
Smith Creek_Hays Co	2.59	5,424	2,719	10,823
Smith Creek_Hays Co	3.60	6,968	3,492	13,904
SMITH TRIBUTARY 2	1.18	2,790	1,398	5,567
SMITH TRIBUTARY 3	1.23	1,912	958	3,814
SMITH TRIBUTARY 3	1.46	2,137	1,071	4,263
SOUTH FORK BLANCO RIVER	1.01	2,832	1,420	5,651

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
SOUTH FORK BLANCO RIVER	1.86	4,365	2,188	8,709
SOUTH FORK BLANCO RIVER	5.56	9,238	4,630	18,433
SOUTH FORK BLANCO RIVER	6.73	9,786	4,905	19,526
SOUTH SMITH CREEK	0.88	1,786	895	3,563
SOUTH SMITH CREEK	2.04	3,433	1,721	6,850
SOUTH SMITH CREEK	2.49	3,891	1,950	7,763
SOUTH SMITH CREEK	2.97	4,193	2,102	8,366
SOUTH SMITH CREEK	3.43	4,250	2,130	8,480
SOUTH SMITH CREEK	5.44	6,197	3,106	12,365
SOUTH SMITH CREEK	6.51	6,963	3,490	13,894
SOUTH SMITH CREEK	9.88	9,130	4,576	18,218
SOUTH SMITH CREEK	11.04	9,472	4,747	18,899
SOUTH SMITH CREEK	16.00	11,820	5,924	23,585
Spanish Oak Creek	0.70	1,380	692	2,754
Spanish Oak Creek	1.35	2,498	1,252	4,984
Spanish Oak Creek	1.36	2,149	1,077	4,289
Spanish Oak Creek	2.00	3,027	1,517	6,039
Spanish Oak Creek	2.80	3,495	1,752	6,973
Spoke Pile Creek	0.43	2,130	1,068	4,251
Spoke Pile Creek	1.03	3,900	1,954	7,781
Spoke Pile Creek	1.19	4,432	2,221	8,843
Spoke Pile Creek	1.80	5,755	2,885	11,484
Spoke Pile Creek	2.50	6,691	3,353	13,350
Spring Branch	0.29	928	465	1,852
Spring Branch	0.82	2,272	1,139	4,533
Spring Branch	1.41	3,060	1,534	6,105
Stream A1	0.88	1,960	982	3,910
Stream A10	0.86	2,068	1,036	4,126
Stream A11	0.22	581	291	1,158
Stream A12	0.11	345	173	688
Stream A2	0.86	1,460	732	2,913
Stream A3	0.52	1,187	595	2,369
Stream A4	0.68	2,001	1,003	3,993
Stream A5	0.44	1,072	537	2,139
Stream A6	0.48	1,160	581	2,314
Stream A7	0.25	341	171	680
Stream A7	0.62	790	396	1,576
Stream A8	0.50	641	321	1,280

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream A8	0.91	1,121	562	2,237
Stream A9	0.40	956	479	1,907
Stream B12	0.39	756	379	1,509
Stream B13	0.27	444	223	886
Stream B14	0.67	1,301	652	2,597
Stream B15	0.22	391	196	781
Stream B16	0.35	562	281	1,121
Stream B17	0.27	561	281	1,119
Stream B18	0.50	679	340	1,355
Stream B19	0.21	320	160	639
Stream B19	0.83	1,193	598	2,381
Stream B20	0.48	720	361	1,437
Stream B21	0.15	316	158	631
Stream B22	0.55	779	390	1,554
Stream B23	0.17	362	182	723
Stream B24	0.72	1,096	549	2,188
Stream B25	0.17	198	99	395
Stream B26	0.39	762	382	1,520
Stream B27	0.19	406	204	810
Stream B28	0.19	501	251	999
Stream B29	0.37	531	266	1,060
Stream B30	0.29	640	321	1,277
Stream B31	0.65	917	460	1,830
Stream B32	0.15	265	133	530
Stream B33	0.48	489	245	975
Stream B33	0.83	817	409	1,630
Stream B34	0.18	358	180	715
Stream B35	0.25	372	187	743
Stream B35	0.85	1,160	581	2,314
Stream B36	0.94	897	450	1,790
Stream B37	0.34	351	176	700
Stream B38	0.32	333	167	665
Stream B39	0.21	207	104	413
Stream B39	0.61	579	290	1,156
Stream B40	0.41	653	327	1,303
Stream B41	0.41	364	182	726
Stream B41	0.91	765	383	1,526
Stream B42	0.12	140	70	279

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream B43	0.19	221	111	440
Stream B44	0.12	133	67	265
Stream B45	0.10	113	57	225
Stream B45	0.52	554	278	1,106
Stream B46	0.14	354	177	706
Stream B47	0.11	280	140	559
Stream B48	0.08	127	64	253
Stream B49	0.20	273	137	545
Stream B50	0.32	404	203	806
Stream B51	0.74	903	453	1,802
Stream B51	1.07	1,258	630	2,510
Stream B52	0.16	205	103	409
Stream B53	0.24	294	147	587
Stream B53	0.50	602	302	1,200
Stream B54	0.35	403	202	804
Stream B55	0.12	382	191	761
Stream B56	0.19	277	139	553
Stream B57	0.41	830	416	1,655
Stream B58	0.45	867	434	1,729
Stream B59	0.28	547	274	1,092
Stream B59	0.76	1,414	709	2,821
Stream B60	0.36	819	411	1,634
Stream B61	0.15	254	127	507
Stream B62	0.40	673	337	1,343
Stream B62	0.79	1,278	640	2,549
Stream B63	0.50	481	241	960
Stream B63	1.09	987	495	1,970
Stream B64	0.18	424	213	847
Stream B65	0.17	357	179	713
Stream B66	0.20	416	208	830
Stream B67	0.11	182	91	363
Stream B68	0.10	161	81	322
Stream B69	0.17	214	107	426
Stream B70	0.41	511	256	1,020
Stream B71	0.35	617	309	1,231
Stream B72	0.19	334	167	666
Stream B73	0.19	298	149	595
Stream B74	0.40	609	305	1,215

