10-30-2018

An Evaluation of Modified Bed Load Sediment Transport Equations for Enhanced Sediment Transport Quantification in Steep Mountain Streams – Case Study Little Fountain Creek, Colorado Springs, Co.

James Emerson Smith IV
Louisiana State University and Agricultural and Mechanical College

AN EVALUATION OF MODIFIED BED LOAD SEDIMENT TRANSPORT EQUATIONS FOR ENHANCED SEDIMENT TRANSPORT QUANTIFICATION IN STEEP MOUNTAIN STREAMS – CASE STUDY LITTLE FOUNTAIN CREEK, COLORADO SPRINGS, CO.

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Science

In

The Department of Geology and Geophysics

By
James Emerson Smith IV
B.S., Louisiana State University, 2015
December 2018

Table of Contents

List of Figures

List of Tables

Abstract

In mountainous regions, extreme floods occur every year, placing societies and infrastructures at risk. Communities rely on local, state, and federal agencies to emplace flood structures, perform flood risk assessments, and simulate catastrophic events. While, our ability to quantify and predict the movement of sediment in streams with low gradients is well developed (Bathurst, 1987), our ability to quantify and predict the movement of sediment along steep mountain streams (SMS) has not been developed to a similar degree (Yager, 2012; Schneider, 2016). To most effectively manage mountainous watersheds and understand the risk associated with flood events, scientists must better understand the hydraulics, morphometric controls, and processes that drive sediment transport in SMS systems.

In September 2013, a large low-pressure system brought torrential rainfalls to the state of Colorado, producing hazardous floods and amassing $3 billion in damages (Kimbrough, 2015). Louisiana State University owns a 1400 - acre property southwest of Colorado Springs, Colorado within the 35-km^2, Upper Little Fountain Creek (ULFC) watershed. The stream is classified as a SMS, and exhibits cascade and step-pool morphologies. Extensive flooding was observed throughout the entire Little Fountain Creek watershed during the 2013 flood event. Within ULFC, the simulated peak streamflow discharge was 40 m^3/s. Keeton Reservoir, a structure downstream of the studied mountainous reach, was compromised during the 2013 food event infilling 60% full with 12,615 m^3 of sediment. The 2013 flood and resultant sediment transport event combined with the documented infilling of the Keeton Reservoir provided an ideal experiment for testing our understanding and ability to predict sediment movement during extreme floods in ungauged watersheds. Thus, the objectives are to (1) apply two methods used to quantify event-driven sediment transport in SMS, (2) determine the range and magnitude of

event-driven sediment transport in LFC for the 2013 flood event, and (3) compare the results to the known volume of sediment that was deposited in Keeton Reservoir. We hypothesize that the integration of simulated hydraulic parameters with high-resolution measurements of channel morphology and grain-size distribution will increase the accuracy of sediment transport quantifications for the 2013 flood event in ULFC.

1. Introduction

In September 2013, a large atmospheric low-pressure system brought torrential rainfalls to Colorado, producing hazardous floods; amassing $3 billion in damages statewide (Kimbrough, 2015). Every year, such extreme events occur damaging infrastructure and placing communities at risk worldwide. To most effectively prepare for floods and their related consequences, we need to intimately understand the processes driving sediment delivery from Steep Mountain Streams (SMS) to lower gradient systems. Currently, a large gap in scientific knowledge exists within the practice of accurately quantifying the magnitude of event driven sediment delivery from SMS's; particularly SMS channels with step-pool and cascade morphologies. An improved understanding of SMS dynamics will provide valuable insights on: hazard mitigation, stream restoration practices, flood risk assessment, the quantification of reservoir infilling rates, and flood structure design.

Steep channels with step-pool morphology, become the dominant form at lower gradients in mountainous watersheds, and partially control the amount, timing, and grain-size distribution of sediment delivered to downstream rivers (Yager, 2012). Step-pool channels have steep longitudinal gradients (0.02–0.20 m/m) with a repeating sequence of boulders, large woody debris (LWD), bedrock steps, and intervening pools (Chin and Wohl, 2005). The hydraulics, channel morphology, and grain-size distribution in step-pool channels are tightly coupled, with flow resistance resulting from the form drag of step-forming clasts and from spill over from steps into downstream pools (Curran and Wohl, 2003; MacFarlane and Wohl, 2003; Wilcox et al., 2006). These complexities make sediment transport quantification in SMS systems difficult, and

bring into question the validity in applying traditional sediment transport equations to these systems.

Traditional sediment transport equations (which were developed for lower gradient streams) do not account for the dynamic characteristics of SMS's, such as: relative abundance of mobile and immobile sediment in the stream, hiding properties of immobile steps, increased energy losses, elevated flow resistance, step protrusions, and marked variation in stream hydraulics (Yager, 2012). This disparity leads to over predictions in event driven sediment transport quantification for SMS's by several orders of magnitude when applying traditional sediment transport equations to SMS systems (Yager, 2012). Due to inaccuracies in applying traditional sediment transport equations to simulated flows, researchers have relied on other methods to quantify event driven sediment transport rates in SMS's through: pre-and post-flood LIDAR differencing, repeat survey data analysis in monitored streams, and the development of bedload rating curves from years of data in specific regions (Ryan, 2005; Rathburn, 2017). The problem with these methods is that they are site specific, require long-term stream monitoring, and high-resolution datasets that are not always/readily available to researchers; these methods also lack accuracy for high discharges. In recent years, researchers have developed modified bedload sediment transport equations for SMS's that take into account some of the dynamic characteristics mentioned above. These equations have proven successful in quantifying event driven sedimentation in SMS's, and have reduced the magnitude of over/under prediction to less than 3 orders of magnitude (Pagliara and Chiavaccini, 2006; Egashira and Ashida, 1991; Yager, 2012; Rickenmann and Recking, 2011; and Schneider, 2016). The modified sediment transport equations put forth by the studies are different in the: parameters used to characterize the stream,

methods undertaken to extract hydraulics, the application flow resistance partitioning equations, and the overall structure of bedload sediment transport equations used.

In this study, two methods (Schneider, 2016; Yager, 2012) for estimating the magnitude of event-driven sedimentation in SMS's were applied. The Schneider (2016) and Yager (2012) methodologies were selected for evaluation in this study due an overlap in: reach averaged parameters needed to apply sediment transport equations, a discharge based approach for extracting hydraulics, and proven success in the prediction of total bedload sediment transport volumes.

The Yager (2012) method delineates the streambed surface into mobile and immobile sediment fractions based on grain size distribution and the presence of immobile steps. The geometry of step-pool sequences and the relationship between immobile and mobile sediments is used to determine the influence of immobile steps to the variation in shear stress acting on mobile grains. From this, Yager (2012) applies a theoretical flow resistance model that uses stress partitioning to account for flow resistance due to macro-roughness elements. This flow resistance model is then used to back calculate reach averaged hydraulic parameters for the specified reach. Yager (2012) modifies equations from Parker (1990) to partition stress and determine bedload sediment transport rates in SMS systems. Yager (2012) evaluated this method in three steep mountain stream systems and was able to predicted bed-load sediment transport rates within one order of magnitude of measured values. Yager (2012) states that "bedload sediment transport can be determined in any steep mountain stream using a series of calculations, eight reach averaged variables/measurements (width, slope, unit discharge, mean boulder diameter, boulder

protrusion, grain size distribution of mobile sediment, step spacing, step width), two drag coefficients, and a hydrograph.

The Schneider (2016) method uses empirical functions, a representative grain-size fraction of entire stream surface (D_{84}, D_{50}), and the hydraulic radius to determine flow resistance in steep mountain streams. Flow resistance partitioning between base level flow resistance (low relative submergence) and total flow resistance (includes macro-roughness elements) is performed to attain a reduced energy slope after Rickenmann and Recking (2011). The reduced energy slope is then used to determine the effective shear stress (energy available for transport) for each time interval through the hydrograph. The effective shear stress is used with a reference shear stress to attain a total dimensionless bedload transport rate for each time interval in the hydrograph. These are summed over the length of the flood event to get a total bedload transport rate for the flood. Schneider (2016) recorded total transport rates within one order of magnitude of measured values.

The objectives of this study are to (1) apply these two methods used to quantify event-driven sediment transport in SMS, (2) determine the range and magnitude of event-driven sediment transport in LFC, (3) to validate results with volume of sediment deposited in Keeton Reservoir. The integration of simulated flood parameters with high-resolution measurements of channel: slope, width, grain-size distribution, and step-pool geometries should increase the accuracy in the quantification of sediment transport in ULFC for the 2013 flood event. This study will assess the validity in applying modified bedload sediment transport equations in ungauged SMS systems through the comparison of sediment transport predictions, per Yager (2012) and Schnieder

(2016), to the measured volume of sediment deposited in Keeton Reservoir for the 2013 flood event (12,615 m^3).

2. Background

2.1 - LFC Basin and Field site

Little Fountain Creek (LFC) is a 145-km^2 dendritic watershed with headwaters in the foothills of the Rocky Mountains, southwest of Colorado Springs. LFC originates at an elevation of 3,196 m and then flows west to east across El Paso County before entering Fountain Creek, a major tributary to the Arkansas River, at an elevation of 1,636 m. The LFC basin can be further divided into 5 sub-basins: Upper LFC (ULFC), Middle LFC (MLFC), Lower LFC (LLFC), Turkey Creek (TK), and Rock Creek (RC) (Figure 1). These sub-divisions are based on major confluences.

The ULFC Basin has a drainage area of 35km^2. The channel with in this mountainous drainage network is characterized as a SMS system, with centerline channel slopes ranging from 2-6%. Step-pool, cascade, and bedrock channel morphologies are recognized throughout the ULFC watershed, with step-pool channels being the dominant form. Within ULFC, the channel is underlain by granitic and metamorphic rocks from the early to middle Proterozoic (Rowley, 2003). These Granitic and metamorphic rocks are felsic in composition and weather to a poorly sorted, unconsolidated grus material, composed of coarse sand and pebbles. The stream network in the ULFC watershed is heavily confined by steep hillslopes that are mantled by this grus material. Hillslopes throughout ULFC serve as a potential point source for fine-grained sediment to enter the stream during extreme rainfall events; however, the degree of coupling between the hillslopes and the stream channel has not been documented. Keeton Reservoir, a human-made

structure and water resource for the City of Fountain, is located in the southeast portion of ULFC watershed, and serves as a retention basin for sediments transported from west to east across the ULFC watershed.

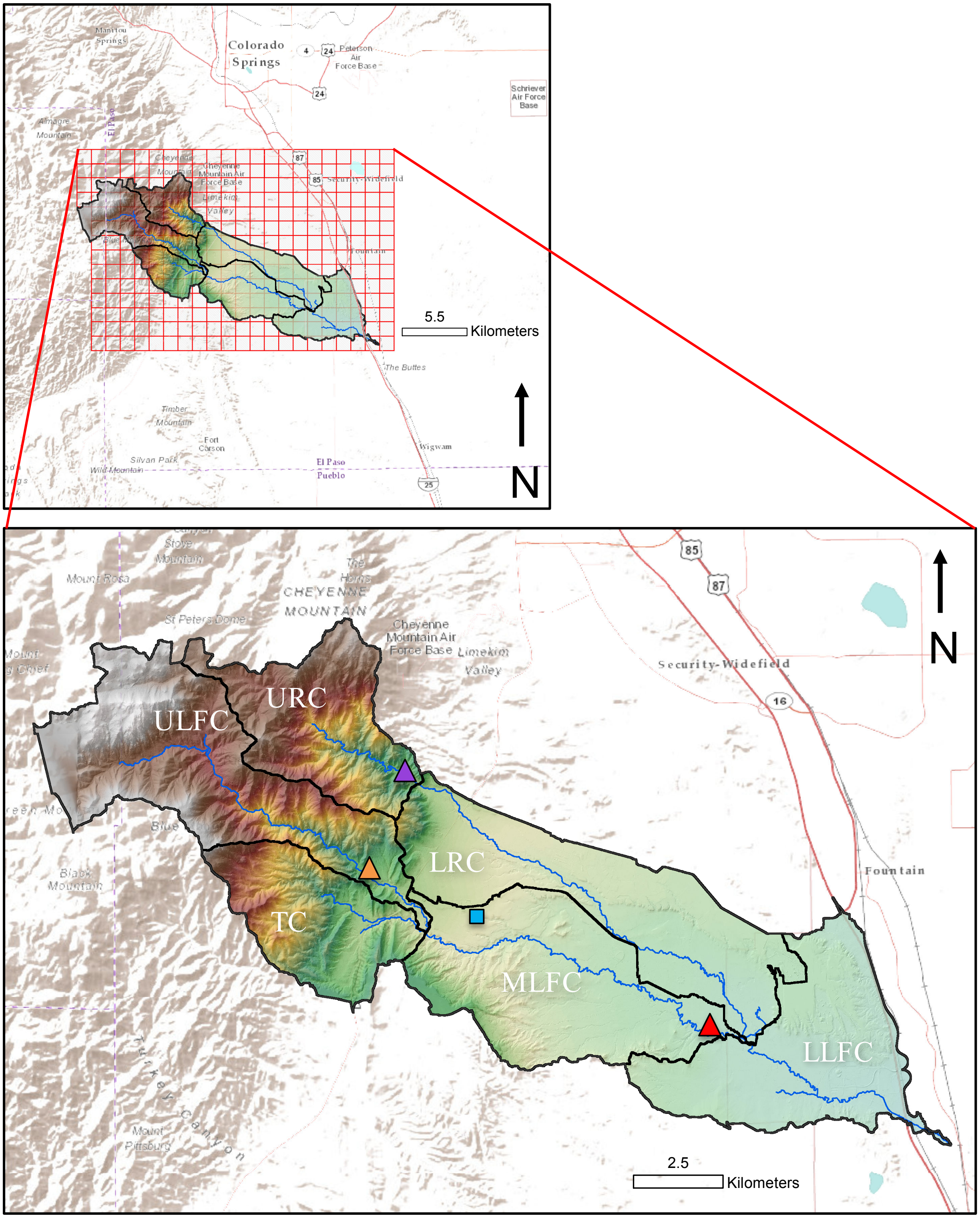

Figure 1. (Upper Left) Map of South-Central Colorado showing regional location of the study area and extent of 2011 pre-flood LIDAR (red tiles). (Lower) Extent of LFC watershed with sub-basin watersheds delineated – (ULFC, URC, TC, LRC, MLFC, LLFC). Stream gauges (triangles) and atmospheric sites (squares) are shown. Rock Creek (purple triangle), Little Fountain Creek (Red triangle), Little Fountain Creek above Keeton Reservoir (Orange Triangle), Rod and Gun met station (light blue square).

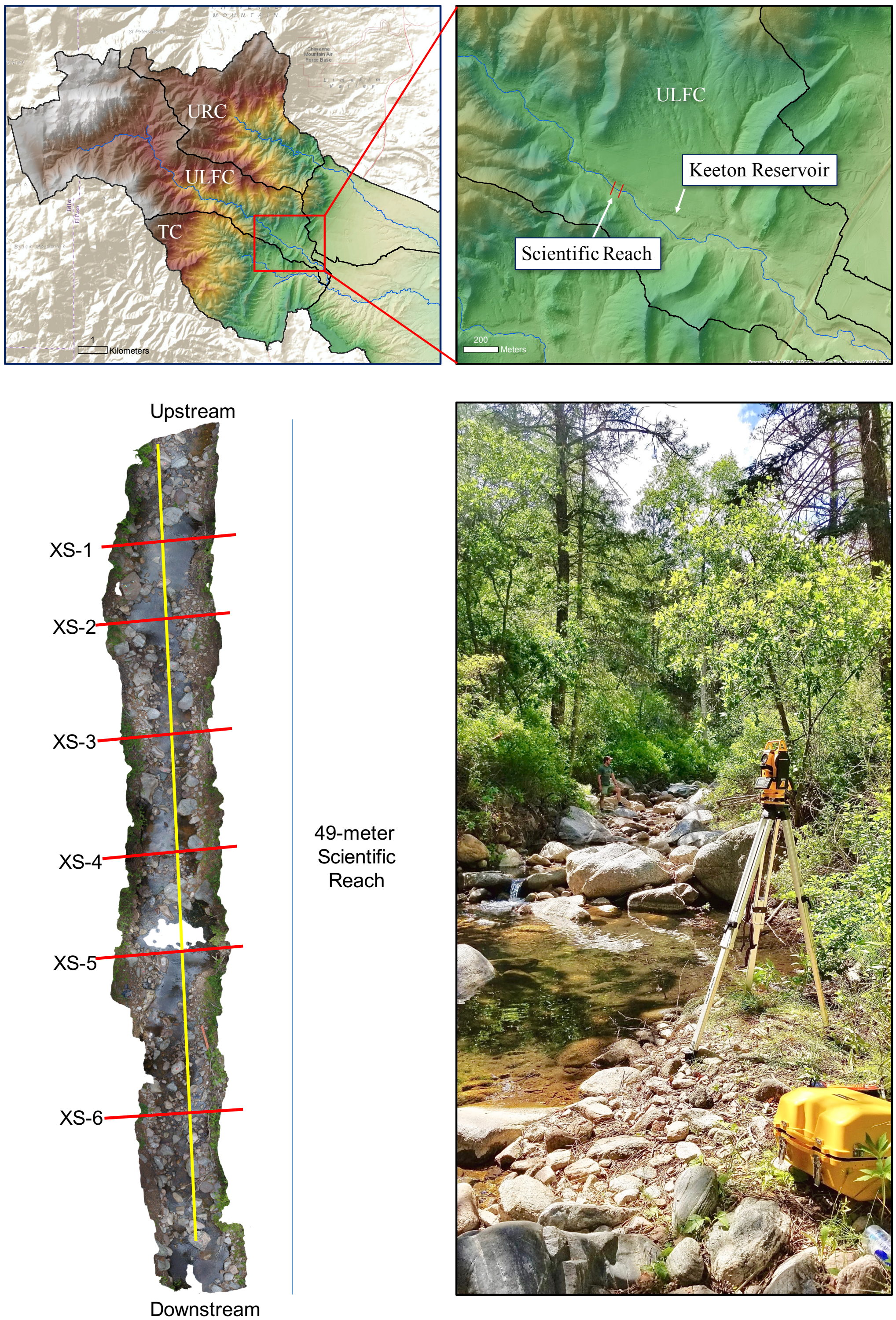

Figure 2. (Upper left) Digital elevation map of ULFC with location of study area outlined in red. (Upper right) Location of studied reach in relation to Keeton Reservoir. (Lower left) Orthomosaic of 49-meter scientific reach with the approximate locations of 6 cross sections (red) and the longitudinal profile (yellow) shown. (Lower right) Photograph of Scientific reach June 2018. Notice the wide range of grain sizes present in the stream.