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream B75	0.37	533	267	1,064
Stream BPC_1	0.14	317	159	633
Stream BPC_2	0.66	915	459	1,826
Stream Brushy_1	0.57	1,348	676	2,690
Stream Brushy_1	1.66	2,767	1,387	5,522
Stream Brushy_1	2.91	4,197	2,104	8,374
Stream Brushy_1	3.30	4,633	2,322	9,244
Stream Brushy_1	5.58	6,051	3,033	12,073
Stream Brushy_1A	0.45	956	479	1,907
Stream Brushy_1A	0.97	1,731	868	3,455
Stream C81	0.58	1,369	686	2,731
Stream C82	0.12	327	164	652
Stream C83	0.38	992	497	1,980
Stream C84	0.31	780	391	1,557
Stream C85	0.34	957	480	1,910
Stream C86	0.77	2,031	1,018	4,052
Stream C87	0.13	540	271	1,077
Stream C88	0.37	402	201	802
Stream C88	0.74	778	390	1,551
Stream C89	0.09	199	100	397
Stream C90	0.30	631	316	1,260
Stream C91	0.30	620	311	1,237
Stream C92	0.63	1,588	796	3,168
Stream C93	0.39	1,552	778	3,097
Stream C94	0.21	1,056	529	2,107
Stream CC_1	0.57	1,970	1,213	3,199
Stream CC_1	0.61	1,870	1,192	2,934
Stream CC_1	1.83	4,590	2,909	7,243
Stream CC_1	2.12	1,530	989	2,367
Stream CC_IH35	0.34	640	412	1,000
Stream CC_IH35	0.47	1,950	1,255	3,029
Stream CC_IH35	0.55	1,890	1,259	2,836
Stream CC_IH35	0.82	1,320	758	2,550
Stream Cypress_1	1.17	2,940	1,473	5,866
Stream Cypress_1	1.77	4,270	2,140	8,520
Stream Cypress_1	2.19	4,745	2,378	9,467
Stream PC_1	1.36	3,100	2,054	4,679
Stream PC_1	1.89	5,400	3,414	8,607

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream PC_1	2.26	6,000	3,768	9,555
Stream PC_1	2.34	6,200	3,817	10,213
Stream Plum_1	0.54	1,084	543	2,162
Stream Plum_1	1.08	2,071	1,038	4,133
Stream Plum_1	2.25	3,988	1,999	7,957
Stream Plum_1	2.88	4,474	2,242	8,927
Stream WSC_1	0.36	1,231	617	2,457
Stream001	1.02	2,160	1,083	4,310
Stream001	1.77	3,178	1,593	6,342
Stream001	2.68	4,741	2,376	9,459
Stream002	1.30	3,325	1,667	6,635
Stream002	2.76	5,792	2,903	11,557
Stream002	6.15	9,669	4,846	19,291
Stream003	1.09	2,904	1,455	5,794
Stream004	1.14	2,795	1,401	5,576
Stream004	2.20	4,054	2,032	8,090
Stream005	0.45	1,516	760	3,026
Stream005	0.81	2,535	1,271	5,058
Stream005	1.39	4,290	2,150	8,560
Stream005	1.77	4,560	2,285	9,097
Stream005	2.86	6,540	3,278	13,048
Stream005	5.72	11,075	5,551	22,098
Stream006	0.65	1,837	921	3,665
Stream006	0.99	2,703	1,355	5,394
Stream006	1.50	3,925	1,967	7,831
Stream006	2.14	5,379	2,696	10,732
Stream008	1.43	3,304	1,656	6,592
Stream008	1.91	2,935	1,471	5,856
Stream009	0.90	1,911	958	3,813
Stream009	1.58	3,189	1,598	6,364
Stream009	2.54	4,468	2,239	8,914
Stream009	3.21	5,227	2,620	10,430
Stream009	4.19	6,171	3,093	12,313
Stream009	5.59	7,568	3,793	15,101
Stream009	6.77	8,592	4,306	17,144
Stream009	9.53	10,505	5,265	20,960
Stream009	11.37	11,793	5,911	23,531
Stream011	1.08	2,065	1,035	4,121

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream012	1.26	2,752	1,379	5,492
Stream012	2.63	4,910	2,461	9,797
Stream012	3.57	6,330	3,173	12,630
Stream013	1.10	2,104	1,054	4,198
Stream014	1.24	3,758	1,884	7,499
Stream014	2.10	4,619	2,315	9,217
Stream014	4.76	8,646	4,333	17,251
Stream014	5.58	9,485	4,754	18,925
Stream014	7.04	11,314	5,671	22,575
Stream015	1.15	3,670	1,839	7,322
Stream015	1.75	4,598	2,304	9,174
Stream016	1.03	3,267	1,638	6,519
Stream017	1.06	1,685	844	3,362
Stream017	1.53	2,341	1,173	4,671
Stream017	2.01	2,905	1,456	5,796
Stream017	2.62	3,324	1,666	6,633
Stream018	1.18	3,210	1,609	6,404
Stream018	1.54	4,080	2,045	8,141
Stream019	0.21	502	252	1,002
Stream019	1.20	2,001	1,003	3,994
Stream019	2.88	3,548	1,778	7,080
Stream020	0.33	813	407	1,621
Stream020	0.67	1,311	657	2,617
Stream021	0.18	454	228	907
Stream022	0.80	1,419	711	2,830
Stream022	1.16	1,810	907	3,612
Stream024	1.29	2,984	1,496	5,955
Stream025	1.66	3,043	1,525	6,072
Stream027	1.29	3,741	1,875	7,463
Stream027	1.85	4,576	2,293	9,130
Stream029	0.80	2,649	1,328	5,285
Stream030	1.08	2,532	1,269	5,051
Stream030	1.74	3,890	1,950	7,762
Stream030	2.80	5,520	2,767	11,014
Stream030	3.61	6,589	3,302	13,146
Stream031	1.19	3,404	1,706	6,792
Stream032	1.54	4,286	2,148	8,551
Stream032	2.63	6,573	3,294	13,115

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream032	3.63	7,588	3,803	15,139
Stream032	5.55	9,399	4,710	18,753
Stream033	0.88	2,469	1,237	4,926
Stream034	1.01	2,747	1,377	5,481
Stream034	1.26	2,880	1,443	5,746
Stream034	2.22	4,518	2,264	9,014
Stream034	2.86	4,717	2,364	9,412
Stream034	3.65	4,823	2,417	9,623
Stream034	4.86	5,954	2,984	11,880
Stream035	1.21	1,633	819	3,259
Stream035	1.84	2,383	1,194	4,755
Stream035	2.44	3,052	1,529	6,089
Stream036	1.46	4,347	2,179	8,673
Stream036	2.16	5,695	2,854	11,363
Stream037	1.39	3,941	1,975	7,864
Stream037	2.17	5,038	2,525	10,052
Stream037	3.28	6,542	3,279	13,053
Stream037	4.31	7,837	3,928	15,637
Stream037	6.58	11,244	5,635	22,435
Stream038	0.96	2,628	1,317	5,243
Stream038	1.55	4,025	2,017	8,030
Stream038	2.18	5,104	2,558	10,185
Stream039	1.41	1,411	707	2,816
Stream039	1.77	1,572	788	3,137
Stream041	1.42	2,312	1,159	4,612
Stream041	1.79	2,645	1,326	5,277
Stream041	2.24	3,130	1,569	6,245
Stream041	4.56	5,752	2,883	11,476
Stream042	1.03	1,670	837	3,333
Stream042	1.63	2,528	1,267	5,044
Stream042	1.98	2,903	1,455	5,793
Stream043	0.75	1,330	667	2,654
Stream043	1.62	2,684	1,345	5,356
Stream043	1.97	2,899	1,453	5,785
Stream043	3.07	4,055	2,032	8,090
Stream045	1.05	3,082	1,545	6,150
Stream045	1.73	4,831	2,421	9,638
Stream045	1.95	4,912	2,462	9,800

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream046	1.24	3,945	1,977	7,871
Stream047	0.78	1,458	731	2,908
Stream047	1.25	2,191	1,098	4,371
Stream047	3.18	4,344	2,177	8,667
Stream048	0.58	1,200	602	2,395
Stream048	1.00	1,994	999	3,978
Stream048	1.12	2,072	1,039	4,135
Stream049	1.39	3,269	1,638	6,522
Stream049	2.04	4,241	2,125	8,462
Stream049	3.08	5,984	2,999	11,939
Stream051	1.03	3,283	1,645	6,550
Stream051	1.40	3,951	1,980	7,883
Stream051	2.01	4,821	2,416	9,618
Stream051	2.46	5,489	2,751	10,952
Stream052	1.41	2,543	1,274	5,073
Stream052	2.17	3,726	1,868	7,435
Stream053	1.10	1,711	858	3,414
Stream053	1.27	1,934	969	3,859
Stream054	1.31	4,256	2,133	8,492
Stream055	1.19	2,707	1,357	5,401
Stream055	1.94	3,780	1,895	7,542
Stream055	2.56	4,371	2,190	8,720
Stream055	2.96	4,548	2,279	9,074
Stream055	4.81	6,387	3,201	12,744
Stream056	0.99	2,346	1,176	4,680
Stream056	1.48	2,823	1,415	5,632
Stream057	1.14	3,371	1,689	6,725
Stream057	1.83	4,371	2,191	8,721
Stream058	1.27	3,607	1,808	7,197
Stream058	2.07	4,958	2,485	9,892
Stream058	4.44	8,122	4,071	16,205
Stream059	1.33	3,282	1,645	6,548
Stream062	0.53	1,149	576	2,292
Stream062	1.07	1,870	937	3,731
Stream062	1.68	2,507	1,256	5,002
Stream062	2.37	3,179	1,593	6,342
Stream062	4.71	5,296	2,654	10,567
Stream063	0.52	1,377	690	2,748

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream063	1.04	2,210	1,108	4,410
Stream063	1.88	2,953	1,480	5,893
Stream064	0.47	1,064	533	2,123
Stream064	1.17	2,227	1,116	4,444
Stream064	2.34	4,076	2,043	8,134
Stream065	0.60	1,390	697	2,774
Stream065	1.17	2,387	1,197	4,763
Stream066	0.53	1,160	582	2,315
Stream067	1.19	3,366	1,687	6,715
Stream067	1.75	4,785	2,398	9,547
Stream067	3.23	8,178	4,099	16,317
Stream068	0.36	1,094	548	2,183
Stream068	1.47	3,964	1,987	7,910
Stream069	1.43	64	32	128
Stream069	3.33	5,132	2,572	10,240
Stream069	3.99	5,732	2,873	11,436
Stream069	5.04	6,602	3,309	13,173
Stream069	6.78	7,383	3,700	14,731
Stream069	7.54	7,994	4,007	15,951
Stream069	8.25	8,097	4,058	16,155
Stream070	0.47	1,237	620	2,468
Stream070	1.16	2,372	1,189	4,733
Stream071	0.40	784	393	1,564
Stream071	0.65	1,246	624	2,486
Stream072	1.14	1,201	602	2,396
Stream072	1.77	1,924	964	3,838
Stream073	1.03	1,204	603	2,402
Stream073	1.54	1,719	861	3,429
Stream073	1.80	1,874	939	3,740
Stream074	1.43	4,200	2,692	6,552
Stream074	2.43	7,300	4,555	11,698
Stream074	4.66	9,400	5,909	14,952
Stream075	1.01	2,557	1,281	5,101
Stream075	1.94	6,600	4,312	10,208
Stream075	1.99	6,700	4,354	10,309
Stream076	1.20	3,987	1,998	7,954
Stream077	0.81	2,718	1,362	5,423
Stream077	1.45	4,590	2,300	9,158