A 49-meter reach of Little Fountain Creek, within the ULFC subbasin, was established as the scientific reach for this study. This reach exhibits 35 meters of step-pool and 14-m of cascade morphology, and has a thalweg channel slope of 0.044 m/m. This reach of stream was selected based upon the following criteria: (1) the straightness of the reach, (2) exhibits morphology representative of the ULFC subbasin, (3) the proximity to Keeton Reservoir (200 m upstream), (4) the presence of steep, confining hillslopes that limit lateral expansion of flow during high discharge events (5) the absence of large woody debris in stream, (6) the ratio of reach length (49 m) to bankfull channel width of 10. Field surveys of channel morphology and grain size distribution within this reach were used to extract the morphometric parameters necessary to apply modified bedload sediment transport equations in LFC.

2.2 - Gauging throughout watershed

Neither the USGS nor local agencies monitor the ULFC basin for flood frequency analysis or climatic studies. A total of three active USGS monitoring stations lie within the LFC basin (outside of the studied watershed), two stream gauges and one atmospheric site (Figure 1,3). Precipitation data for the 2013 event are provided at 5-minute intervals for the USGS atmospheric site within the LFC Basin, the USGS 84053104492001 - Rod and Gun Meteorologic station (Figures 1,3). The USGS - National Water Information System provides estimated and approved peak flood discharge data, at 15 minute intervals, for two stream gauges within the LFC basin for the 2013 event: USGS 07105940 - Little Fountain Creek near Fountain, and USGS 07105945 - Rock Creek above Fort Carson (Figure 1,3). Stream hydrograph discharge and point precipitation totals for the storm are shown in Figure 3. No stream gauges were active for the 2013 flood event in ULFC. However, approved historical data for the inactive stream gauge site, USGS 07105920 - Little Fountain Creek above Keeton reservoir (Figure 1) are

available for the years 1978-1988, 1995-1998. Historical data allowed for the development of a discharge scaling relationship between Little Fountain Creek above Keeton reservoir to be determined based on the long-term relationship the Rock Creek above Fort Carson Gauge.

2.3 - 2013 flood event

In early September 2013, a large low-pressure system setup over the state of Colorado, pulling vast amounts of tropical moisture northward from the Pacific Ocean and Gulf of Mexico (Kimbrough, 2015). This low-pressure system resulted in one of the most extreme precipitation events in Colorado history with numerous daily rainfall records set across the state. By September 16, 2013, as much as 30 to 51 cm of rain had fallen in the foothills of the Southern Rocky Mountains and adjacent plains near Colorado Springs, Colorado (Kimbrough, 2015). The Rod and Gun gauging station (Figure 1,3), is within LFC watershed, and currently has set the highest daily rainfall record in the state, with >30 cm falling over a 24-hour period on September 11-12 (Nolan Doesken, State Climatologist for Colorado, written coummun. 2014). Gridded radar precipitation data from NOAA's Advanced Hydrologic Prediction Service shows that rainfall totals would have increased to the west of the Rod and Gun precipitation gauge within the ULFC basin (Figure 4). With this information, rainfall totals and streamflow discharges within the studied reach would have been proportionally on par with the highest in the state for this event.

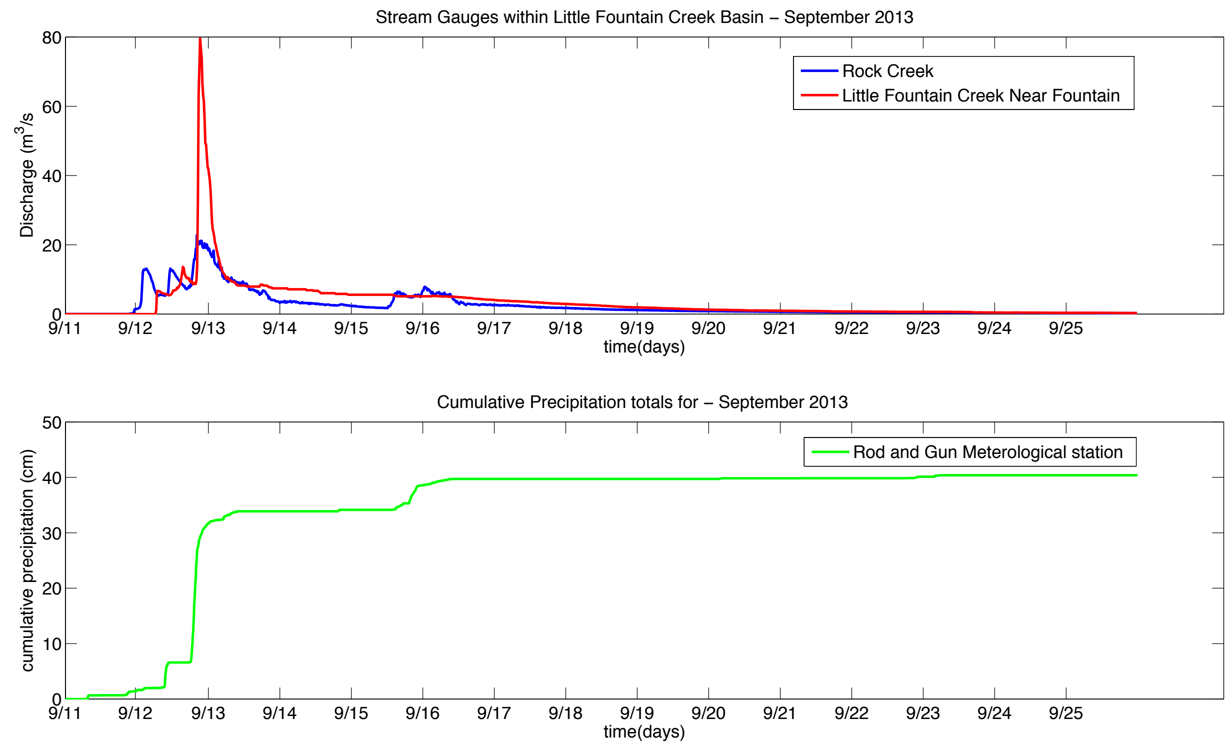

Figure 3. (Above) Discharge hydrographs for the Rock Creek and Little Fountain Creek above Fountain USGS stream gauges during September 2013 flood event. (Below) Cumulative precipitation totals for the USGS - Rod and Gun Metrologic Station during September 2013 flood event.

In LFC, peak discharges occurred late on September 12, around 21:00 Mountain standard time. This coincides with the period of maximum rainfall within this basin (Figure 3). The Rock Creek stream gauge, above Fort Carson, (Figure 1,3) had a peak discharge of 23 m^3/s for the 2013 flood event, this is the highest streamflow recorded in the 35-year history of the station (Kimbrough, 2015). The Little Fountain Creek near Fountain gauging station (Figure 1,3), recorded a peak discharge of 80 m^3/s, this is the highest peak discharge recorded in the 12-year history of the station (Kimbrough, 2015).

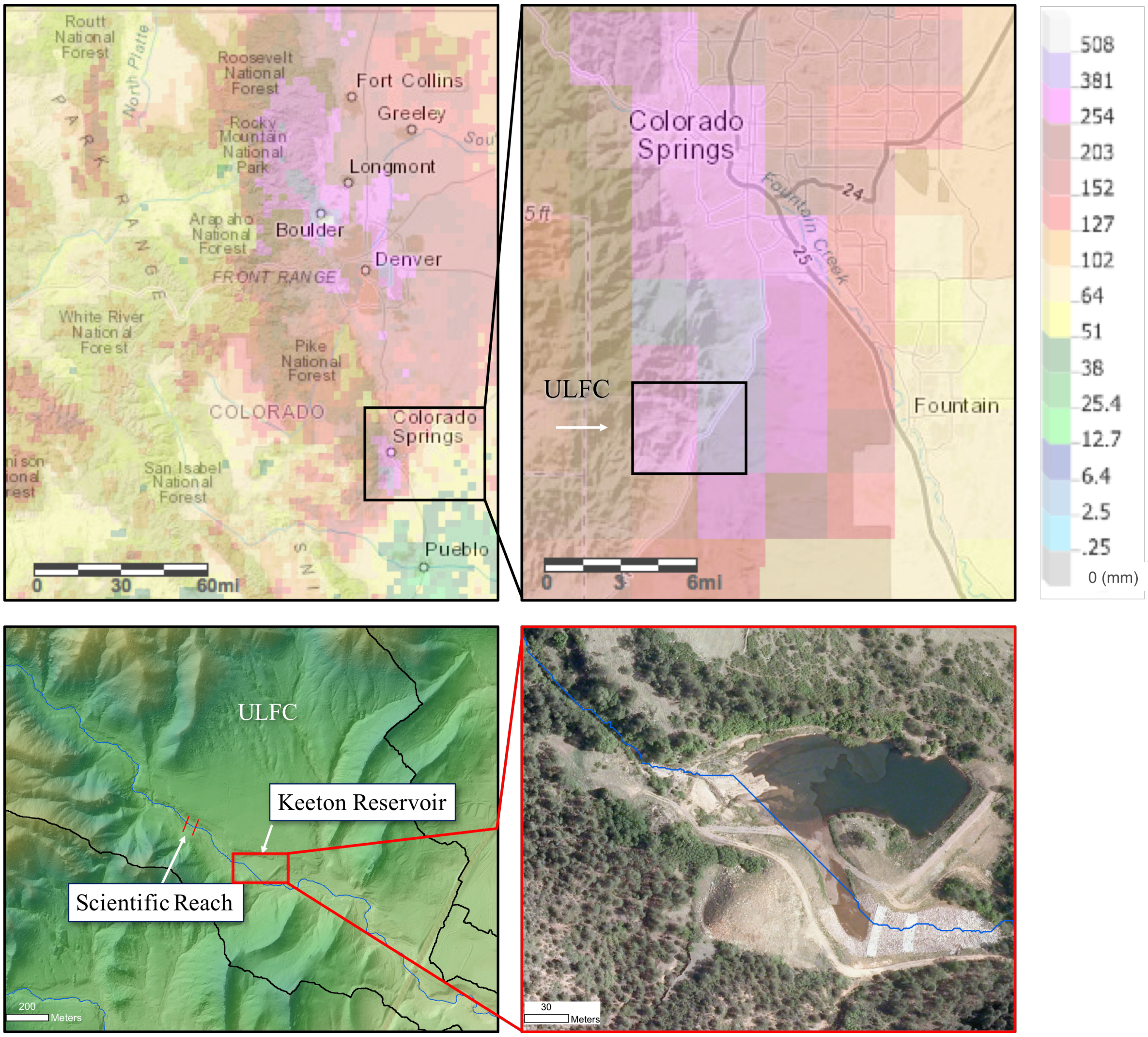

Figure 4. (Upper left) observed rainfall totals for September - 2013 flood event across the Front Rage of Colorado. (Upper Right) Observed Rainfall totals for Colorado Springs with ULFC study area outlined. ULFC is on par with highest rainfall totals in the state. (Lower Left) location of Keeton Reservoir in 2011 pre-flood LIDAR. (lower right) 2008 – 2013 overlay showing the extent of reservoir infilling with the 2013 flood event. Keeton reservoir infilled 60% full with 12,615 m^3 of sediment deposited with the 2013 flood event.

12615 m^3 of sediment was deposited within Keeton Reservoir during the 2013 flood event, infilling the reservoir 60% full with clastic sediment, and reducing the storage capacity of Keeton reservoir by 40% (Figure 4). Officials associated with the City of Fountain used pre/post flood topographic surveys of the reservoir and metrics on the physical excavation of sediment to quantify the magnitude of sediment transport for the 2013 flood event.

3. Field Site and Methods

3.1 – Lidar Data

In Spring 2011, LIDAR (one-meter resolution) of El Paso County Colorado was collected by the Sanborn Mapping Company of Colorado Springs in partnership with FEMA and El Paso County. The resulting publicly available dataset covers 455 km^2, encompassing the entire drainage basin of LFC (available through the Colorado GIS Coordination and Development Program). The purpose of the data collection was to enhance flood risk assessment and hazard mitigation in El Paso County. This dataset was used to delineate the stream network and to define the subbasins within the LFC watershed.

3.2 – Field Measurements

In June 2018, a 49-meter scientific reach within the Upper Little Fountain Creek Basin, 500 m upstream of Keeton Reservoir, was selected for this study. A modification of streambed mapping techniques set by Yager (2012) was used to delineate the streambed, because the field measurements necessary to apply the Schneider (2016) methodology are included within the stream survey methods outlined by Yager (2012). Based on field relationships the stream bed surface was delineated into immobile step and mobile sediment fractions. Immobile sediment fractions or immobile steps were delineated after Zimmerman (2008) and Yager (2012) as: (1) large macro-roughness elements that span at least half the channel width, (2) sediment patches dominated by boulder or cobble size grains (>22.6 mm), (3) have a minimum pool length of (10% bank full width), (4) have a minimum step drop height greater than 3.3% bank full width. Following these criteria, 6 immobile steps were identified within the scientific reach. Isolated boulders and cobble-boulder sediment patches that failed to meet 1 or more of the criteria mentioned above were grouped in with the mobile sediment. The remaining portion of the

streambed (the pools and the cascades) was treated as mobile sediment. Grain size distribution data for the mobile and immobile portions of the stream were collected independently. Slight modifications to the Yager (2012) mapping techniques were incorporated to reduce field time. Yager (2012) mapped individual sediment patches within the mobile sediment, conducted Wolman (1954) pebble counts within each of the sediment patches identified, and aerially weighted grain size distribution data before combining the mobile sediment into one large class with one grain size distribution. In this study, individual mobile sediment patches within the pools and cascade portion of the stream were grouped together and not mapped separately.

In order to apply the modified bedload sediment transport equations after Yager (2012) and Schneider (2016), reach averaged measurements and surveys of: stream morphology, macro-roughness elements, and grain size distribution are needed. Six cross-sectional surveys and one longitudinal profile along the centerline of the channel were collected using a Berger CST-302R total station. The channel slope was obtained from the longitudinal profile. Additionally, the locations of immobile steps along the study reach were noted. Along the reach length, cross-sectional surveys were spaced so that the center of pool was included and immobile steps were avoided. The reach averaged active channel width (W) was obtained from the data collected in the six cross sections.

Morphometric measurements of the immobile steps were collected using methods similar to those used by Yager (2012). Seven to ten paired elevation measurements (upstream, Z_u and downstream, Z_d) of each immobile step were collected using a Berger CST-302R total station (Figure 5). The reach averaged difference between upstream and downstream paired elevations was calculated to determine the depth of the mobile sediment fraction upstream of the immobile

steps (Z_{mu}) (Figure 5). Straight-line distances between upstream and downstream paired elevation measurements were calculated and averaged for the entire reach to attain a reach averaged, bed parallel, downstream step length of the immobile steps (λ_w)(Figure 5). The length of the step-pool portion of the reach (35m), was divided by the total number of steps delineated in the scientific reach to attain the average downstream step spacing (λ_x)(Figure 5).