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream077	2.72	7,146	3,581	14,258
Stream079	0.75	2,113	1,059	4,216
Stream079	1.46	3,999	2,004	7,979
Stream079	2.21	5,768	2,891	11,508
Stream082	1.12	2,831	1,419	5,649
Stream082	2.45	5,017	2,514	10,010
Stream082	3.13	5,447	2,730	10,868
Stream082	3.44	5,721	2,867	11,415
Stream083	0.87	2,089	1,047	4,169
Stream084	1.00	3,265	1,636	6,514
Stream084	2.44	6,426	3,221	12,822
Stream084	2.88	7,010	3,513	13,986
Stream084	3.72	7,569	3,793	15,102
Stream084	5.77	9,851	4,937	19,654
Stream085	1.15	3,163	1,585	6,310
Stream086	1.27	3,281	1,645	6,547
Stream086	1.86	4,087	2,048	8,154
Stream086	4.15	6,870	3,443	13,707
Stream087	1.07	2,772	1,389	5,531
Stream088	1.00	2,222	1,114	4,434
Stream088	1.88	3,911	1,960	7,804
Stream089	1.03	1,804	904	3,600
Stream092	1.10	1,698	851	3,389
Stream093	1.34	1,992	998	3,974
Stream093	1.81	2,370	1,188	4,728
Stream094	0.82	2,425	1,215	4,838
Stream094	1.46	3,835	1,922	7,652
Stream094	2.88	6,442	3,229	12,853
Stream095	1.14	3,123	1,565	6,231
Stream096	1.65	2,970	1,488	5,926
Stream097	1.04	1,314	659	2,622
Stream098	1.05	3,033	1,520	6,052
Stream098	2.01	4,289	2,150	8,558
Stream098	3.01	5,495	2,754	10,964
Stream098	3.94	5,893	2,953	11,757
Stream098	4.54	6,569	3,292	13,107
Stream098	5.46	7,585	3,802	15,135
Stream098	6.44	8,693	4,357	17,344

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream098	6.94	9,464	4,743	18,883
Stream098	9.87	12,243	6,136	24,429
Stream099	0.97	2,674	1,340	5,335
Stream099	2.58	5,453	2,733	10,880
Stream100	0.93	2,968	1,487	5,921
Stream101	1.27	3,831	1,920	7,645
Stream101	2.17	5,173	2,593	10,321
Stream101	2.99	6,319	3,167	12,609
Stream101	4.32	11,900	7,620	18,584
Stream101	4.35	120	99	151
Stream101	4.80	1,600	1,110	2,307
Stream102	1.28	3,284	1,646	6,552
Stream103	1.06	1,787	896	3,565
Stream103	1.53	2,487	1,247	4,963
Stream103	1.93	2,978	1,493	5,943
Stream103	2.37	3,491	1,750	6,966
Stream103	3.63	5,066	2,539	10,109
Stream104	0.54	1,343	673	2,680
Stream104	1.02	2,359	1,182	4,707
Stream105	1.24	3,025	1,516	6,036
Stream106	1.27	3,540	1,774	7,063
Stream106	1.80	4,258	2,134	8,496
Stream107	0.65	1,912	958	3,815
Stream107	1.39	3,390	1,699	6,764
Stream108	1.26	3,282	1,645	6,548
Stream108	1.84	3,999	2,004	7,979
Stream108	2.65	5,335	2,674	10,646
Stream109	0.59	2,215	1,110	4,420
Stream110	0.74	1,893	949	3,776
Stream110	1.57	3,719	1,864	7,420
Stream110	2.18	4,423	2,217	8,825
Stream110	2.95	5,561	2,787	11,096
Stream110	3.67	6,641	3,328	13,250
Stream111	1.36	3,827	1,918	7,635
Stream111	1.96	4,853	2,432	9,683
Stream111	2.42	5,488	2,750	10,949
Stream111	2.66	5,959	2,987	11,890
Stream111	3.52	6,858	3,437	13,684

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream112	0.64	2,052	1,029	4,095
Stream112	1.52	4,663	2,337	9,304
Stream112	2.11	5,029	2,520	10,034
Stream112	2.98	6,455	3,235	12,880
Stream112	3.60	7,106	3,562	14,179
Stream113	1.09	3,300	1,654	6,583
Stream114	1.51	3,836	1,922	7,653
Stream115	0.86	2,839	1,423	5,665
Stream115	1.16	3,460	2,145	5,581
Stream115	1.35	4,430	2,648	7,413
Stream115	1.48	4,570	2,682	7,786
Stream115	1.66	4,760	2,762	8,204
Stream115	1.69	2,730	1,608	4,635
Stream115	1.86	4,520	2,545	8,029
Stream115	1.87	4,970	2,927	8,440
Stream116	1.03	2,784	1,395	5,555
Stream116	1.90	4,494	2,252	8,967
Stream118	0.97	3,781	1,895	7,544
Stream118	1.79	6,002	3,008	11,975
Stream118	2.40	6,498	3,256	12,964
Stream120	0.82	3,098	1,553	6,181
Stream121	0.31	1,559	781	3,110
Stream121	0.54	2,655	1,331	5,298
Stream123	0.44	1,907	956	3,805
Stream123	1.06	3,943	1,976	7,868
Stream125	1.01	3,203	1,605	6,391
Stream125	1.83	4,684	2,348	9,346
Stream125	2.45	5,460	2,737	10,894
Stream125	3.50	7,084	3,550	14,134
Stream126	1.02	3,152	1,580	6,289
Stream126	1.49	3,729	1,869	7,441
Richmond Branch	0.54	1,204	604	2,403
Richmond Branch	1.03	1,782	893	3,555
Richmond Branch	1.84	2,760	1,383	5,506
Andrews Branch	0.52	1,242	623	2,479
Andrews Branch	1.13	2,087	1,046	4,164
Stream129	0.66	1,608	806	3,209
Stream129	1.49	3,335	1,672	6,655