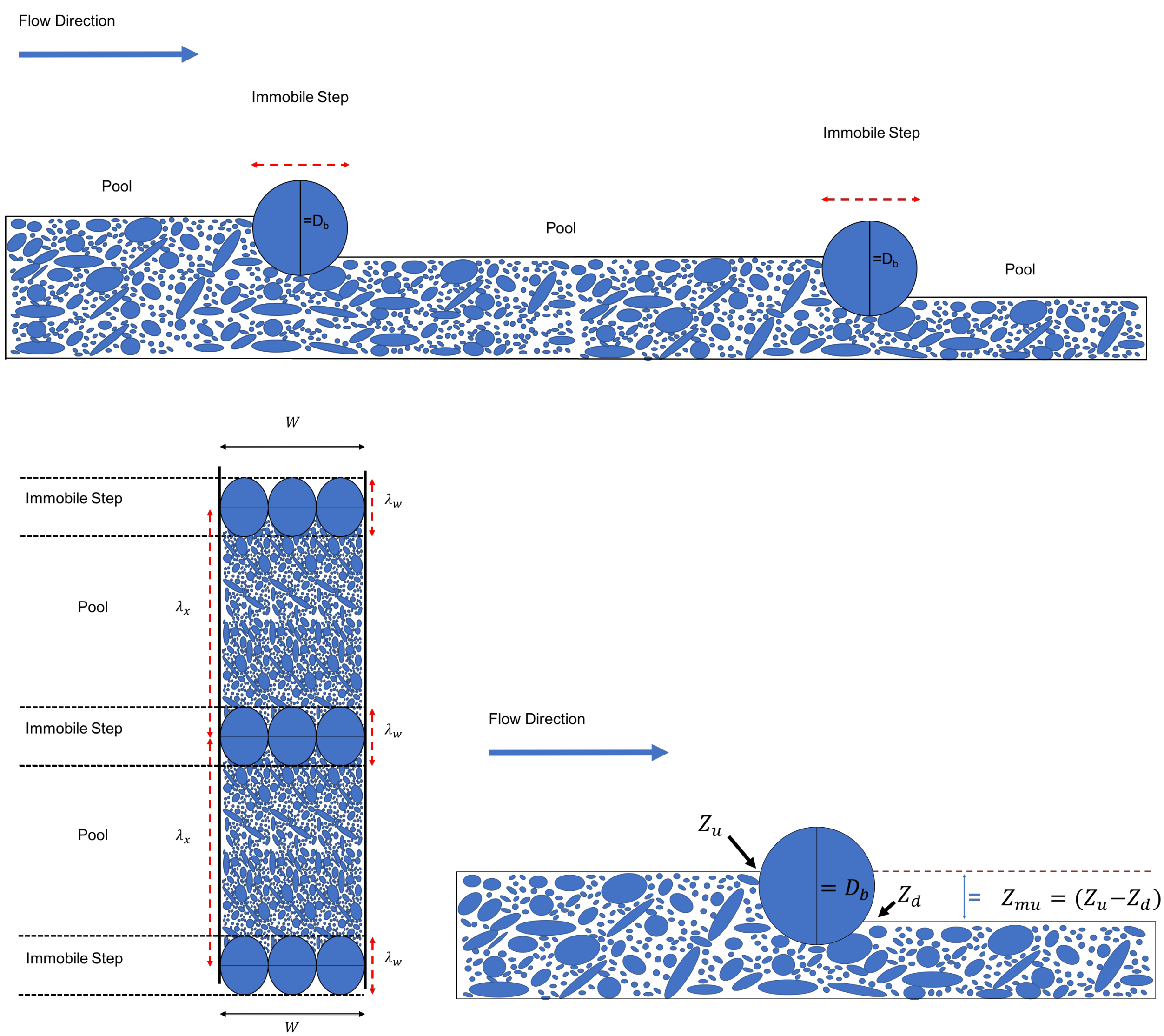

Figure 5. Idealized channel with reach averaged parameters displayed after Yager (2012). (Above) Cross sectional view of the channel with step and pool sequences depicted. (Left) Plane view of the idealized channel with Channel Width (W), Step Spacing (λ_x), and Step width (λ_w) parameters depicted. (Right) Cross sectional view of an idealized immobile step with the location of paired elevation measurements upstream (Z_u) and downstream (Z_d)

Bed surface grain size distributions of the mobile and immobile sediment fractions are needed to apply the methods of Yager (2012) and Schieder (2016). The mobile grain size distribution was extracted from seven pebble counts completed after Wolman (1954) within the mobile portion of the stream, (pool and cascade sequences). Individual pebble counts were conducted within each of the six pools delineated within the scientific reach, with the intermediate axis of ≥ 100 grains collected/ measured per pool. One Wolman pebble count was conducted within the cascade portion of the mobile sediment with the intermediate axis of ≥ 100 grains collected/ measured. The intermediate axis of all cobbles and boulders that make up the immobile steps were measured in the field to define the grain size distribution of the immobile steps. The grain size distributions of mobile and immobile sediment patches were binned into twenty-two ½ phi grain-size classes from 2- 4096 mm. Grain sizes less than 2mm (Coarse sand) are not reported. The total grain size distribution of the mobile sediment is determined through a summation of grain size distributions for the mobile fraction of the stream bed surface containing 6 pools and 1 cascade. The total grain-size distribution of the mobile sediment was the summation of all of the grain-size distributions for the mobile fraction of the streambed surface containing six pools and one cascade. The total grain-size distribution for the immobile steps is determined through a summation of grain-size distributions for the six immobile steps. A representative grain-size distribution for the entire streambed surface is determined through a summation of the total immobile and total mobile grain-size distributions.

Survey results were used to calculate a number of other parameters after Yager (2012): the proportion of the bed area occupied by mobile sediment (A_m/A_t), the characteristic grain size of the immobile sediment patches (D_b), the reach averaged height of the mobile sediment upstream of the immobile sediments (Z_{mu}) recorded as the average difference between the 49 paired

elevation measurements of the upstream protrusion (Z_u) and downstream protrusion (Z_d) of the immobile steps. The reach average protrusion of the immobile steps (P_u) is calculated for the reach by subtracting the reach averaged height of mobile sediment from the characteristic grain size of the immobile sediment ($P_u = D_b - Z_{mu}$).

3.3 – Hydraulic scaling

In order to apply the modified bedload sediment transport equations of Yager (2012) and Schneider (2016) a discharge hydrograph is needed. As noted, in ULFC, no stream gauges were active during the 2013 flood event. However, there are 13 years of approved historical data available for the USGS - National Water Information System provided for the Little Fountain Creek above Keeton reservoir (USGS 07105920, Figure 1) for the years 1978-1988 and for 1995-1998 (Appendix A.1). These historical data allow for a peak daily discharge scaling relationship for Little Fountain Creek above Keeton reservoir to be determined based on the long-term relationships with the other gauging stations within the LFC basin. We use the Rock Creek above Fort Carson site to create our discharge scaling relationship, because of: (1) the sites proximity to the ULFC basin (2) possesses mountainous basin characteristics similar to ULFC (3) was active with approved discharge measurements for the 2013 flood event, (4) and has approved historical peak daily discharge measurements for the entire time period of the data available for the now inactive Little Fountain Creek above Keeton Reservoir Gauge (Appendix A.1). Approved discharge measurements for the Rock Creek gauge during the 2013 flood event are provided in the appendix (A.2) The discharge scaling relationship for Rock Creek to Little Fountain Creek above Keeton Reservoir (Figure 6) is expressed by the linear trendline ($Y = 1.72(X_{RC}) + 0.0148\, m^3/s$), with the discharge of Rock Creek is expressed as (X_{RC}). The relationship has an R^2 value of 0.87. Each point in the Rock Creek hydrograph is scaled by this

relationship to attain a scaled hydrograph for Little Fountain Creek above Keeton Reservoir for the 2013 flood event. The upper and lower 95% confidence intervals for this linear regression were computed (Figure 6). Scaled hydrographs for the upper/lower 95% confidence interval were extracted to determine a range in total volumetric sediment transport with the upper and lower bounds of the scaling relationship.

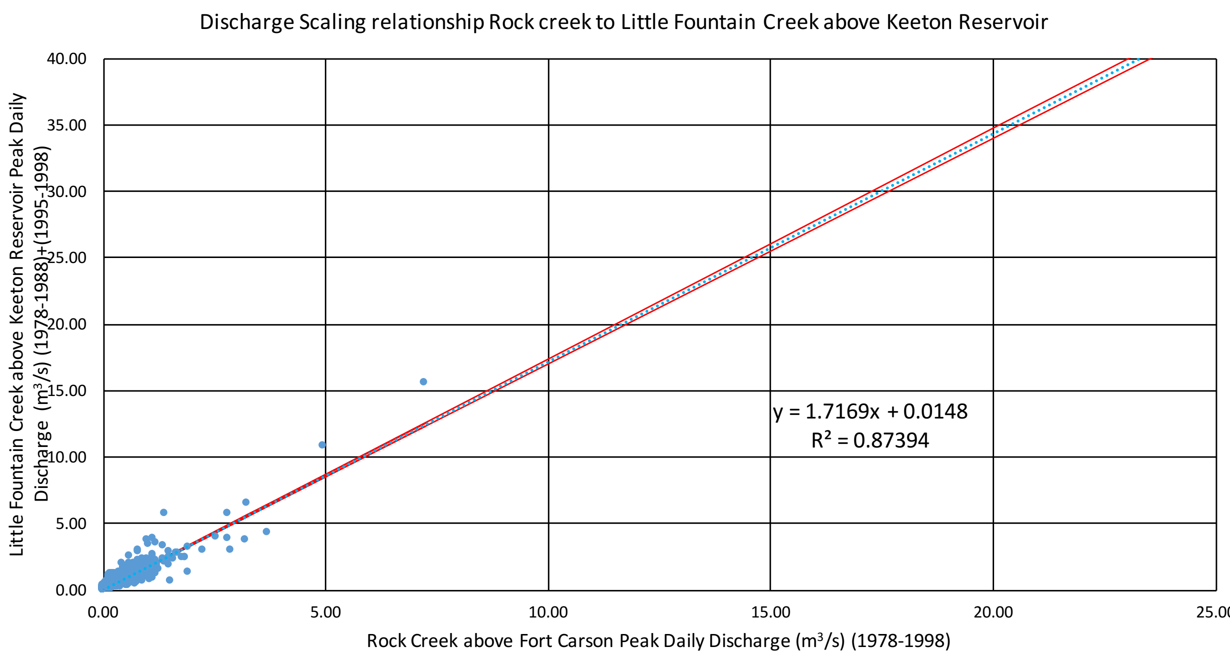

Figure 6. Historical discharge scaling relationship (1978-1998) for the Rock Creek near Fort Carson stream gauge to the Little Fountain Creek above Keeton Reservoir (now inactive) stream gauge. This relationship was used to scale the 2013 flood event in ULFC. The Upper and lower 95% confidence interval of the linear regression are shown in red.

3.4 - Bedload Sediment Transport Quantification

3.4.1 - Method 1: Schneider (2016)

3.4.1.A - Hydraulic Parameters: Rickenmann and Recking, 2011

The predictive quality, of bedload sediment transport equations, are much improved when hydraulic parameters, needed for inputs, are back calculated/calibrated to flow discharge at a location. Measurements of hydraulic radius are difficult to measure in the field, and the temporal resolution of measurements is often at too coarse of a resolution for robust scientific analysis. To account for this the flow velocity (U) and hydraulic radius (r_h) for each moment in the hydrograph are determined after Rickenmann and Recking (2011). This method for hydraulic parameter extraction has been calibrated to a large field data set containing 2890 measurements of flow velocity in gravel bed streams with channel slopes ranging from 0.00004-0.24 m/m Rickenmann and Recking (2011).

Averaged cross sectional profiles were used to attain a reach averaged bankfull width of the channel (W). The stream is treated as rectangular channel with steady uniform flow occurring throughout the event. Total discharge (Q) at the station was divided by the average channel width to get the discharge per unit width (q) for that time period. Discharge per unit width (q) values were inserted into the dimensionless unit discharge equation of Rickenman and Recking (2011):

$$(1) \qquad q^{**} = \frac{q}{\sqrt{gS(D_{84tot})^3}}$$

Where (g) is the acceleration due to gravity, (S) is the total energy slope or thawleg slope of the channel, and (D_{84tot}) is the 84th percentile grain size of the total stream bed surface. The

dimensionless unit discharge (q^{**}) attained from Equation (1) was then inserted into the dimensionless flow velocity logarithmic matching equation, Equation (2), of Rickenmann and Recking (2011). This logarithmic matching equation is derived from a large dataset with 2890 measurements of flow velocity in steep mountain stream systems, and is cited to fall within $\pm 0.7\%$ of values from the VPE equation of Ferguson (2007) (Rickenmann and Recking, 2011).

$$(2) \qquad U^{**} = 1.443 q^{**0.6} \left[1 + \left(\frac{q^{**}}{43.78}\right)^{0.8214}\right]^{-0.2435}$$

The dimensionless flow velocity, derived from the logarithmic matching equation, Equation (2), is then inserted into the Dimensionless flow velocity equation, Equation (3), of Rickenmann and Recking (2011) to extract the flow velocity for each unit discharge throughout the hydrograph.

$$(3) \qquad U^{**} = \frac{U}{\sqrt{gS(D_{84tot})}}$$

The flow velocity and hydraulic radius for each specific discharge were calculated using the continuity equation with averaged cross-sectional profiles. The hydraulic parameters calculated above to quantify bedload sediment transport after Schneider (2016).

3.4.1.B - Bedload Sediment Transport

Schneider (2016) calibrated the Wilcock and Crowe (2003) dimensionless total bedload sediment transport equation (Equation 4) to a large field dataset including 3,099 measurements of bedload sediment transport rates from 19 SMS and 16 lower gradient channels with bankfull discharges for ranging from 0.3 – 651 m^3/s and channel slopes ranging from 0.0005 – 0.11 m/m Schneider (2015). The dimensionless bedload transport equation is a function of the ratio of the reduced

dimensionless shear stress ($\tau_{D50}^{*\prime}$), and the reduced dimensionless reference shear stress ($\tau_{rD50}^{*\prime} = 0.03$), and empirically derived constants.

$$(4) \qquad W_{tot}^{*} = \begin{cases} 0.002\left(\frac{\tau_{D50}^{*\prime}}{\tau_{rD50}^{*\prime}}\right)^{7.8} & for\ \frac{\tau_{D50}^{*\prime}}{\tau_{rD50}^{*\prime}} < 1.33\ and\ D_{50} > 4mm \\ 14\left(1-\frac{0.894}{\left(\frac{\tau_{D50}^{*\prime}}{\tau_{rD50}^{*\prime}}\right)^{0.5}}\right)^{4.5} & for\ \frac{\tau_{D50}^{*\prime}}{\tau_{rD50}^{*\prime}} \geq 1.33\ and\ D_{50} > 4mm \end{cases}$$

The dimensionless reduced shear stress ($\tau_{D50}^{*\prime}$), Equation (5), is a function of the reduced shear stress (τ'), the density of sediment (ρ_s), the density of water (ρ), the acceleration due to gravity (g), and the 50th percentile fraction of the stream bed surface (D_{50}). The dimensionless reduced shear stress is effectively reducing the shear stress available for sediment transport further, as a function of the 50th percentile fraction of the stream bed surface.

$$(5) \qquad \tau_{D50}^{*\prime} = \frac{\tau'}{(\rho_s - \rho)gD_{50}}$$

The reduced shear stress, Equation (6) is the solution of the shear stress equation with a reduced energy slope (S_{red}). Schneider (2016) uses the reduced energy slope to account for flow resistance due to macro-roughness elements. The reduced shear stress (τ') represents the energy available for sediment transport.

$$(6) \qquad \tau' = \rho g r_h S_{red}$$

The reduced energy slope is derived from the flow resistance partitioning equations of Rickenmann and Recking (2011). These equations partition the flow resistance into 2 fractions, the Base level flow resistance (f_0), and the total flow resistance (f_{tot}). (e) is an empirically

derived constant equal to 1.5, and (S) is equal to the total energy slope or reach averaged channel slope.

(7) $$S_{red} = S\left(\sqrt{\frac{f_0}{f_{tot}}}\right)^{e}$$

The base level flow resistance (f_0) and the total flow resistance (f_{tot}) are a function of the hydraulic radius (r_h), the 84$^{\text{th}}$ percentile grain size fraction of the stream bed surface (D_{84tot}), and the empirical constants (a_1) and (a_2) equal to 6.5 and 2.5 respectively. The total flow resistance is quantified via Equation (9); the variable power equation (VPE) of Ferguson (2007). The hydraulic radius and Flow velocity derived above are used as input parameters in these equations. (U^*) is the shear velocity $(U^* = {}^{\tau}/_{\rho})$. The total shear stress (τ_t), Equation (10), is used to determine the magnitude of reduction in shear stress via the flow resistance portioning. The total shear stress (τ_t) represents the energy available for sediment transport without accounting for macro roughness elements.

(8) $$\sqrt{\frac{8}{f_0}} = a_1\left(\frac{r_h}{D_{84}}\right)^{0.167}$$

(9) $$\frac{U}{U^*} = \sqrt{\frac{8}{f_{tot}}} = \frac{a_1 a_2\left(\frac{r_h}{D_{84}}\right)}{\sqrt{a_1^2 + a_2^2\left(\frac{r_h}{D_{84}}\right)^{\frac{5}{3}}}}$$

(10) $$\tau_t = \rho g r_h S$$

The dimensionless bedload transport rate (W_{tot}^*), derived in Equation (4), is inserted into a volumetric bedload transport rate per unit width (excluding porosity) (q_{bvol}), for each time-step throughout the hydrograph with Equation (11). Where (U^*) is the shear velocity, and (R) is the dimensionless submerged specific gravity of sediment $(\rho_s/\rho - 1)$. The total volumetric

transport for a flood event (Vol_{event}) in m^3 is determined via Equation (12), Where (N) is the number of time intervals throughout the hydrograph, (W) is the active channel width, and (TI) is the time interval (duration) in seconds of each measurement throughout the hydrograph.

$$(11) \qquad q_{bvol} = \frac{W_{tot}^{*} \cdot U^{*3}}{Rg}$$

$$(12) \qquad Vol_{event} = \sum_{1}^{N} q_{bvol} \cdot \mathrm{W} \cdot \mathrm{TI}$$

In this study, 2 methods of sediment transport quantification are applied after Schneider (2016). These methodologies are referenced as Schneider method 1 and Schneider method 2. These methodologies differ only in the grain size distribution used to derive (D_{50}) for sediment transport quantification. Schneider method 1 uses the entire stream bed surface grain size distribution to derive (D_{50}), and Schneider method 2 uses the mobile sediment grain size distribution to derive (D_{50}).

3.4.2 - Method 2: Yager (2012)

3.4.2.A - Hydraulic Parameters

Flow velocity (U) and reach averaged flow depth (h) are extracted after Yager (2012). Averaged cross sectional profiles were used to attain a reach averaged bank full width of the active channel (W). The stream is treated as rectangular channel with steady uniform flow occurring throughout the event. Total discharge (Q), derived from the hydrograph, was divided by the average channel width to get the unit discharge (q) for that time period.

Equation (13) represents the solution of the stress-partitioning equations put forth by Yager (2012). In this investigation, the predicted unit discharge (q_p) is a function of: gravity, reach

averaged channel slope, downstream step spacing (λ_x), Downstream step width (λ_w), the flow depth (h), the bed perpendicular area occupied by immobile grains (A_{IF}), the drag coefficient of associated with the immobile grains (C_I), The drag coefficient associated with mobile sediment ($C_m = 0.44$), and downstream length of immobile grains/steps (λ_w). Empirical calibration for Equation (13) is limited to seven flood events with 69 measurements of flow velocity, discharge, and flow depth within the Erlenbach SMS. The two drag coefficients (C_I) and (C_m) are the only portions of this equation that have been empirically calibrated. Discharges for this calibration did not exceed 2.1 m^3/s.

(13) $$q_p = \sqrt{\frac{2gS\lambda_x h^3}{\frac{A_{IF}C_I}{W} + C_m(\lambda_x - \lambda_w)}}$$

To calculate water depth (h) using Equation (13) we must Iteratively compute (q_p) with values of (h) until the predicted discharge calculated in Equation (13) is equal to the measured discharge per unit with (q) for each time interval in the hydrograph. Flow velocity can be determined from this using the continuity equation ($q = U \cdot h$). These hydraulic parameters will be used to calculate the shear stress enacting on mobile grains and the energy available for sediment transport.

The drag coefficient enacting on the immobile grains is a function of the hydraulic radius and the upstream protrusion of the of immobile grains (ρ_u). It is expressed by Equation (14) after Yager (2012). The coefficient and exponent of the original drag coefficient equation (Yager 2012), were modified and refitted so the equations don't collapse at high relative flow depths. More information on how this drag coefficient was refitted and modified for this study is provided in

the Appendix (A.3). The original drag coefficient equation ($C_I = 157(h/P_u)^{-1.6}$), was updated for this study with Equation 14.

$$(14) \qquad C_I = 59.93\left(\frac{h}{P_u}\right)^{-0.554}$$

The bed perpendicular area of immobile grains (A_{IF}), used in the stress partitioning Equation (13), is a function of the water depth (h), the mean diameter of immobile grains (D_b), and the reach averaged height of the mobile sediment upstream from protruding grains (Z_{mu}), and is expressed by Equations (15,16). The (A_{IF}) represents the portion of immobile grains that are protruding into the flow for a given flow depth.

$$(15) \qquad A_{IF} = \left[\left(h + Z_{mu} - \frac{D_b}{2}\right)\sqrt{(h + Z_{mu})D_b - (h + Z_{mu})^2} + \frac{D_b^2}{4} sin^{-1}\left(2\left[\frac{h+Z_{mu}}{D_b}\right] - 1\right) - \left(Z_{mu} - \frac{D_b}{2}\right)\sqrt{Z_{mu}D_b - Z_{mu}^2}\right]\frac{W}{D} \qquad When\ h + Z_{mu} \leq D_b$$

$$(16) \qquad A_{IF} = \left[\frac{\pi D_b^2}{8} - \left(Z_{mu}\frac{D_b}{2}\right)\sqrt{Z_{mu}D_b - Z_{mu}^2} - \frac{D_b^2}{4}\sin^{-1}\left(\frac{2Z_{mu}}{D_b} - 1\right)\right]\frac{W}{D_b} \qquad When\ h + Z_{mu} > D_b$$

The reach averaged height of the mobile sediment (Z_{mu}) is calculated as the reach averaged difference between paired measurements of the mobile sediment upstream (Z_u) and downstream (Z_d) of immobile grains (Figure 5 and Equation 17). The reach average protrusion (P_u) is a function of the median grain size of the immobile sediment/ steps (D_b), and the reach averaged depth of mobile sediment. The reach averaged protrusion (P_u), is derived with Equation (18).

$$(17) \qquad Z_{mu} = Z_u - Z_d$$

$$(18) \qquad P_u = D_b - Z_{mu}$$

3.4.2.B - Bed load sediment transport

The total transport rate per unit width for all grain sizes in the mobile sediment is determined from Equation (19) after Yager (2012). This is represented as the sum of the volumetric transport rates per unit width (q_{bmi}) for each i^th grain size class in the relatively mobile sediment. The transport rate is also scaled by the fraction of the bed covered my mobile sediment (A_m) to the total bed area surveyed (A_T) Yager (2012).

$$(19) \qquad q_{Tm} = \left(\sum_{i=1}^{n} q_{bmivol}\right)\frac{A_m}{A_t}$$

$$(20) \qquad A_m = W \cdot \lambda_x - A_{IP}$$

$$(21) \qquad A_T = W \cdot \lambda_x$$

$$(22) \qquad A_{IP} = W \cdot \lambda_w$$

The volumetric transport rate per unit width for each i^th grain size class of the mobile sediment is determined from Equation (23), where (τ_m) is the shear stress enacting on the mobile sediment Equation (24), (τ_t) is the total shear stress enacting on the bed. (F_{mi}) is the volumetric proportion of mobile sediment in each i^th grain size class, and (W_{mi}^*) is the dimensionless bed load transport rate after Parker (1990).

$$(23) \qquad q_{bmivol} = \frac{\left(\tau_t/\rho\right)^{1.5} F_{mi} W_{mi}^*}{(\rho_s - \rho)/\rho}$$

$$(24) \qquad \tau_m = \frac{\rho C_m U^2}{2}$$

$$(25) \qquad \tau_t = \rho g h S$$

The volumetric proportion of mobile sediment in each i^th grain size class is determined from Equation (26), Where ($\sum D_{im}$) is the summation of grain sizes in each specific grain size class of

the streambed delineated as mobile sediment (excluding steps), and ($\sum D_{iTot}$) is the summation of grain sizes for all classes of sediment delineated in the scientific reach (including steps).

$$(26) \qquad F_{mi} = \frac{\sum D_{im}}{\sum D_{iTot}}$$

The dimensionless bedload transport rate for each grain size class, (W^*_{mi}) is determined in Equations (27- 34) after methods proposed by Parker (1990) and Yager (2012). In this portion of the study, the degree of size selective transport acting on the mobile sediments is determined from a hiding function (ϕ_{mi}), this function is calibrated to the specific reach in question based on the bulk grain size distribution of the mobile sediment.

$$(27) \qquad W^*_{mi} = 0.00218G(\phi_{mi})$$

Where ($G(\phi_{mi})$) is an empirical function from Parker (1990) expressed in Equation (28) as:

$$(28) \qquad G(\phi_{mi}) = \begin{cases} 5474\left(1 - \frac{0.853}{\phi_{mi}}\right)^{4.5} & for\ \phi_{mi} > 1.59 \\ EXP[14.2(\phi_{mi} - 1) - 9.28(\phi_{mi} - 1)^2] & for\ 1 \leq \phi_{mi} \leq 1.59 \\ \phi_{mi}^{14.2} & for\ \phi_{mi} < 1 \end{cases}$$

The hiding function (ϕ_{mi}) is a function of: (ω_m) an empirical function after Parker (1990), (ϕ_{sgm}) the surface geometric mean hiding function of the mobile sediment, the grain size class in question (D_i), and the surface geometric mean of the mobile sediment $\left(D_{sgm}\right)$. We use 3 different hiding function exponents (B) calibrated by Yager (2012) and Parker (1990) in order to apply the 4 methods of sediment transport outlined in Yager (2012). The hiding function can be determined from Equation (29)

(29) $$\phi_{mi} = \omega_m \phi_{sgm} \left(\frac{D_i}{D_{sgm}}\right)^{(B)}$$

The surface geometric mean hiding function of the mobile sediment (ϕ_{sgm}) is a function of (τ^*_{sgm}) the dimensionless shear stress acting on the geometric surface mean of the mobile sediment, and a reference shear stress (τ^*_{rsg}). We use 3 different combinations of (τ^*_{rsg}) to apply 4 different methods outlined in Yager (2012), we report these values in table 1. We use the shear stress values(τ_m, τ_t), derived in Equation (24,25), as an input parameter in Equation (31).

(30) $$\phi_{sgm} = \frac{\tau^*_{sgm}}{\tau^*_{rsg}}$$

(31) $$\tau^*_{sgm} = \frac{\tau_m, \tau_t}{\rho(\rho_s - \rho)D_{sgm}}$$

The empirical function (ω_m) is a function of: $(\sigma_{\phi m})$ the arrhythmic standard deviation or the relatively mobile sediment, and two graphical function taken from parker (1990) $\left(\sigma_{\phi 0}(\phi_{sgm})\right)$ and $\left(\omega_0(\phi_{sgm})\right)$. A figure of this graphical function is given in the Appendix (A.3). Values are derived from this graph and imported into Equation (32).

(32) $$\omega_m = 1 + \frac{\sigma_{\phi m}}{\sigma_{\phi 0}(\phi_{sgm})}\left[\omega_0(\phi_{sgm}) - 1\right]$$

The arithmetic standard deviation or the relatively mobile sediment is derived from Equation (34)

(33) $$\sigma^2_{\phi m} = \sum_{i=1}^{N} \left(\frac{\ln\left(D_i/D_{sgm}\right)}{\ln 2}\right)^2 F_{mi}$$

The surface based geometric mean of the mobile sediment is derived from Equation (34) after Yager (2012), where the bed is divided into N grain size classes with characteristic grain diameters (D_i).

$$(34) \qquad \ln D_{sgm} = \sum_{i=1}^{N} F_{mi} \ln D_i$$

The total volumetric transport (Vol_{event}) is calculated as the sum the total transport rates for all of the grain sizes in the mobile sediment (q_{Tm}) via Equation (1), where (N) is the number of time intervals throughout the hydrograph, (W) is the active channel width, and (TI) is the time interval (duration) in seconds of each measurement throughout the hydrograph.

$$(35) \qquad Vol_{event} = \sum_{1}^{N} q_{Tm} \cdot \mathrm{W} \cdot \mathrm{TI}$$

In this study, 4 methods of sediment transport quantification are applied after Yager (2012). These methodologies are referenced as Yager methods (1-4) (table 1) and these methods incorporate various shear stress, grain size distributions, reference shear stress, and hiding functions into sediment transport equations (table 1). A MATLAB script was provided by Dr. Elowyn Yager to administer the Yager (2012) methodologies evaluated in this study.

Table 1. Yager (2012) methods 1-4

Method	Shear stress	Grain Size Distribution	Reference shear stress (τ^*_{rsg})	Hiding function exp (B)
1	Total Shear Stress (τ_t)	Total Grain Size Distribution	0.0386	-0.0951 - Original Parker (1990)
2	Total Shear Stress (τ_t)	Total Grain Size Distribution	0.1444	-0.3770 - Modified Yager Total bed
3	Mobile shear stress (τ_m)	Mobile Grain Size Distribution	0.0386	-0.0951 - Original Parker (1990)
4	Mobile shear stress (τ_m)	Mobile Grain Size Distribution	0.0699	-0.8450 - Modified Yager Mobile bed

Yager (2012) methods 1-4 with variations in shear stress, grain size distribution, reference shear stress, and hiding function per each method outlined.

4. Results

4.1 - Bed Surface Properties LFC

Stream surveys of channel morphology, macro-roughness elements, and grain size distribution where used to obtain reach averaged parameters for the 49-meter scientific reach. The centerline longitudinal survey of the channel yielded a reach averaged slope (S) of .0439 (m/m). 6 cross-sectional surveys were used to extract a reach averaged channel width (W) of 5.2465 m. Grain size distributions from the thirteen Wolman pebble counts conducted within the Step, pool, and cascade portions of the scientific reach are provided in the Appendix (A.4). All Wolman pebble counts were used to attain a total grain size distribution for the stream. The ($D_{16T}/D_{50T}/D_{84T}$) of the entire stream bed surface are 5.7 mm, 115 mm, 363 mm respectively. Excluding the immobile steps (145 grains) from the total grain size distribution, allows for a grain size distribution for the mobile sediment (pool and cascade portions of the stream) to be determined. The ($D_{16m}/D_{50m}/D_{84m}$) of the mobile sediment are 5.2 mm, 75 mm, and 256 mm respectively. Alternatively, excluding the mobile sediment (703 grains) from the total grain size distribution, allows for a grain size distribution for the immobile steps to be determined. The ($D_{16I}/D_{50I}/$

D_{84I}) of the immobile steps are 270 mm, 400 mm, and 690 mm respectively. Results for the total, mobile, and immobile grain size distributions of the streambed are shown in Figure (7), and appendix (A.4)

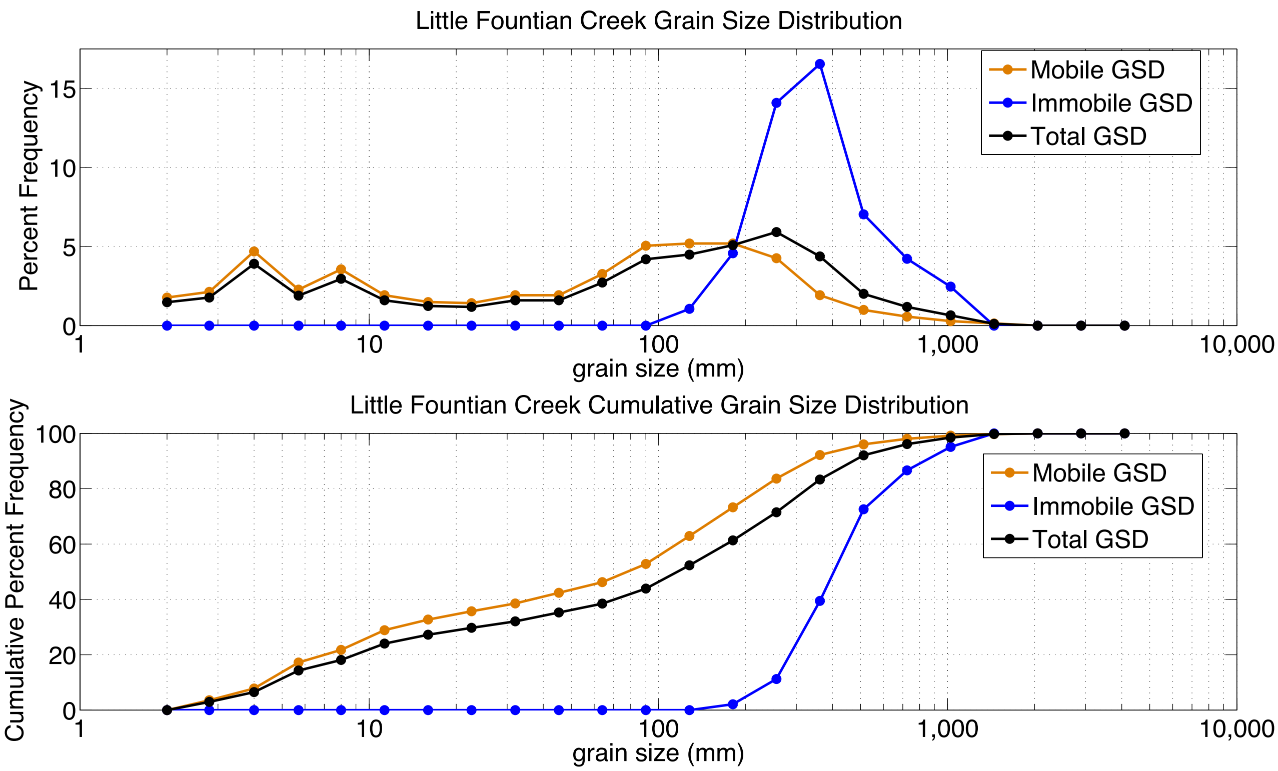

Figure 7. (Above) Grain size distributions for the mobile portion of the stream bed, immobile portion of the stream bed, and the total streambed surface (combined). (Below) Cumulative grain size distributions for the mobile portion of the streambed, immobile portion of the streambed, and the total streambed surface (combined).

4.2 - Immobile step morphometrics

Reach averaged morphometrics of the immobile steps were extracted from total station surveys of step morphology. The reach averaged depth of mobile sediment upstream of the immobile steps ($Z_{mu} = 0.303\ m$), reach averaged upstream protrusion ($P_u = 0.098\ m$), and the reach averaged step width ($\lambda_w = 1.176\ m$) was determined from 98 paired elevation/distance measurements upstream (Z_u) and downstream (Z_d) of the immobile steps. A reach averaged immobile step spacing ($\lambda_x = 5.851\ m$) was determined from the centerline longitudinal survey.

The rest of the reach averaged morphometrics and are provided in Table 2. Survey notes, cross-sectional, and longitudinal survey plots are provided in the Appendix (A.5).