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream130	0.46	1,416	710	2,826
Stream131	1.18	2,687	1,347	5,361
Stream132	0.43	1,080	541	2,155
Stream132	0.79	1,741	872	3,473
Stream132	1.62	2,820	1,413	5,626
Stream133	0.50	1,265	634	2,523
Stream133	1.14	2,004	1,004	3,998
Stream133	1.62	2,429	1,217	4,847
Stream134	0.99	2,134	1,070	4,259
Stream134	2.15	4,105	2,057	8,190
Stream134	3.16	4,941	2,476	9,859
Stream135	0.46	865	434	1,726
Stream135	1.13	1,643	824	3,279
Stream136	0.29	566	284	1,129
Stream136	1.34	2,376	1,191	4,741
Stream137	0.53	1,083	543	2,161
Stream137	0.92	1,631	817	3,254
Stream137	1.18	1,903	954	3,798
Stream138	0.89	1,640	822	3,273
Stream138	1.49	2,202	1,103	4,393
Stream138	2.02	2,543	1,275	5,075
Stream138	2.95	3,435	1,721	6,853
Stream139	0.60	1,543	773	3,079
Stream139	1.44	3,410	1,709	6,803
Stream140	0.29	577	289	1,152
Stream140	1.04	1,755	879	3,501
Stream140	1.57	2,395	1,200	4,778
Stream141	0.61	1,432	717	2,856
Stream141	1.03	2,169	1,087	4,328
Stream141	1.43	2,479	1,242	4,946
Stream141	2.57	3,652	1,830	7,286
Stream142	1.13	2,216	1,111	4,421
Stream142	1.40	2,719	1,363	5,426
Stream143	0.46	737	369	1,471
Stream143	1.09	1,649	826	3,289
Stream143	1.57	2,705	1,356	5,398
Stream144	0.67	1,159	581	2,313
Stream144	1.41	2,010	1,007	4,010

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream144	2.94	3,694	1,851	7,370
Stream145	0.29	482	242	963
Stream145	1.20	1,781	893	3,554
Stream145	1.72	2,308	1,157	4,605
Stream146	0.70	1,067	535	2,130
Stream146	1.39	1,998	1,001	3,986
Stream146	2.33	3,147	1,577	6,279
Stream146	2.80	3,666	1,837	7,315
Stream147	0.46	1,488	746	2,969
Stream148	0.84	3,019	1,513	6,024
Stream149	0.97	2,973	1,490	5,933
Stream150	0.53	1,766	885	3,523
Stream151	0.69	1,843	924	3,678
Stream152	0.32	1,011	507	2,017
Stream153	0.79	2,161	1,083	4,311
Stream154	0.11	272	136	543
Stream155	0.48	723	363	1,443
Stream155	0.74	1,004	503	2,002
Stream156	0.64	1,141	572	2,276
Stream157	0.73	1,365	684	2,724
Stream158	0.15	450	226	898
Stream159	0.39	1,016	509	2,027
Stream160	0.57	1,058	530	2,110
Stream161	0.75	1,382	693	2,757
Stream162	0.43	916	459	1,828
Stream163	0.64	1,690	847	3,372
Stream164	0.54	1,614	809	3,221
Stream164	0.74	1,959	982	3,909
Stream165	0.20	527	264	1,052
Stream165	0.53	1,321	662	2,636
Stream166	0.44	1,224	614	2,443
Stream166	0.75	1,737	871	3,467
Stream167	0.50	994	498	1,983
Stream167	0.77	1,497	750	2,986
Stream168	0.69	1,519	761	3,031
Stream169	0.64	1,534	769	3,060
Stream170	0.43	1,007	505	2,010
Stream170	0.76	1,483	743	2,958

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream171	0.50	1,058	530	2,112
Stream171	0.93	1,891	948	3,181
Stream172	0.58	1,608	806	3,209
Stream173	0.59	1,475	739	2,942
Stream174	0.31	627	314	1,252
Stream175	0.30	648	325	1,293
Stream175	0.61	1,138	571	2,272
Stream175	0.65	4,462	2,236	8,902
Stream176	0.27	632	317	1,262
Stream176	0.66	1,484	744	2,962
Stream177	0.11	352	176	702
Stream178	0.37	858	430	1,713
Stream179	0.44	1,039	521	2,073
Stream180	0.50	974	488	1,944
Stream181	1.08	1,878	941	3,747
Stream181	1.70	2,668	1,337	5,323
Stream183	0.10	403	202	805
Stream184	1.05	4,046	2,028	8,073
Stream184	2.94	6,963	3,490	13,894
Stream184	3.88	7,654	3,836	15,272
Stream184	5.44	10,144	5,084	20,240
Stream185	0.27	1,294	648	2,581
Stream185	1.02	3,242	1,625	6,468
Stream186	0.78	2,618	1,312	5,224
Stream187	0.40	1,775	890	3,542
Stream187	0.96	2,889	1,448	5,765
Stream187	1.66	4,473	2,242	8,925
Stream188	0.65	2,191	1,098	4,372
Stream189	0.68	2,011	1,008	4,013
Stream189	1.25	3,162	1,585	6,308
Stream189	1.43	3,509	1,759	7,001
Stream189	1.91	4,346	2,178	8,672
Stream190	0.38	1,030	516	2,055
Stream191	0.09	347	174	693
Stream192	0.27	934	468	1,863
Stream193	0.50	1,034	518	2,063
Stream193	0.88	1,767	886	3,526
Stream194	0.38	1,024	513	2,043