Table 2. Reach averaged parameters extracted for the scientific reach in ULFC. The method for which each parameter is needed is provided Y = Yager and S = Schneider

Reach averaged parameter	Value	Method
Slope (%) - (S)	0.044 m/m	(Y)(S)
Active Channel Width - (W)	5.247 m	(Y)(S)
Average Step Width - (λ_w)	1.176 m	(Y)
Average Step spacing - (λ_x)	5.851 m	(Y)
height of mobile sediment upstream of steps - (Z_{mu})	0.303 m	(Y)
Protrusion of Immobile grains upstream - (P_u)	0.098 m	(Y)
Bed parallel area covered by immobile grains - (A_{IP})	6.166 m^2	(Y)
Unit channel area covered by mobile sediment - (A_m)	24.531 m^2	(Y)
Total unit channel area - (A_T)	30.699 m^2	(Y)
proportion of the bed area occupied by mobile sediment - (A_m/A_T)	0.799	(Y)
50^{th} percentile cumulative grain size of the Immobile steps - $(D_{50I,b})$	400 mm	(Y)
50^{th} percentile of the cumulative mobile grain size distribution- (D_{50m})	75 mm	(S)
50^{th} percentile of the cumulative total grain size distribution - (D_{50T})	115 mm	(S)
84^{th} percentile of the cumulative total grain size distribution - (D_{84T})	363 mm	(S)

4.3 - Discharge scaling

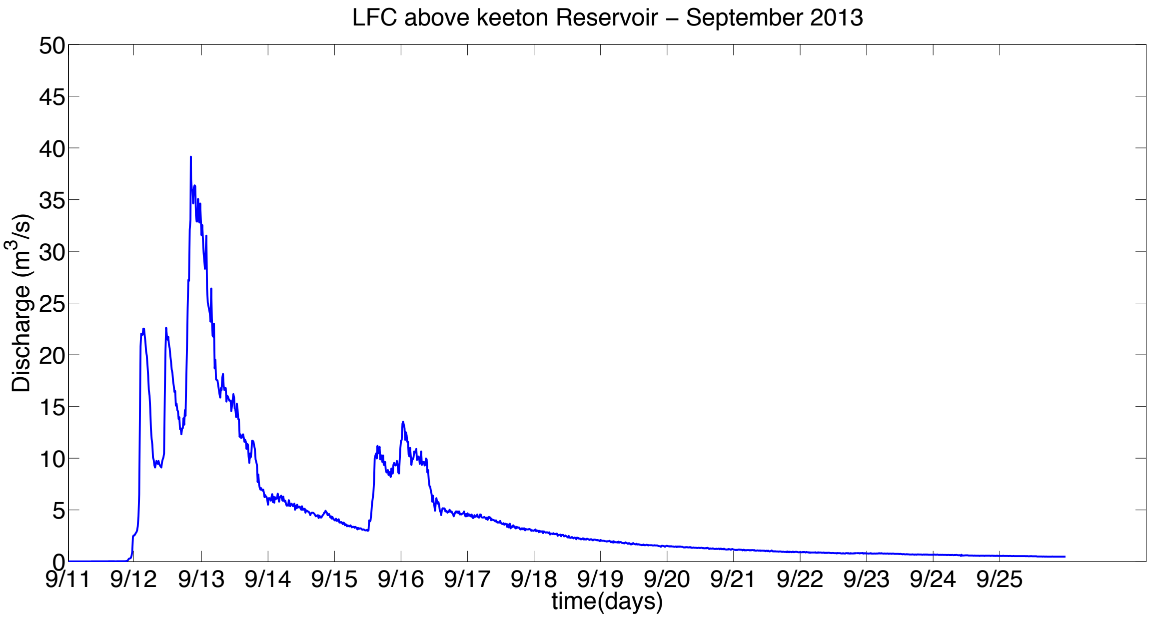

Figure 8. Simulated discharge hydrograph for Little Fountain Creek above Keeton Reservoir September 2013. This hydrograph is based on the scaling relationship to the Rock Creek above Fort Carson stream gauge. Peak stream flow discharge of 40 m^3/s.

The 1428 15-minute interval approved discharge measurements are scaled from the Rock Creek gauge to ULFC for the 2013 flood event. Two significant events are discernable in the hydrograph occurring between September 12-14 and September 15-16, respectively. The first significant flood event has a peak discharge of ≈40 m^3/s. The second major flood event has a peak discharge ≈15 m^3/s.

4.4 - Drag coefficient calibration

The original drag coefficient equation proposed by Yager (2012) over predicts shear stress borne by the mobile sediment (τ_m). At relative flow depths greater than six, a cross over between total shear stress (τ_t) and mobile shear stress (τ_m) occurs (Figure 9). This cross over results in the mobile shear stress borne by the mobile sediment, exceeding values of total shear stress. This cross-over is not realistic or the intended outcome when deriving the mobile shear stress borne by the mobile sediment. In conception, mobile shear stress was derived in order to reduce shear

stress values, further reducing the effective shear stress or energy available for sediment transport. To account for this, a re-fit modified drag coefficient equation (Equation 14) was used. This modified equation reduces the mobile shear stress to values below the total bed shear stress for all discharges simulated for the September 2013 flood event (Figure 9).

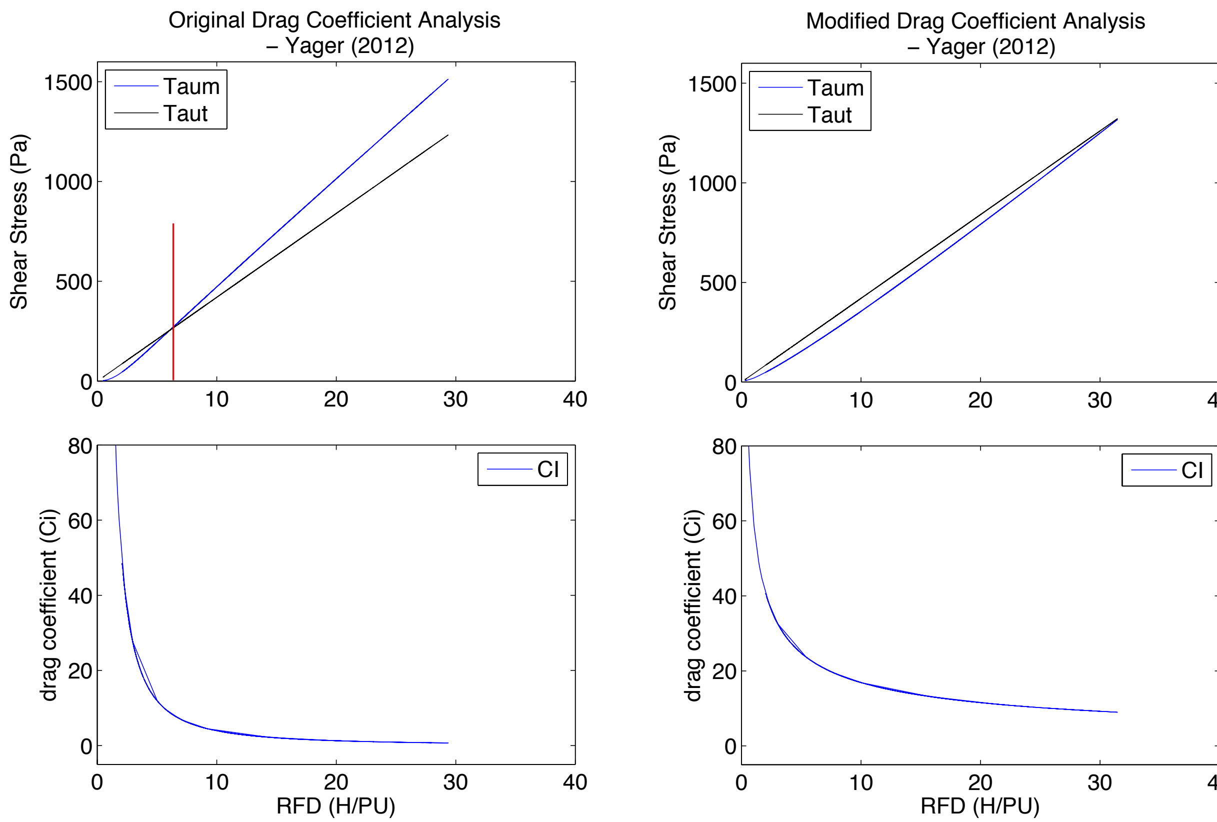

Figure 9. Comparative analysis of the original drag coefficient equation proposed by Yager (2012) to the modified drag coefficient proposed in this study. The new fit to the drag coefficient equation reduces values of mobile shear stress (τ_m), so that there is no longer a cross over with the total shear stress (τ_t) at Relative flow depths > 6 (red line).

4.5 - Hydraulics

The approaches used by Schneider (2016) and Yager (2012) to extract flood event hydraulics with scaled discharge data are vastly different. Schneider uses the empirical relationships outlined by Rickenmann and Recking (2011) derived from a large dataset with 2890 measurements of flow velocity in steep mountain stream systems; whereas Yager (2012) uses a

stress partitioning approach that takes into account flow resistance due to immobile steps. This discrepancy leads to a large variance in the hydraulics simulated by each method (figure 10). The hydraulics simulated after Schneider (2016), treat the flow in the channel as shallow and quick, with flow velocities for the peak discharge reaching ≈5 m/s, and flow depths reaching a maximum height of 1.5 meters (Figure 10). The hydraulics simulated with the Yager (2012) stress partitioning approach predicts flows with intermediate velocities and flow depths, with flow velocities for the peak discharge reaching ≈2.5 m/s, and flow depths reaching a maximum height of 3 meters (Figure 10).

Total Shear stresses (τ_t) for each method were calculated in the same fashion using equations (10,26). However, due to the marked variance water depth (h) and flow velocity (U) determinations per Yager (2012) and Schneider (2016), the total shear stresses computed for each method drastically different. Total shear stresses determined after Schneider (2016) range from ≈ 0 to 400 pascals for the 2013 flood event in LFC, whereas total shear stresses determined after Yager (2012) range from ≈ 0 to 1400 pascals. Each method uses a reduced shear stress for sediment transport quantification, but the magnitudes of these are not comparable, because the way they are used in later steps. The reduced shear stress (τ'), computed through Equation (6) after Schneider (2016), ranges from ≈ 0 to 200 pascals, and is considerably lower than the total shear stress (τ_t) computed for this method. The shear stress born by the mobile sediment (τ_m), computed through Equation (25) after Yager (2012), ranges from ≈ 0 to 1400 pascals and is hardly discernable from the Total shear stress (τ_t) computed for this method.

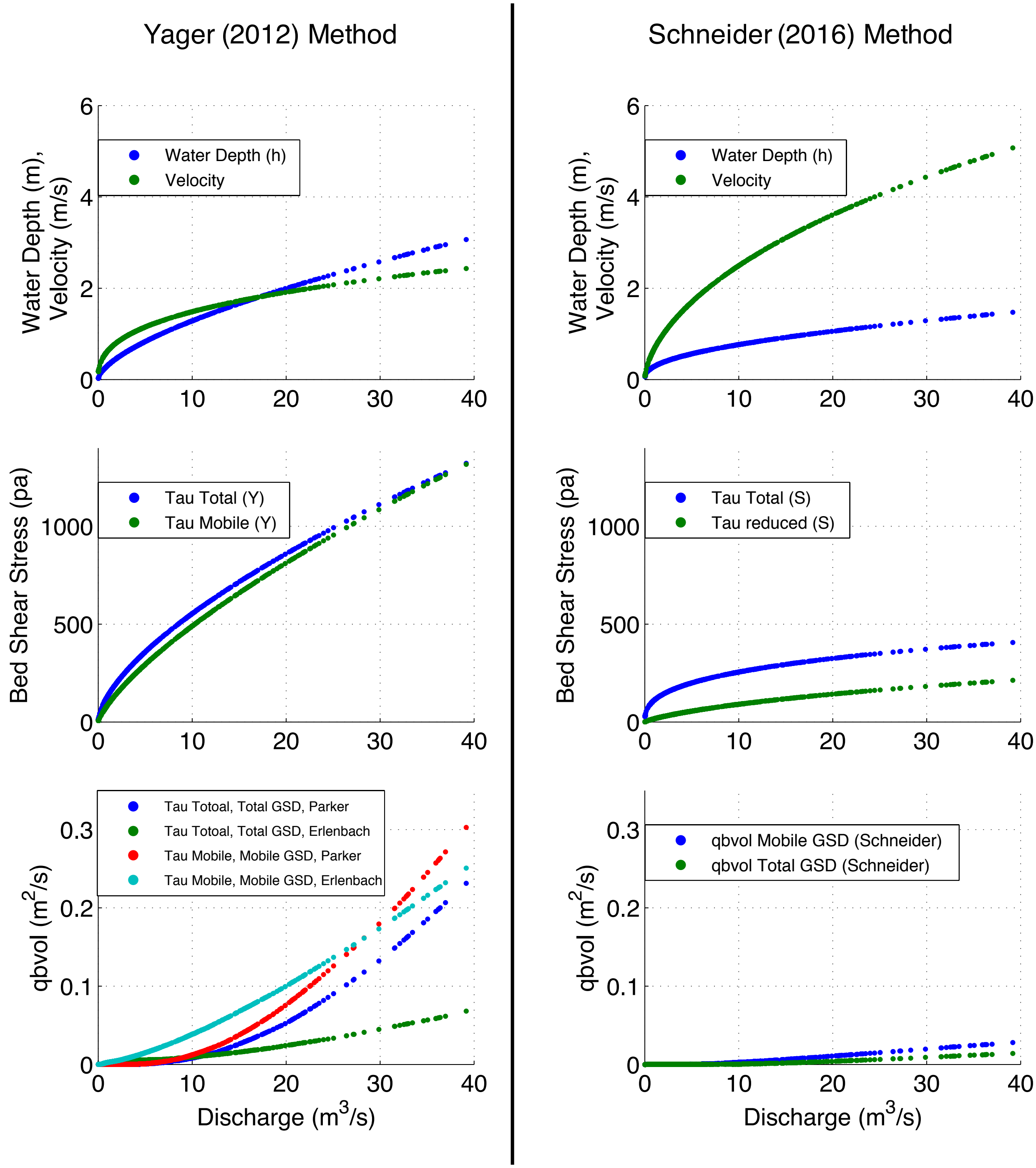

Figure 10. Comparative analysis of the hydraulics, bed shear stress, and sediment transport rates derived after the Yager (2012) and Schnieder (2016) methedologies.

4.6 - Bed load sediment transport

4.6.1 - Schneider (2016)

4.6.1.A - Schneider method 1

2 methods of sediment transport derived from Schneider (2016) are applied in this study. The first method uses the (D_{84T}) of the total grain size distribution to extract the hydraulics, and uses (D_{50T}) of the total grain size distribution as a proxy for total volumetric bedload sediment transport rates per unit width (q_{bvol}). Volumetric transport rates derived from this method range from 0 to 0.0141 m^2/s for the 2013 flood event. Sediment transport is severely limited for the flood event following this method with significant sediment transport only occurring during the major peak discharge event simulated in ULFC (Figure 11). This method yields a total volumetric transport (Vol_{event}) (including 40% porosity) of 4,436 m^3 and comes out to 35% of the measured sediment load in Keeton Reservoir. Using the lower and upper 95% confidence interval scaled discharge resulted in changes in the magnitude of total volumetric transport. The lower 95% confidence interval scaled discharge resulted in a drop in total volumetric transport to 4,326 m^3, accounting for 34% of the volume deposited in Keeton Reservoir. The Upper 95% confidence interval scaled discharge resulted in an increase in the total volumetric transport to 4,549 m^3, accounting for 36% of the volume deposited in Keeton Reservoir.

4.6.1.B - Schneider method 2

The second method uses the (D_{84T}) of the total grain size distribution to extract the hydraulics, and uses (D_{50m}) of the mobile grain size distribution as a proxy for total volumetric bedload sediment transport rates per unit width (q_{bvol}). Volumetric transport rates derived from this method range from 0 to 0.0279 m^2/s for the 2013 flood event. Sediment transport is slightly limited for the flood event following this method, with sediment transport only occurring during

the two peak discharge events simulated in ULFC (Figure 12). This method yields a total volumetric transport (Vol_{event}) (including 40% porosity) of 12,473 m^3 accounting for 99% of the measured sediment load in Keeton Reservoir. Using the lower and upper 95% confidence interval scaled discharge resulted in changes in the magnitude of total volumetric transport. The lower 95% confidence interval scaled discharge resulted in a drop in total volumetric transport to 12,219 m^3, accounting for 97% of the volume deposited in Keeton Reservoir. The Upper 95% confidence interval scaled discharge resulted in an increase in the total volumetric transport to 12,730 m^3, accounting for 99% of the volume deposited in Keeton Reservoir.

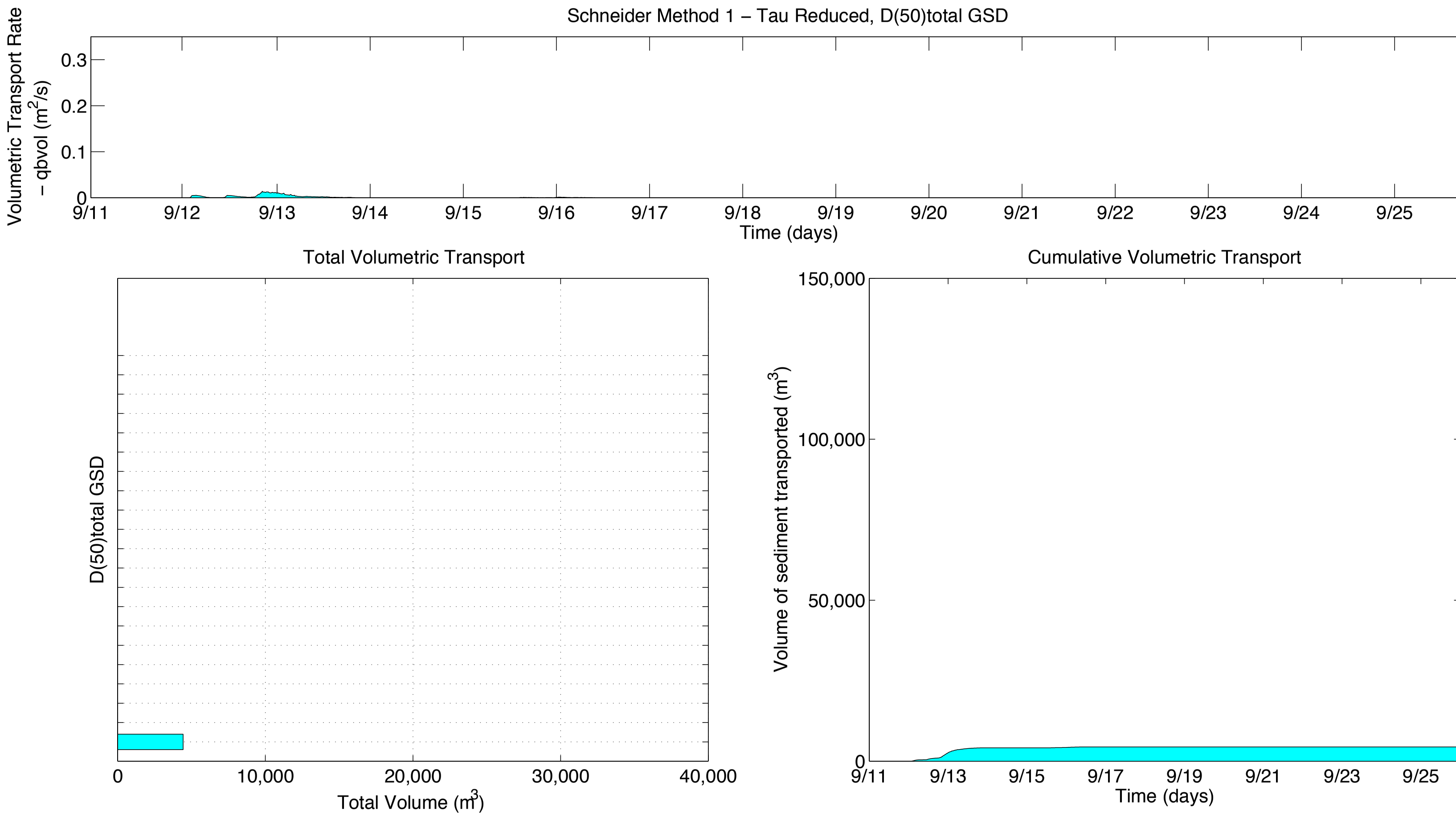

Figure 11. Evaluation of bedload sediment transport for the 2013 flood event in ULFC using the original Schneider methodology. Schneider Method 1 uses a reduced shear stress (τ') and the 50th percentile of the total grain size distribution (D_{50T}). (Above) Volumetric sediment transport rates per unit width (q_{bvol}) during the September 2013flood event. (Bottom left) Total volumetric sediment transport for the Schneider method 1. (Lower right) Cumulative volumetric transport for the 2013 flood event for the Schneider method 1.

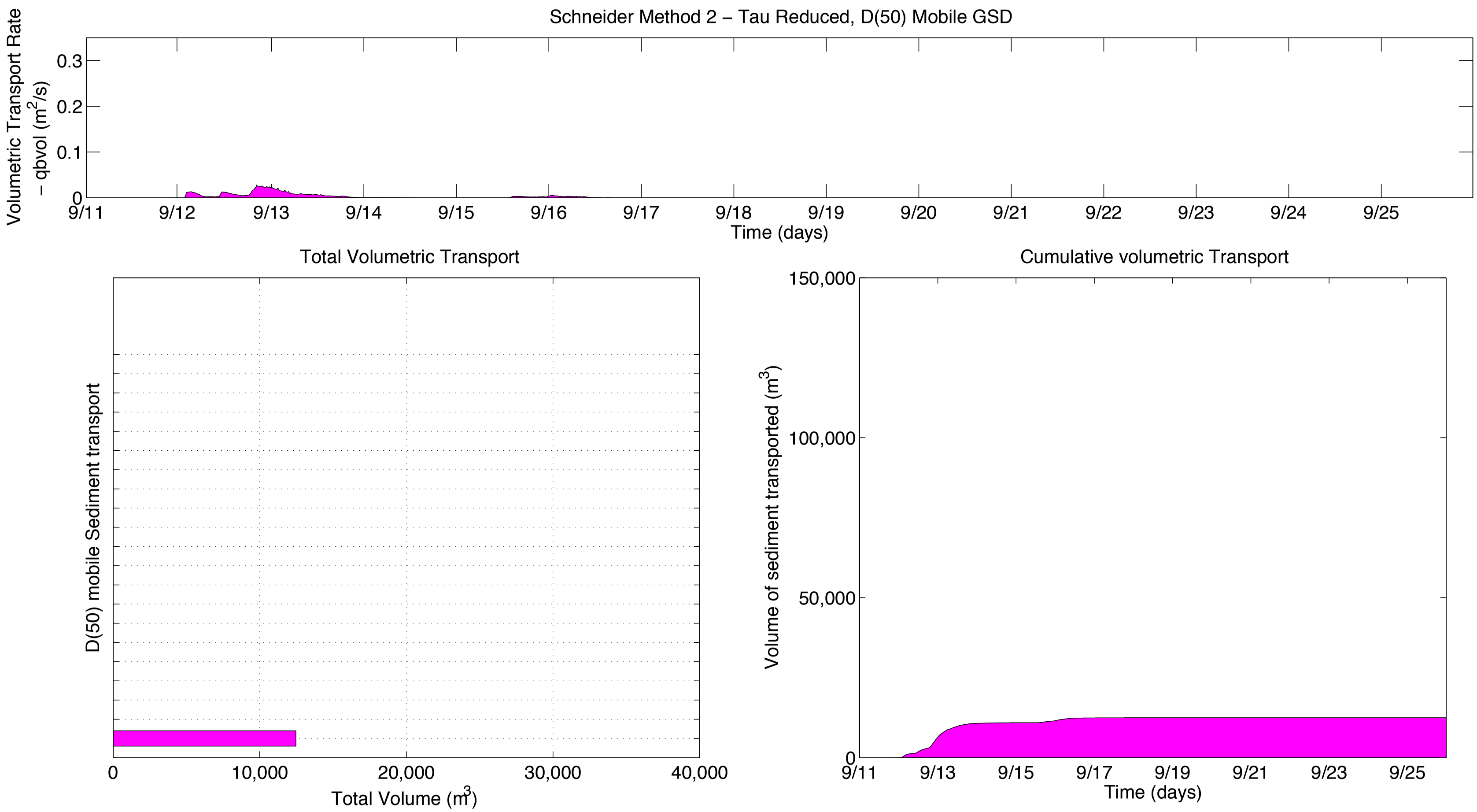

Figure 12. Evaluation of bedload sediment transport for the 2013 flood event in ULFC using the modified Schneider methodology. Schneider method 2 uses a reduced shear stress (τ') and the 50th percentile of the mobile grain size distribution (D_{50m}). (Above) Volumetric sediment transport rates per unit width (q_{bvol}) during the September 2013 flood event. (Bottom left) Total volumetric sediment transport for the Schneider method 2. (Lower right) Cumulative volumetric transport for the 2013 flood event for the Schneider method 2.

4.6.2 - Yager (2012)

4.6.2.A - Yager method 1

4 methods of sediment transport are applied following the methodology of Yager (2012) (table 1). The first method uses the total shear stress, the total grain size distribution, and the original parker hiding function. Total volumetric transport rates per unit width (q_{bvol}) range from 0 to 0.23 m^2/s for the 2013 flood event. The Yager (2012) methodology provides fractional transport rates for each of the 22 (½ phi) grain size bins used in this study. This method yields a total volumetric transport (Vol_{event}) of 47,347 m^3 accounting for 375% of the measured sediment load in Keeton Reservoir (Figure 13). This total volume is within an order of magnitude of the actual measured volume of sediment that was deposited in Keeton reservoir. Using the lower and upper 95% confidence interval scaled discharge resulted in changes in the magnitude of total volumetric transport. The lower 95% confidence interval scaled discharge resulted in a drop in total volumetric transport to 46,119 m^3, accounting for 366% of the volume deposited in Keeton Reservoir. The Upper 95% confidence interval scaled discharge resulted in an increase in the total volumetric transport to 48,597 m^3, accounting for 385% of the volume deposited in Keeton Reservoir.

4.6.2.B - Yager method 2

The second method uses the total shear stress, the total grain size distribution, and the total bed grain size distribution hiding function for the Erlenbach. Total volumetric transport rates per unit width (q_{bvol}) range from 0 to 0.075 m^2/s for the 2013 flood event (Figure 14). This method yields a total volumetric transport (Vol_{event}) of 36,002 m^3 accounting for 285% of the measured sediment load in Keeton Reservoir. This total volume is within an order of magnitude of the actual measured volume of sediment that was deposited in Keeton reservoir. Using the lower an

upper 95% confidence interval scaled discharge resulted in changes in the magnitude of total volumetric transport. The lower 95% confidence interval scaled discharge resulted in a drop in total volumetric transport to 35,506 m^3, accounting for 281% of the volume deposited in Keeton Reservoir. The Upper 95% confidence interval scaled discharge resulted in an increase in the total volumetric transport to 36,506 m^3, accounting for 289% of the volume deposited in Keeton Reservoir.

4.6.2.C - Yager method 3

The third method uses the mobile shear stress, the mobile grain size distribution, and the original parker hiding function. Total volumetric transport rates per unit width (q_{bvol}) range from 0 to 0.3 m^2/s for the 2013 flood event (Figure 15). This method yields a total volumetric transport (Vol_{event}) of 65,585 m^3 accounting for 520% of the actual measured sediment load in Keeton Reservoir. This total volume is within an order of magnitude of the actual measured volume of sediment that was deposited in Keeton reservoir. Using the lower and upper 95% confidence interval scaled discharge resulted in changes in the magnitude of total volumetric transport. The lower 95% confidence interval scaled discharge resulted in a drop in total volumetric transport to 63,929 m^3, accounting for 507% of the volume deposited in Keeton Reservoir. The Upper 95% confidence interval scaled discharge resulted in an increase in the total volumetric transport to 67,259 m^3, accounting for 533% of the volume deposited in Keeton Reservoir.

4.6.2.D - Yager method 4

The fourth method uses the mobile shear stress, the mobile grain size distribution, and the mobile bed grain size distribution hiding function for the Erlenbach. Total volumetric transport rates per unit width (q_{bvol}) range from 0 to 0.25 m^2/s for the 2013 flood event (Figure 16). This method yields a total volumetric transport (Vol_{event}) of 119,727 m^3 accounting for 949% of the actual

measured sediment load in Keeton Reservoir. This total volume is within an order of magnitude of the actual measured volume of sediment that was deposited in Keeton reservoir. Using the lower and upper 95% confidence interval scaled discharge resulted in changes in the magnitude of total volumetric transport. The lower 95% confidence interval scaled discharge resulted in a drop in total volumetric transport to 117,882 m^3, accounting for 934% of the volume deposited in Keeton Reservoir. The Upper 95% confidence interval scaled discharge resulted in an increase in the total volumetric transport to 121,588 m^3, accounting for 964% of the volume deposited in Keeton Reservoir.

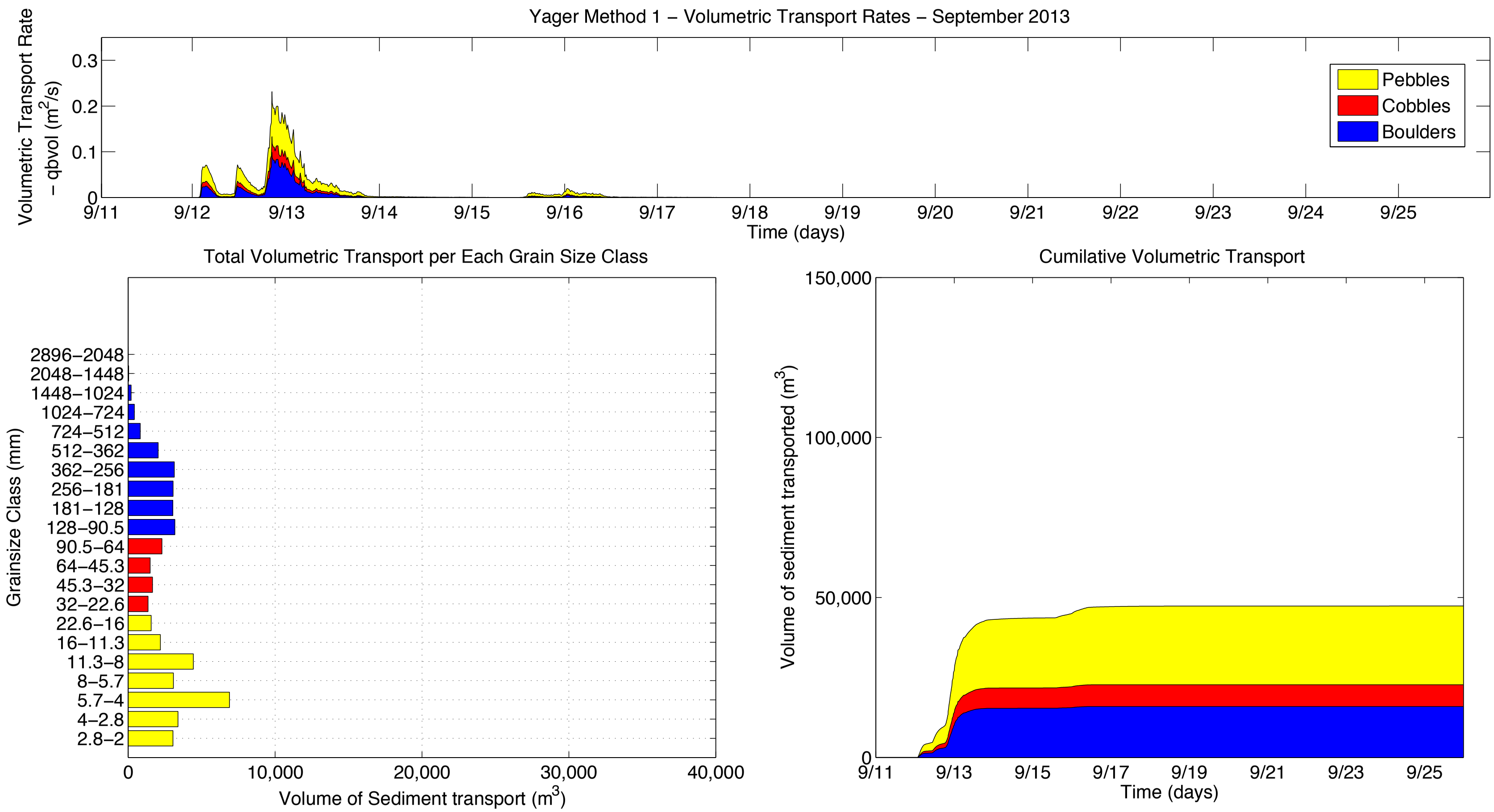

Figure 13. Evaluation of bedload sediment transport for the 2013 flood event in ULFC using Yager method 1. Yager method 1 uses a total shear stress (τ_t), total grain size distribution, and the original Parker hiding function. (Above) Volumetric sediment transport rates per unit width (q_{bvol}) during the September 2013 flood event. The relative transport of each major grain size class is shown. (Bottom left) Total volumetric sediment transport for each grain size class. (Lower right) Cumulative volumetric transport for the 2013 flood event showing the relative cumulative transport of major grain size fractions.

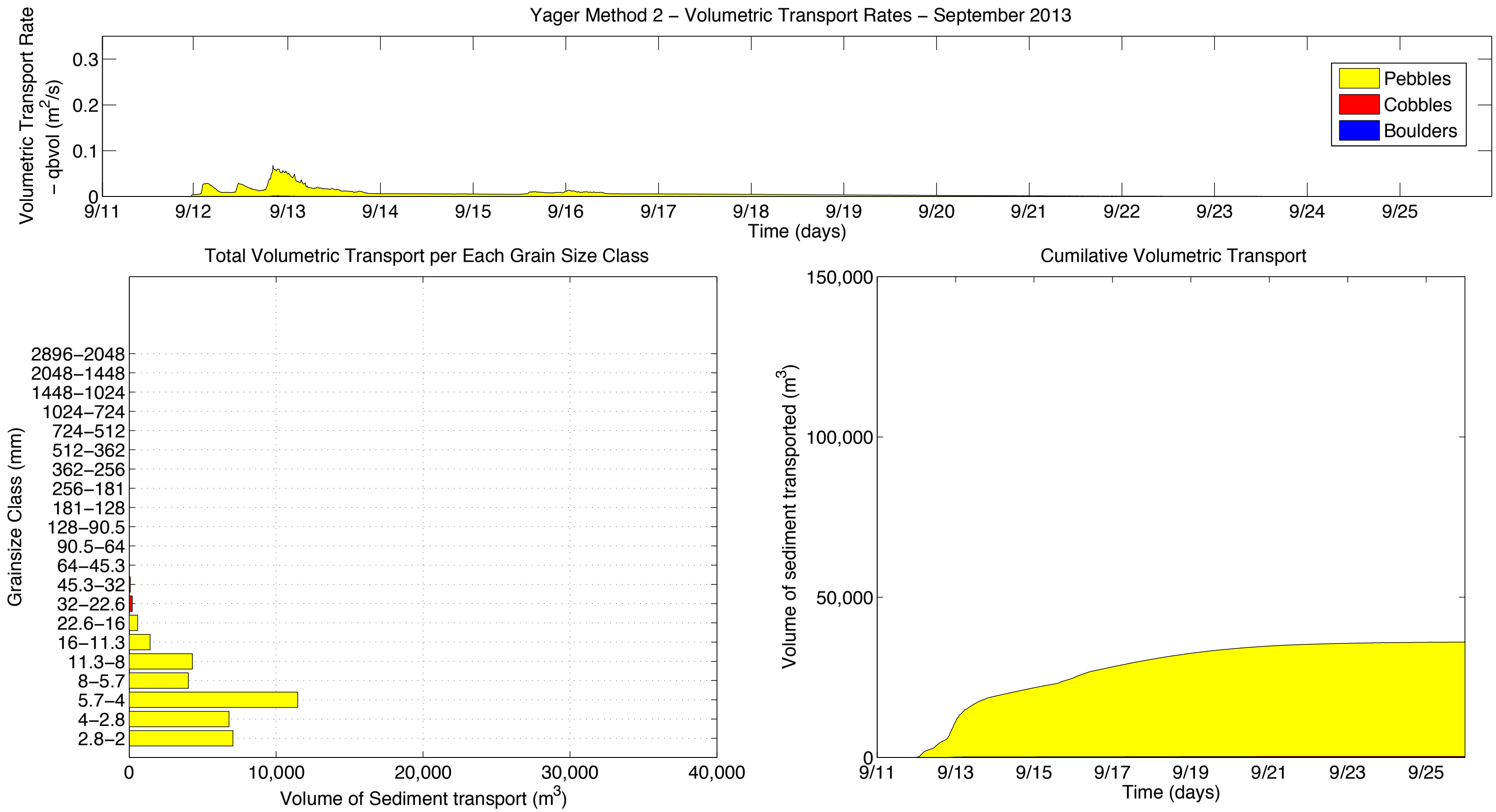

Figure 14. Evaluation of bedload sediment transport for the 2013 flood event in ULFC using Yager method 2. Yager method 2 uses a total shear stress (τ_t), total grain size distribution, and the Erlenbach total GSD hiding function (Above) Volumetric sediment transport rates per unit width (q_{bvol}) during the September 2013 flood event. The relative transport of each major grain size class is shown. (Bottom left) Total volumetric sediment transport for each grain size class. (Lower right) Cumulative volumetric transport for the 2013 flood event showing the relative cumulative transport of major grain size fractions.