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream195	0.63	1,566	785	3,124
Stream195	1.30	2,342	1,174	4,674
Stream195	1.73	2,868	1,437	5,722
Stream195	2.33	2,797	1,402	5,581
Stream195	4.47	4,778	2,394	9,532
Stream196	0.29	728	365	1,452
Stream197	0.58	970	486	1,936
Stream197	1.49	2,137	1,071	4,264
Stream198	0.24	810	406	1,615
Stream199	0.47	1,320	661	2,633
Stream201	1.30	2,194	1,100	4,378
Stream201	1.95	3,100	1,554	6,185
Stream202	0.63	1,662	833	3,315
Stream203	0.54	1,410	706	2,812
Stream203	1.22	2,448	1,227	4,884
Stream203	2.23	3,613	1,811	7,209
Stream204	0.59	1,445	724	2,883
Stream205	0.19	477	239	951
Stream205	0.63	1,529	766	3,051
Stream205	1.71	3,180	1,594	6,345
Stream206	0.49	1,199	601	2,391
Stream206	0.69	1,642	823	3,277
Stream207	0.52	1,300	652	2,595
Stream207	0.94	2,059	1,032	4,108
Stream207	1.63	3,366	1,687	6,715
Stream207	2.17	4,202	2,106	8,384
Stream208	0.49	1,155	579	2,305
Stream209	0.43	1,083	543	2,160
Stream210	0.33	842	422	1,680
Stream210	0.56	1,131	567	2,256
Stream210	0.93	1,748	876	3,489
Stream210	1.04	1,888	946	3,767
Stream211	0.48	1,206	605	2,407
Stream211	0.88	1,760	882	3,512
Stream212	0.18	527	264	1,051
Stream213	0.30	616	309	1,230
Stream213	1.09	2,027	1,016	4,045
Stream213	1.60	2,793	1,400	5,573

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream214	0.49	1,148	575	2,291
Stream215	0.48	773	387	1,542
Stream215	0.85	1,318	661	2,630
Stream215	2.15	2,763	1,385	5,512
Stream216	0.31	690	346	1,378
Stream216	0.82	1,429	716	2,851
Stream217	0.70	1,158	581	2,311
Stream217	1.41	2,187	1,096	4,364
Stream217	1.95	2,824	1,416	5,636
Stream217	3.34	3,835	1,922	7,651
Stream218	0.46	1,161	582	2,317
Stream218	0.88	1,314	658	2,621
Stream219	1.01	2,836	1,421	5,658
Stream219	1.89	4,265	2,138	8,510
Stream220	1.04	2,790	1,398	5,566
Stream220	1.63	4,173	2,091	8,325
Stream224	1.10	2,546	1,276	5,080
Stream224	1.56	3,467	1,738	6,918
Stream226	1.14	3,149	1,578	6,284
Stream226	1.90	4,381	2,196	8,742
Stream227	0.69	1,951	978	3,892
Stream227	1.39	3,716	1,862	7,415
Stream227	2.18	5,452	2,733	10,879
Stream227	3.34	7,438	3,728	14,841
Stream227	4.54	8,750	4,385	17,458
Stream230	1.22	2,558	1,282	5,105
Stream233	1.10	2,535	1,270	5,057
Stream233	2.03	4,309	2,160	8,598
Stream233	2.80	4,897	2,454	9,771
Stream234	1.49	3,000	1,503	5,985
Stream235	1.48	3,653	1,831	7,288
Stream237	1.43	4,258	2,134	8,496
Stream237	2.32	5,686	2,850	11,345
Stream238	1.22	3,586	1,797	7,156
Stream238	2.32	5,324	2,669	10,624
Stream239	0.97	2,799	1,403	5,585
Stream239	1.53	4,239	2,125	8,458
Stream241	1.22	4,179	2,095	8,339

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream242	1.34	3,033	1,520	6,052
Stream243	1.11	2,347	1,176	4,683
Stream244	1.09	2,672	1,339	5,331
Stream245	1.25	3,040	1,524	6,065
Stream245	1.72	3,857	1,933	7,695
Stream245	2.30	4,892	2,452	9,761
Stream245	3.20	6,082	3,048	12,135
Stream247	1.11	2,699	1,353	5,386
Stream248	0.86	1,167	585	2,328
Stream248	1.52	1,942	973	3,875
Stream249	1.33	2,738	1,372	5,463
Stream249	1.84	3,522	1,765	7,027
Stream250	0.96	1,736	870	3,463
Stream250	1.63	2,804	1,405	5,595
Stream250	2.25	3,282	1,645	6,548
Stream250	3.18	4,377	2,194	8,733
Stream250	5.78	7,064	3,540	14,095
Stream251	0.82	1,598	801	3,188
Stream251	1.52	2,796	1,401	5,579
Stream251	1.92	3,133	1,570	6,251
Stream251	2.81	3,989	1,999	7,959
Stream251	3.37	4,392	2,201	8,764
Stream251	4.05	5,086	2,549	10,148
Stream251	4.53	5,460	2,737	10,895
Stream251	5.09	5,395	2,704	10,764
Stream252	0.43	970	486	1,934
Stream252	1.54	3,123	1,565	6,230
Stream252	1.90	3,422	1,715	6,828
Stream252	2.24	3,490	1,749	6,963
Stream253	1.31	2,566	1,286	5,121
Stream254	0.87	1,493	748	2,979
Stream254	1.72	2,752	1,379	5,490
Stream254	2.34	3,393	1,700	6,769
Stream256	1.36	2,983	1,495	5,952
Stream256	2.05	4,063	2,036	8,107
Stream256	2.70	4,833	2,422	9,644
Stream256	3.50	5,838	2,926	11,649
Stream257	1.20	1,979	992	3,949