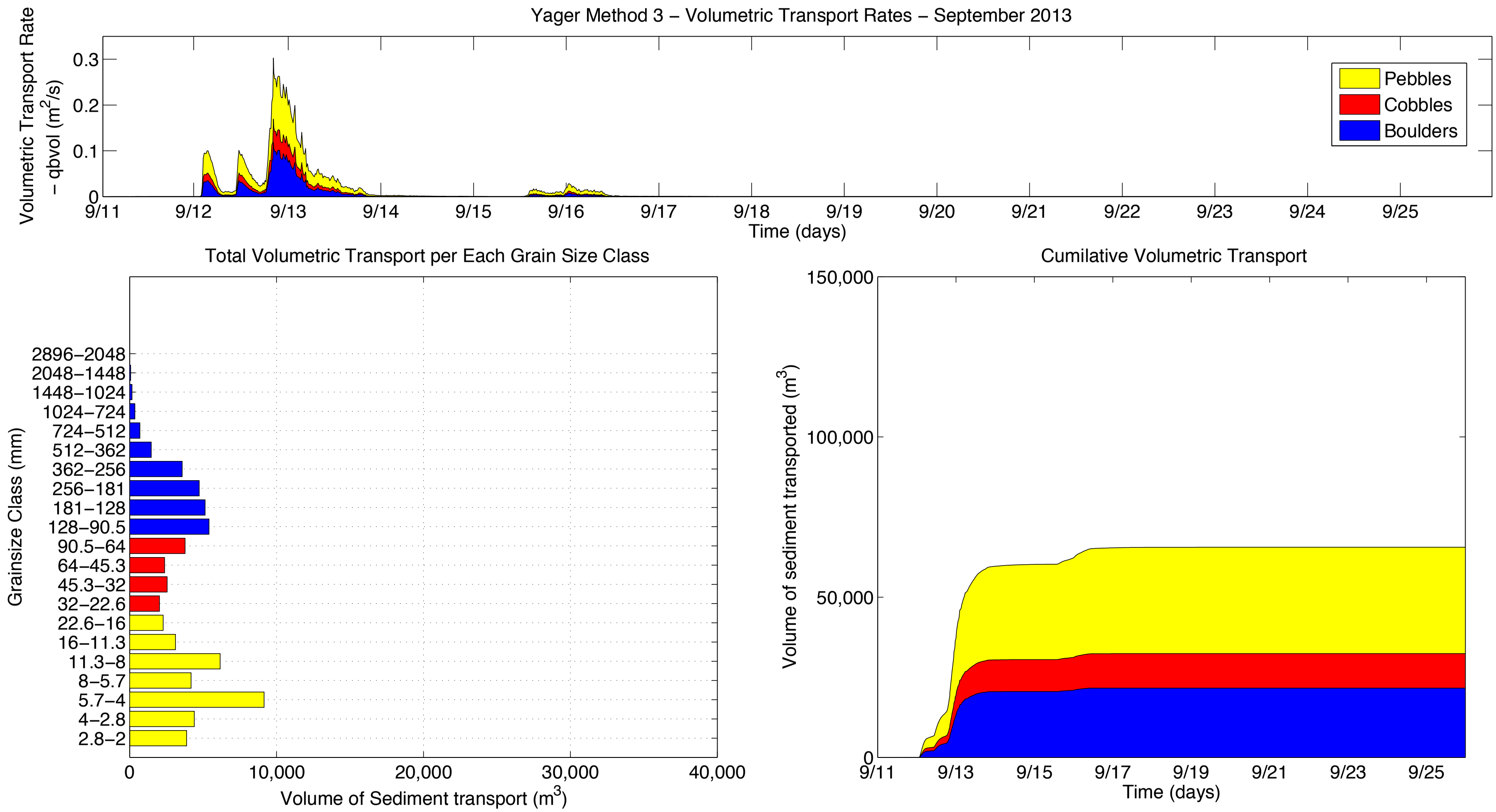

Figure 15. Evaluation of bedload sediment transport for the 2013 flood event in ULFC using Yager method 3. Yager method 3 uses a mobile shear stress (τ_m), mobile grain size distribution, and the original Parker hiding function. (Above) Volumetric sediment transport rates per unit width (q_{bvol}) during the September 2013 flood event. The relative transport of each major grain size class is shown. (Bottom left) Total volumetric sediment transport for each grain size class. (Lower right) Cumulative volumetric transport for the 2013 flood event showing the relative cumulative transport of major grain size fractions.

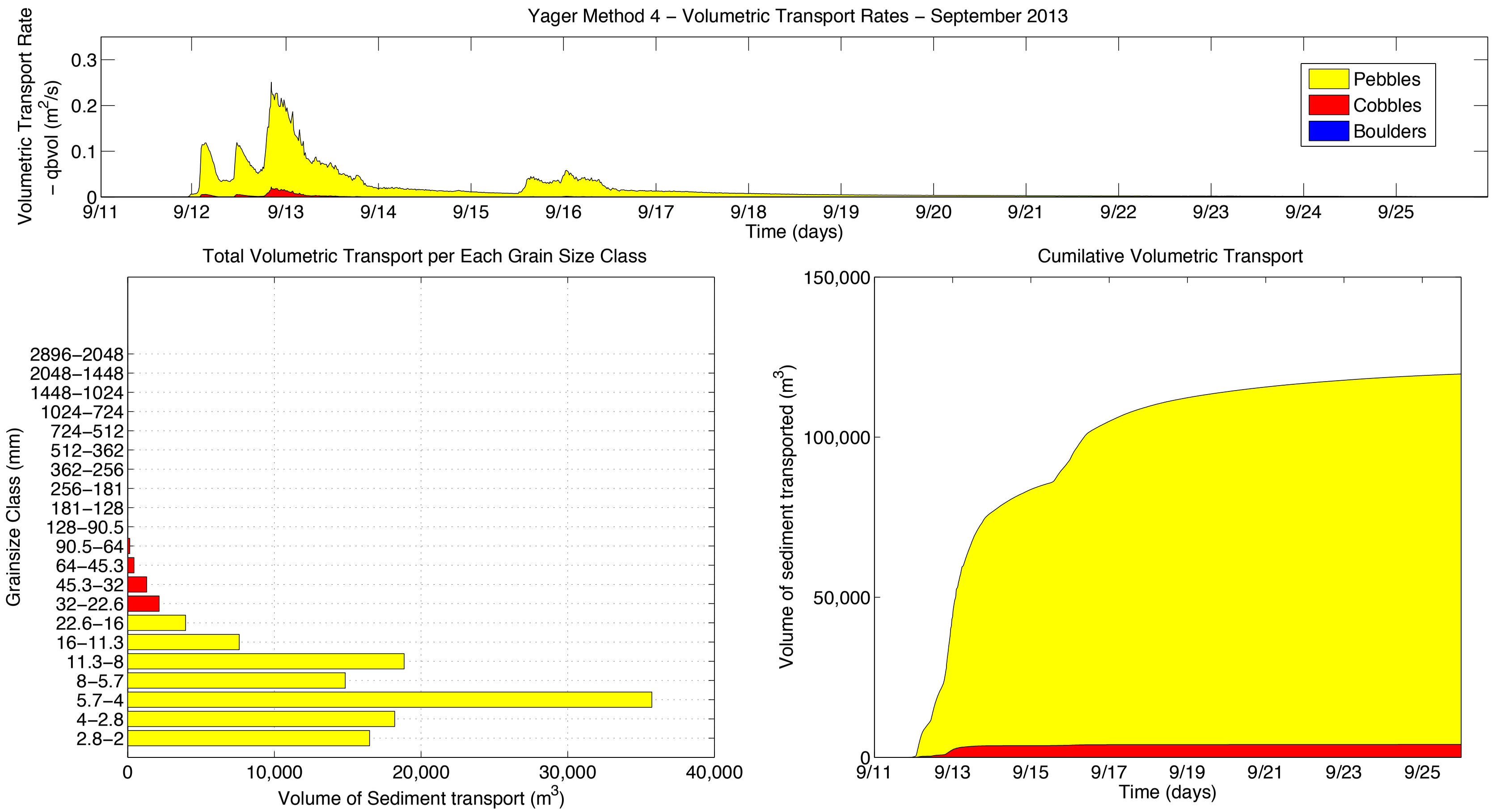

Figure 16. Evaluation of bedload sediment transport for the 2013 flood event in ULFC using Yager method 4. Yager method 4 uses a mobile shear stress (τ_m), mobile grain size distribution, and the Erlenbach mobile GSD hiding function. (Above) Volumetric sediment transport rates per unit width (q_{bvol}) during the September 2013 flood event. The relative transport of each major grain size class is shown. (Bottom left) Total volumetric sediment transport for each grain size class. (Lower right) Cumulative volumetric transport for the 2013 flood event showing the relative cumulative transport of major grain size fractions.

4.6.3 - Synthesis of Bedload Sediment Transport

All methodologies applied in this study fall within 1 order of magnitude of the measured volume deposited in Keeton Reservoir 12,615 m^3. Of all the methodologies evaluated in this study, the Schneider method 1 and 2 come the closest to the amount deposited within Keeton Reservoir, at 35% and 99% of the measured volume respectively. Total volumetric transport determinations for Schneider method 1 and 2 are 4,436 m^3 and 12,473 m^3 respectively. All of the Yager methods, (1-4), over predict total bedload sediment transport volumes for the 2013 flood event in ULFC, with total volumetric determinations of 47,347 m^3, 36,002 m^3, 65,585 m^3, 119,727 m^3 respectively (Figure 17). The magnitude of over prediction ranges from 285-949% of the amount measured for the 2013 flood event when administering the Yager (2012) methodology.

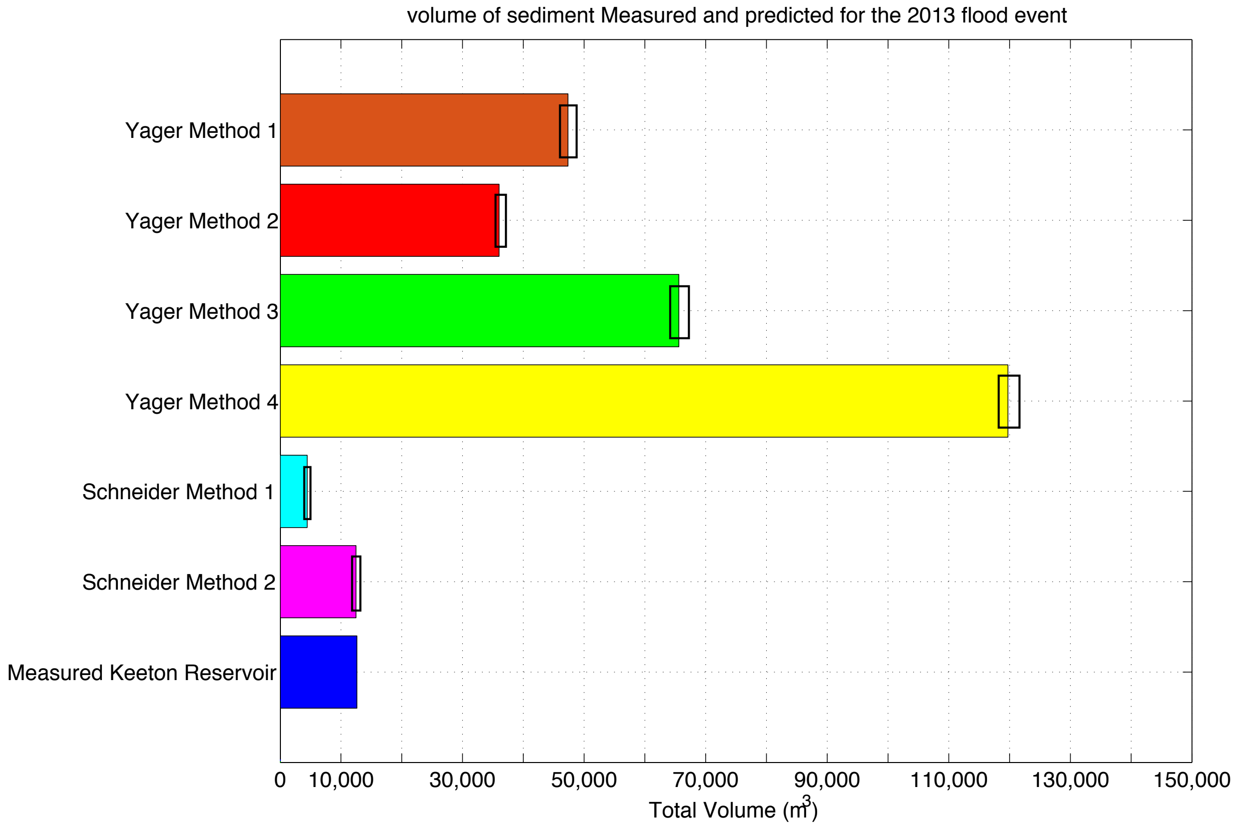

Figure 17. Predictions of total volumetric sediment transport during the 2013 flood event for each methodology applied in this study. Error bars represent variations in transport with the upper/lower 95% confidence discharge. The volume of sediment deposited within Keeton Reservoir during the 2013 flood event is shown for comparison.

5 - Discussion

5.1 – Hydraulics

Two different approaches are used in this study to extract hydraulic parameters for the flood event in ULFC, as mentioned in section 4.5, after Yager (2012) and Schnieder (2016). Schnieder (2016) uses the Rickenmann and Recking (2011) method for hydraulic parameter extraction and to perform flow resistance partitioning. This method has been calibrated to a large field data set containing 2890 measurements of flow velocity in gravel bed streams with channel slopes ranging from 0.00004-0.24 m/m. This large dataset includes discharges ranging from 0.0017 – 16,950 m^3/s Rickenmann and Recking (2011). The 2013 flood event in ULFC is confined within

the range of events to which the Schneider (2016) methods for hydraulic parameter extraction and flow resistance partitioning have been calibrated.

The Yager (2012) method has few elements of empirical calibration involved. The two drag coefficients (C_I) and (C_m) are nestled within the stress partitioning equation (Equation 13), and are used to predict the reach averaged by hydraulics (flow depth (h), flow velocity (U), mobile shear stress (τ_m), and total shear stress (τ_t) (Yager, 2012). These drag coefficients have been calibrated to seven flood events with 69 measurements of flow velocity, discharge, and flow depth within the Erlenbach SMS. The Erlenbach has a channel slope 0.098 m/m. The range of discharges to which these calibrations were performed did not exceed 2.1 m^3/s (Yager 2006), much lower flow discharges than were scaled and observed for the 2013 flood event in ULFC. The scaled discharge hydrograph for 2013 flood event remains well above flow discharges of 2.1 m^3/s for the majority of the flood event, and has a peak flood discharge of 40 m^3/s. These flow conditions greatly exceed the discharges for which the Yager (2012) drag coefficients, and thus hydraulic parameter extraction was calibrated. This brings into question the validity/ confidence in extracted hydraulics per this methodology.

The Schnieder (2016) and Yager (2012) methods are vastly different in the ways they simulate flow in the channel for the 2013 flood event. The Schnieder (2016) method simulates a shallow and quick flow with velocities ranging from 0.07 to 5.07 (m/s), and flow depths ranging from 0.07 to1.47 meters (Figure 10). The Yager (2012) stress partitioning approach simulates flows with intermediate velocities and large flow depths; with flow velocities ranging from 0.17 to 2.43 m/s, and flow depths ranging from 0.03 to 3.01 meters (Figure 10). Shortly after the 2013 flood event researchers from LSU went out and measured high water marks throughout the ULFC

basin. Field measurements of high water marks near the scientific reach investigated in this study ranged from 1.62-1.66 meters. These measurements of high water marks corroborate with the predicted maximum flow depths extracted with the Schnieder (2016) methodology. Flow depths predicted with the Yager (2012) methodology are much greater than measured flow depths following the 2013 flood. Cross sections with high water marks are provided in the Appendix (A.6).

This discrepancy in extracted hydraulics for the 2013 flood event, per each method, is responsible for the wide range in event driven sediment transport between the two methodologies. Bedload sediment transport is a function of hydraulic forces, which can be expressed in terms of discharge, stream power, and bed shear stress (Schnieder 2016). The Schnieder (2016) and Yager (2012) methods applied in this study both express the hydraulic forces in terms of a total bed shear stress (τ_t), as a function of the flow depth. This is extracted per each method via Equations (10,26) respectively. Each methodology proceeds in deriving a reduced shear stress to be used in the sediment transport equations. However, the disparity between the initial total bed shear stresses derived after Yager (2012) and Schnieder (2016) using flow depth (h), creates a disconnect between the methodologies at an early stage in the sediment transport quantification process. Total bed shear stresses derived with the Yager (2012) method elevates total shear stresses (τ_t) up to 3.25 times the total bed shear stresses derived from the Schnieder (2016) method (Figure 10). This leads to over predictions in volumetric sediment transport in later steps following the Yager (2012) methedology.

5.2 - Bedload Sediment transport

5.2.1 - Schneider Method

Schneider (2016) calibrated the Wilcock and Crowe (2003) dimensionless total bedload sediment transport equation (Equation 4) to a large field dataset including 3,099 measurements of bedload sediment transport rates from 19 SMS and 16 lower gradient channels with bankfull discharges for ranging from 0.3 – 651 m^3/s, and channel slopes ranging from 0.0005 – 0.11 m/m Schneider (2015). The conditions to which this dimensionless bedload sediment transport equation has been calibrated well encapsulate the extreme flood conditions observed within the ULFC basin for the 2013 flood event.