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Stream257	1.41	2,450	1,228	4,889
Stream258	1.08	1,903	954	3,796
Stream258	1.56	2,653	1,330	5,294
Stream259	0.76	1,465	734	2,924
Stream259	1.69	3,000	1,504	5,986
Stream260	1.11	2,079	1,042	4,148
Stream260	1.57	2,838	1,423	5,663
Stream261	1.32	3,086	1,547	6,157
Stream262	1.28	3,335	1,671	6,654
Stream262	1.71	4,316	2,163	8,611
Stream262	2.69	5,583	2,798	11,140
Stream262	3.99	6,749	3,383	13,467
Stream263	0.92	1,778	891	3,547
Stream263	1.53	2,819	1,413	5,624
Stream264	1.12	1,654	829	3,300
Stream264	1.74	2,444	1,225	4,876
Stream265	1.03	1,722	863	3,436
Stream265	1.39	2,367	1,186	4,723
Stream265	2.06	3,138	1,573	6,262
Sycamore Creek	1.01	4,351	2,181	8,681
Sycamore Creek	1.34	4,882	2,447	9,740
Tenney Creek	0.86	1,872	938	3,735
Tenney Creek	1.74	3,528	1,768	7,038
Tenney Creek	2.41	4,461	2,236	8,901
Tenney Creek	2.92	4,774	2,393	9,525
Tenney Creek	3.69	5,670	2,842	11,314
Tenney Creek	7.30	8,895	4,458	17,747
Tenney Creek	8.05	9,043	4,532	18,043
Tenney Creek	13.90	13,362	6,697	26,661
Tenney Creek	15.88	14,257	7,145	28,446
Tenney Creek	18.07	14,616	7,325	29,162
Tenney Creek	22.21	15,883	7,961	31,691
Tenney Creek	25.64	16,203	8,121	32,329
Tenney Creek	40.16	20,180	11,464	35,522
Town Branch	1.17	1,440	722	2,873
Town Branch	2.26	2,526	1,266	5,039
Town Branch	2.78	3,151	1,579	6,288
Town Branch	3.62	4,025	2,017	8,032

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
Town Branch	4.45	5,191	2,602	10,358
Town Branch	5.66	6,806	3,411	13,580
Town Branch	6.76	7,842	3,930	15,646
Town Creek	0.29	776	389	1,548
Town Creek	0.68	1,712	858	3,417
Town Creek	1.24	2,963	1,485	5,913
Unnamed Tributary to Plum Creek	0.57	1,646	825	3,285
UNT 1 to UNT to Cedar Fork	0.73	1,961	983	3,913
UNT 1 to UNT to Cedar Fork	1.46	3,426	1,717	6,835
UNT 1 to UNT to Cedar Fork	2.43	4,827	2,419	9,632
UNT 2 to UNT to Cedar Fork	0.44	1,551	777	3,094
UNT of Cypress Creek	0.81	2,722	1,364	5,430
UNT of Cypress Creek	1.61	3,802	1,905	7,585
Wanslow Creek	0.49	1,460	732	2,913
Wanslow Creek	1.72	4,597	2,304	9,173
Wanslow Creek	2.77	6,484	3,250	12,938
Wanslow Creek	3.70	7,943	3,981	15,848
Wanslow Creek	7.47	12,102	6,065	24,146
Wanslow Creek	8.45	12,993	6,512	25,924
Wanslow Creek	9.37	13,256	6,644	26,449
Wanslow Creek	10.49	14,520	7,277	28,970
Wanslow Creek	12.10	16,371	8,205	32,664
Wanslow Creek	13.30	17,665	8,854	35,247
Water Hole Creek	0.66	2,188	1,096	4,365
Water Hole Creek	1.58	4,007	2,008	7,994
Water Hole Creek	4.49	6,774	3,395	13,516
Water Hole Creek	6.24	7,305	3,661	14,575
Water Hole Tributary 5	1.32	2,935	1,471	5,855
Water Hole Tributary 5	1.91	3,477	1,743	6,939
West Fork Hines Branch	1.32	3,726	1,868	7,435
West Fork Hines Branch	2.66	6,017	3,016	12,006
West Fork Hines Branch	3.48	6,601	3,308	13,171
West Fork Plum Creek	1.14	2,197	1,101	4,384
West Fork Plum Creek	2.57	4,287	2,149	8,554
West Fork Plum Creek	3.92	5,488	2,751	10,950
West Fork Plum Creek	7.80	8,322	4,171	16,606
West Fork Plum Creek	10.02	10,019	5,021	19,990
West Fork Plum Creek	10.14	10,116	5,070	20,183

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
West Fork Plum Creek	11.30	10,098	5,061	20,148
West Fork Plum Creek	11.64	10,342	5,183	20,634
West Fork Plum Creek	13.56	10,991	5,508	21,930
West Fork Plum Creek	14.63	11,685	5,857	23,316
West Fork Plum Creek	14.91	11,864	5,946	23,673
West Fork Plum Creek	15.38	11,710	5,869	23,364
West Fork Plum Creek	16.70	12,507	6,268	24,954
West Fork Plum Creek	19.24	13,832	6,932	27,598
West Fork Plum Creek	19.96	13,661	6,847	27,257
West Fork Plum Creek	21.11	14,275	7,155	28,483
West Fork Plum Creek	27.86	17,639	8,841	35,195
West Fork Plum Creek	29.63	18,289	9,166	36,491
West Fork Plum Creek	31.11	18,965	9,505	37,840
West Fork Plum Creek	34.45	19,437	9,741	38,781
West Fork Plum Creek	37.12	18,804	9,424	37,519
West Fork Plum Creek	40.49	20,100	10,074	40,104
Willow Springs Creek	0.55	1,445	724	2,884
Willow Springs Creek	1.53	3,431	1,719	6,845
Willow Springs Creek	2.25	4,130	2,070	8,240
Willow Springs Creek	2.97	4,892	2,452	9,761
Willow Springs Creek	3.22	5,055	2,534	10,087
Willow Springs Creek	3.51	5,268	2,640	10,511
Willow Springs Creek	4.74	6,361	3,188	12,692
Wilson Creek	1.03	3,136	1,572	6,257
Wilson Creek	1.53	3,882	1,946	7,746
Wilson Creek	2.38	5,656	2,835	11,285
Wilson Creek	3.39	6,311	3,163	12,591
Wilson Creek	5.35	10,142	5,083	20,236
WOLF CREEK	0.52	919	460	1,833
WOLF CREEK	0.95	1,616	810	3,225
WOLF CREEK	1.47	2,383	1,194	4,754
WOLF CREEK	1.75	2,517	1,262	5,023
WOLF CREEK	2.56	3,329	1,668	6,642
WOLF CREEK	2.83	3,572	1,790	7,128
WOLF CREEK	3.25	4,025	2,017	8,032
WOLF CREEK	4.20	4,741	2,376	9,460
WOLF CREEK	5.17	5,277	2,645	10,529
WOLF CREEK	5.94	5,565	2,789	11,104

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
WOLF TRIBUTARY 2	0.52	1,072	537	2,139
WOLF TRIBUTARY 2	0.74	1,342	672	2,677
York Creek	0.65	2,094	1,049	4,178
York Creek	1.55	4,611	2,311	9,201
York Creek	2.56	6,389	3,202	12,748
York Creek	3.56	7,409	3,713	14,783
York Creek	4.11	8,487	4,254	16,935
York Creek	6.49	11,807	5,917	23,557
York Creek	12.67	20,575	10,312	41,052
York Creek	14.59	22,779	11,417	45,451
York Creek	19.43	27,790	13,928	55,449
York Creek	23.14	29,834	14,952	59,527
York Creek	27.42	31,926	16,001	63,701
York Creek	27.75	28,914	14,491	57,690
York Creek	34.13	33,276	16,678	66,395
York Creek	142.02	45,539	27,600	87,400
YORK FORK TRIBUTARY 1	1.00	2,016	1,010	4,023
YORK FORK TRIBUTARY 1	1.98	3,393	1,701	6,770
YORK FORK TRIBUTARY 10	1.20	2,180	1,093	4,350
YORK FORK TRIBUTARY 10	1.82	2,864	1,436	5,715
YORK FORK TRIBUTARY 10	2.72	3,590	1,799	7,163
York Fork Tributary 16	0.43	1,119	561	2,232
York Fork Tributary 16	0.71	1,651	827	3,294
York Fork Tributary 17	0.23	616	309	1,230
YORK FORK TRIBUTARY 5	1.09	2,317	1,161	4,622
YORK FORK TRIBUTARY 5	1.74	3,272	1,640	6,528
York Tributary 1	1.42	4,081	2,046	8,143
York Tributary 1	2.05	4,932	2,472	9,841
York Tributary 16	1.04	3,622	1,815	7,226
York Tributary 16	2.00	5,668	2,841	11,309
YORK TRIBUTARY 30	1.15	2,348	1,177	4,684
YORK TRIBUTARY 30	1.65	2,984	1,496	5,954
YORK TRIBUTARY 33	1.05	3,315	1,661	6,615
YORK TRIBUTARY 33	1.93	4,352	2,181	8,683
YORK TRIBUTARY 33	2.70	5,120	2,566	10,215
YORK TRIBUTARY 37	1.07	1,686	845	3,363
YORK TRIBUTARY 37	1.69	2,657	1,332	5,302
YORK TRIBUTARY 37	2.79	4,128	2,069	8,237

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
YORK TRIBUTARY 37	5.49	7,023	3,520	14,014
YORK TRIBUTARY 37	6.52	7,795	3,907	15,553
YORK TRIBUTARY 4	1.08	1,383	693	2,760
YORK TRIBUTARY 4	1.52	1,883	944	3,757
YORK TRIBUTARY 4	2.01	2,168	1,087	4,326
YORK TRIBUTARY 4	2.74	2,638	1,322	5,264
YORK TRIBUTARY 4	3.23	3,140	1,574	6,265
YORK TRIBUTARY 4	7.38	6,339	3,177	12,648
YORK TRIBUTARY 4	8.28	6,985	3,501	13,937
YORK TRIBUTARY 4	8.71	7,249	3,633	14,464
YORK TRIBUTARY 4	11.18	8,985	4,503	17,927
YORK TRIBUTARY 41	0.71	1,758	881	3,507
YORK TRIBUTARY 41	1.37	3,181	1,594	6,346
YORK TRIBUTARY 41	2.06	3,830	1,919	7,641
YORK TRIBUTARY 51	1.04	2,736	1,371	5,460
YORK TRIBUTARY 51	1.42	2,906	1,457	5,799
YORK TRIBUTARY 53	1.28	2,593	1,300	5,174
YORK TRIBUTARY 55	1.24	2,940	1,473	5,866
YORK TRIBUTARY 55	2.23	4,224	2,117	8,428
YORK TRIBUTARY 61	1.07	2,309	1,157	4,607
YORK TRIBUTARY 61	1.48	3,085	1,546	6,155
YORK TRIBUTARY 61	2.08	3,554	1,781	7,091
YORK TRIBUTARY 63	1.37	3,356	1,682	6,696
YORK TRIBUTARY 63	2.31	4,639	2,325	9,256
YORK TRIBUTARY 63	3.26	5,466	2,740	10,906
YORK TRIBUTARY 63	7.41	10,575	5,300	21,100
YORK TRIBUTARY 63	8.33	9,963	4,993	19,878
YORK TRIBUTARY 63	8.47	10,150	5,087	20,252
YORK TRIBUTARY 63	10.06	10,922	5,474	21,792
YORK TRIBUTARY 67	1.13	2,354	1,180	4,698
YORK TRIBUTARY 67	1.86	3,470	1,739	6,924
York Tributary 7	1.14	3,433	1,721	6,851
York Tributary 7	1.25	3,743	1,876	7,468
YORK TRIBUTARY 8	1.34	2,460	1,233	4,908
YORK TRIBUTARY 8	1.66	2,482	1,244	4,951
YORK TRIBUTARY 8	3.08	3,786	1,897	7,554
York Tributary 8_Comal Co	1.08	3,184	1,596	6,353
York Tributary 8_Comal Co	2.04	5,047	2,529	10,070

Stream Name	Drainage Area (sq. mi)	1% Peak Q (cfs)	1%- Peak Q (cfs)	1%+ Peak Q (cfs)
York Tributary 8_Comal Co	2.54	5,902	2,958	11,777
York Tributary 8_Comal Co	3.39	7,524	3,771	15,012
York Tributary 8_Comal Co	4.19	8,900	4,461	17,758
York Tributary 8_Comal Co	4.90	9,894	4,959	19,740
York Tributary 8_Comal Co	5.67	10,800	5,413	21,548
YORK TRIBUTARY 9	0.80	1,635	819	3,262
YORK TRIBUTARY 9	1.14	2,078	1,041	4,146

Appendix B BLE Map