The original Schneider (2016) method for total sediment transport quantification (Schneider method 1) treats the entire stream bed surface as mobile and uses the 50th percentile of the total grain size distribution (D_{50T}) as a proxy for total volumetric bedload sediment transport rates per unit width (q_{bvol}). Including the immobile steps within the grain size distribution raises the size of the 50th percentile grain size and limits sediment transport significantly in ULFC, with bedload sediment transport rates per unit width (q_{bvol}) remaining close to zero until the discharges reach ≈10 m^3/s. This greatly restricts the time period of sediment transport during the 2013 flood event, with sediment transport only occurring during the two major discharge flood events associated with this storm.

The modified Schneider (2016) method for total sediment transport quantification (Schneider method 2) delineates the streambed surface into mobile and immobile fractions after Yager (2012) and uses the 50th percentile of the mobile grain size distribution (D_{50m}) as a proxy for total volumetric bedload sediment transport rates per unit width (q_{bvol}). This improves on the

sediment transport limitations mentioned above for the original Schneider method, with bedload sediment transport rates per unit width (q_{bvol}) remaining close to zero until the discharges reach $\approx 5\ m^3/s$. This greatly increases the magnitude of sediment transport during the 2013 flood event, when compared to the original method, with considerable sediment transport occurring at lower discharges in the hydrograph.

The Schneider methodology is quite sensitive to the grain size distribution of the stream, specifically the 50th and 84th percentiles of the distribution($D_{84T,} D_{50T}, D_{50m}$). We observe a 64% increase in total sediment transport when using the mobile grain size distribution as a proxy for sediment transport, Schnieder method 2. Our results indicate that it is important to use the entire grain size distribution (including immobile steps) to extract the hydraulics and account for macro roughness elements in the stream. However, for sediment transport quantification, in step-pool channels, it is important to exclude the large immobile grains (steps) from the grain size distribution.

In June 2018, LSU geology students enrolled in an upper level field geology course, GEOL 4002, collected measurements necessary to perform the original Schieder (2016) method in ULFC. The students performed these measurements at two locations within the study area: Reach 5.5 located 100 meters upstream of Keeton Reservoir and Reach 13.5 located 1000 meters upstream of Keeton Reservoir. Morphometric parameters used to perform the original Schneider method for each reach are provided in table 3, and more detailed survey results are provided in the appendix (A.7).

Table 3: Averaged parameters for two scientific reaches analyzed by GEOL 4002 class.

Variable	Reach 5.5 - upstream Cascade	Reach 13.5 - Step-Pool, cascade
Slope (S)	0.051 m/m	0.054 m/m
Average Channel width (W)	6.68 m	5.78 m
D_{50}	98 mm	128 mm
D_{84}	270 mm	407 mm

The students performed these measurements in order to determine a range in sediment transport predictions based on channel morphology, channel slope, and proximity to Keeton Reservoir. Measurements from reach 5.5 resulted in a predicted total volumetric transport volume of 13,655 m^3, accounting for 92% of the sediment deposited in Keeton reservoir. Measurements from reach 13.5 resulted in a predicted total volumetric sediment transport volume of 6076 m^3, accounting for 48% of the sediment deposited in Keeton Reservoir. This shows that considerable variation in total sediment transport prediction occurs when applying the original Schneider (2016) method to different portions of stream networks. Analyzing reaches closest to reservoirs or structures in question is important when trying to predict the magnitude of volumetric transport.

5.2.2 - Yager method

The modified parker bedload sediment transport equation used by Yager (2012) has limited calibration to one stream system, Oak Creek (Yager, 2006). This calibration was constructed using repeat measurements of bedload sediment transport rates within the Oak Creek watershed (Milhous, 1973). This calibration was constructed with long-term stream flow data with discharges ranging from 0 – 8.50 m^3/s. This calibration does not encapsulate conditions observed and simulated for the extreme flood event in ULFC. This discrepancy brings into question the applicability in applying the Yager (2012) methodology to extreme flood events.

The Yager methodology greatly over predicts sediment transport quantification for each case evaluated in this study, Yager methods 1-4. The initial quantification of total bed shear stress

using flow depth (h), over estimates shear stress acting on the stream bed surface, and is likely the cause for great over predictions when using this method. However, there is a great deal of variance between each method evaluated after Yager (2012). Since the total shear stress (τ_t) and mobile shear stress(τ_m) do not vary greatly with the increase in discharge per this methodology (Figure 10), flow resistance partitioning and use of a reduced shear stress is not responsible for the cause of variance is sediment transport between Yager methods 1-4. Instead, the combinations of total or mobile grain size distributions with 3 hiding functions are responsible for the variance (table 1).

Yager method 1 pairs the total grain size distribution with the original parker hiding function to obtain a fractional volumetric sediment transport rate per unit width (q_{bvoli}) for each i^{th} grain size class, 22 ½ phi classes. For this method sediment transport is restricted to the two peak discharge events; however, boulders, cobbles, and pebbles are all being transported, with boulders and pebbles accounting for the majority of sediment transport. This method allows for an unrealistic amount of boulder transport with the 2013 flood event, with boulders accounting for more transport than cobble size grains.

Yager method 2 pairs the total grain size distribution with the Erlenbach total GSD hiding function to obtain a fractional volumetric sediment transport rate per unit width (q_{bvoli}) for each i^{th} grain size class. For this method sediment transport is not restricted to the two peak discharge events and occurs consistently from 9/12-9/20. The hiding function allows for the transport of pebble and cobble grain size fractions of the grain size distribution to move, and the magnitude of transport is based on their abundance and size.

Yager method 3 pairs the mobile grain size distribution with the original Parker (1990) hiding function to obtain a fractional volumetric sediment transport rate per unit width (q_{bvoli}) for each i^{th} grain size class, 22 ½ phi classes. For this method sediment transport is restricted to the two peak discharge events; however, boulders, cobbles, and pebbles are all being transported with boulders and pebbles accounting for the majority of sediment transport. This method allows for an unrealistic amount of boulder transport with the 2013 flood event, with boulders accounting for more transport than cobble size grains.

Yager method 4 pairs the mobile grain size distribution with the Erlenbach mobile GSD hiding function to obtain a fractional volumetric sediment transport rate per unit width (q_{bvoli}) for each i^{th} grain size class. For this method sediment transport is not restricted to the two peak discharge events and occurs consistently from 9/12-9/21. This hiding function allow for pebbles and cobbles to be transported during this event, but pebbles account for the vast majority of sediment transport. The magnitude of transport per each grain size fraction is based on their abundance and size.

The Yager (2012) methodology accounts for the main sources of flow resistance present in SMS with step-pool morphology, but ignores other sources of flow resistance well-documented within SMS such as: overbank roughness, isolated boulders, wall roughness, vegetated banks, an armored bed surface, etc. The original drag coefficient equation proposed by Yager (2012) collapses at higher flow depths. This collapse creates a cross over point between the total shear stress (τ_t) and mobile shear stress (τ_m) at relative flow depths (h/P_u) greater than six. This causes the mobile shear stress to exceed the total shear stress above this threshold. This is unrealistic and brings into question the validity in applying this methodology to predict sediment

transport. In this study, a modified drag coefficient equation that reduces the mobile shear stress to values lower than the total shear stress is used. This modified drag coefficient needs to be tested in under various flow condition in order to determine its applicability in SMS. An explanation on the derivation of this new drag coefficient is provided in the appendix (A.3).

Shear stresses derived via the Yager (2012) methodology greatly exceed shear stresses derived with the Schneider methodology, and are likely the root of the over-prediction problems observed with this method. The size selective transport performed by this method is extremely sensitive to the grain size distribution and specific hiding function used to predict sediment transport. The hiding functions used in this study need to be reviewed for applicability to other SMS systems. Re-calibration of the stress partitioning equations so that hydraulic parameters extracted conform to a large field data set containing discharge, flow velocity, and water depth measurements will increase the accuracy of shear stress extraction and total bedload sediment transport predictions for this method.

6. Conclusions

In this study, we set out to determine a range of event driven sediment transport for the 2013 flood event in Little Fountain creek following the methodologies of Yager (2012) and Schnieder (2016). Upon review, these methodologies are vastly different in the ways they: (1) account for macro roughness elements, (2) extract hydraulic parameters from simulated flood discharges, (3) perform flow resistance partitioning, and (4) calculate bedload sediment transport rates. These discrepancies have led to a large range of total event driven sediment transport for the 2013 flood event in ULFC with values ranging from 4,436 - 119,727 m^3. The Schneider (2016) method is simplified in its application of flow resistance partitioning in that it relies heavily on empirical

relationships from large field data sets to predict sediment transport, as opposed to using a physics based model like Yager (2012). However, it is more successful in predicting volumetric sediment transport for the 2013 flood event in little fountain creek (Figure 17), likely do to the successful extraction of hydraulic parameters at high flow depths. The Yager (2012) methodology uses a physics based approach to account for macro-roughness elements in the stream and quantify flow resistance; however, these sets of equations lack calibration to discharge events > 2.1 m^3/s bringing in to question the validity in applying this methodology to extreme flood events. The Yager (2012) method consistently over-predicts sediment transport for this stream and flood event when compared to the Schneider methodology.

This analysis provides important insights into the predictive quality of sediment transport equations when applied to ungauged SMS, and elucidates goals for future research in this field. A study that incorporates multiple field sites, a wide range of flow conditions, and a diverse range of stream morphologies is needed in order to calibrate the hydraulics, flow and stress partitioning equations, and bedload sediment transport equations for each methodology.

7. Appendix

A.1 – Rock Creek Discharge September – 2013

Table 1. Approved Discharge measurements for the Rock Creek above Fort Carson Stream gauge during the September - 2013 Flood event.

Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/11/13 0:00	0.23	9/11/13 9:30	0.38	9/11/13 19:00	0.57
9/11/13 0:15	0.23	9/11/13 9:45	0.38	9/11/13 19:15	0.57
9/11/13 0:30	0.26	9/11/13 10:00	0.38	9/11/13 19:30	0.57
9/11/13 0:45	0.26	9/11/13 10:15	0.35	9/11/13 19:45	0.53
9/11/13 1:00	0.26	9/11/13 10:30	0.38	9/11/13 20:00	0.53
9/11/13 1:15	0.26	9/11/13 10:45	0.38	9/11/13 20:15	0.53
9/11/13 1:30	0.29	9/11/13 11:00	0.35	9/11/13 20:30	0.66
9/11/13 1:45	0.26	9/11/13 11:15	0.35	9/11/13 20:45	0.76
9/11/13 2:00	0.29	9/11/13 11:30	0.38	9/11/13 21:00	1.04
9/11/13 2:15	0.29	9/11/13 11:45	0.38	9/11/13 21:15	1.45
9/11/13 2:30	0.29	9/11/13 12:00	0.38	9/11/13 21:30	3
9/11/13 2:45	0.29	9/11/13 12:15	0.38	9/11/13 21:45	5.43
9/11/13 3:00	0.29	9/11/13 12:30	0.38	9/11/13 22:00	5.95
9/11/13 3:15	0.29	9/11/13 12:45	0.38	9/11/13 22:15	6.32
9/11/13 3:30	0.32	9/11/13 13:00	0.41	9/11/13 22:30	7.29
9/11/13 3:45	0.32	9/11/13 13:15	0.41	9/11/13 22:45	11.8
9/11/13 4:00	0.32	9/11/13 13:30	0.41	9/11/13 23:00	19.1
9/11/13 4:15	0.32	9/11/13 13:45	0.45	9/11/13 23:15	49.3
9/11/13 4:30	0.32	9/11/13 14:00	0.49	9/11/13 23:30	51.9
9/11/13 4:45	0.32	9/11/13 14:15	0.49	9/11/13 23:45	51.9
9/11/13 5:00	0.32	9/11/13 14:30	0.53	9/12/13 0:00	53.7
9/11/13 5:15	0.29	9/11/13 14:45	0.53	9/12/13 0:15	56.4
9/11/13 5:30	0.29	9/11/13 15:00	0.53	9/12/13 0:30	58.2
9/11/13 5:45	0.29	9/11/13 15:15	0.53	9/12/13 0:45	62
9/11/13 6:00	0.29	9/11/13 15:30	0.53	9/12/13 1:00	70
9/11/13 6:15	0.29	9/11/13 15:45	0.53	9/12/13 1:15	89.9
9/11/13 6:30	0.29	9/11/13 16:00	0.53	9/12/13 1:30	134
9/11/13 6:45	0.29	9/11/13 16:15	0.53	9/12/13 1:45	270
9/11/13 7:00	0.26	9/11/13 16:30	0.53	9/12/13 2:00	428
9/11/13 7:15	0.29	9/11/13 16:45	0.49	9/12/13 2:15	453
9/11/13 7:30	0.29	9/11/13 17:00	0.49	9/12/13 2:30	451
9/11/13 7:45	0.32	9/11/13 17:15	0.49	9/12/13 2:45	451
9/11/13 8:00	0.32	9/11/13 17:30	0.53	9/12/13 3:00	463

9/11/13 8:15	0.35	9/11/13 17:45	0.53	9/12/13 3:15	463
9/11/13 8:30	0.38	9/11/13 18:00	0.53	9/12/13 3:30	449
9/11/13 8:45	0.38	9/11/13 18:15	0.57	9/12/13 3:45	437
9/11/13 9:00	0.38	9/11/13 18:30	0.57	9/12/13 4:00	418
9/11/13 9:15	0.38	9/11/13 18:45	0.57	9/12/13 4:15	409
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/12/13 4:30	391	9/12/13 14:15	337	9/13/13 0:15	669
9/12/13 4:45	369	9/12/13 14:30	339	9/13/13 0:45	614
9/12/13 5:00	341	9/12/13 14:45	310	9/13/13 1:15	582
9/12/13 5:15	330	9/12/13 15:00	314	9/13/13 1:45	648
9/12/13 5:30	303	9/12/13 15:15	301	9/13/13 2:00	543
9/12/13 5:45	265	9/12/13 15:30	299	9/13/13 2:15	515
9/12/13 6:00	244	9/12/13 15:45	283	9/13/13 3:00	493
9/12/13 6:15	232	9/12/13 16:00	287	9/13/13 3:15	477
9/12/13 6:30	207	9/12/13 16:15	263	9/13/13 3:30	543
9/12/13 6:45	202	9/12/13 16:30	263	9/13/13 3:45	483
9/12/13 7:00	191	9/12/13 16:45	253	9/13/13 4:00	449
9/12/13 7:15	187	9/12/13 17:00	265	9/13/13 4:15	447
9/12/13 7:30	194	9/12/13 17:15	265	9/13/13 4:30	473
9/12/13 7:45	200	9/12/13 17:30	285	9/13/13 4:45	384
9/12/13 8:00	196	9/12/13 17:45	272	9/13/13 5:00	401
9/12/13 8:15	194	9/12/13 18:00	301	9/13/13 5:15	362
9/12/13 8:30	200	9/12/13 18:15	290	9/13/13 5:45	360
9/12/13 8:45	194	9/12/13 18:30	364	9/13/13 6:30	333
9/12/13 9:00	191	9/12/13 18:45	426	9/13/13 6:45	326
9/12/13 9:15	189	9/12/13 19:00	503	9/13/13 7:00	345
9/12/13 9:30	187	9/12/13 19:15	560	9/13/13 7:15	341
9/12/13 9:45	198	9/12/13 19:30	558	9/13/13 7:30	366
9/12/13 10:00	203	9/12/13 19:45	660	9/13/13 7:45	373
9/12/13 10:15	207	9/12/13 20:00	679	9/13/13 8:00	349
9/12/13 10:30	215	9/12/13 20:10	805	9/13/13 8:15	341
9/12/13 10:45	326	9/12/13 20:15	760	9/13/13 8:30	345
9/12/13 11:00	422	9/12/13 20:30	739	9/13/13 8:45	345
9/12/13 11:15	465	9/12/13 20:45	739	9/13/13 9:00	318
9/12/13 11:30	449	9/12/13 21:00	712	9/13/13 9:15	330
9/12/13 11:45	441	9/12/13 21:15	744	9/13/13 9:30	328
9/12/13 12:00	447	9/12/13 21:30	748	9/13/13 9:45	324
9/12/13 12:15	431	9/12/13 21:45	746	9/13/13 10:00	320
9/12/13 12:30	424	9/12/13 22:00	688	9/13/13 10:15	320
9/12/13 12:45	409	9/12/13 22:15	676	9/13/13 10:30	320

9/12/13 13:00	397	9/12/13 22:30	676	9/13/13 10:45	299
9/12/13 13:15	382	9/12/13 22:45	721	9/13/13 11:00	310
9/12/13 13:30	375	9/12/13 23:15	674	9/13/13 11:15	322
9/12/13 13:45	358	9/12/13 23:30	712	9/13/13 11:30	333
9/12/13 14:00	349	9/13/13 0:00	649	9/13/13 11:45	326
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/13/13 12:00	303	9/13/13 21:45	143	9/14/13 7:30	122
9/13/13 12:15	301	9/13/13 22:00	141	9/14/13 7:45	117
9/13/13 12:30	287	9/13/13 22:15	143	9/14/13 8:00	110
9/13/13 12:45	314	9/13/13 22:30	137	9/14/13 8:15	113
9/13/13 13:00	303	9/13/13 22:45	128	9/14/13 8:30	115
9/13/13 13:15	283	9/13/13 23:00	132	9/14/13 8:45	113
9/13/13 13:30	283	9/13/13 23:15	129	9/14/13 9:00	110
9/13/13 13:45	248	9/13/13 23:30	128	9/14/13 9:15	113
9/13/13 14:00	253	9/13/13 23:45	122	9/14/13 9:30	115
9/13/13 14:15	246	9/14/13 0:00	113	9/14/13 9:45	103
9/13/13 14:30	246	9/14/13 0:15	126	9/14/13 10:00	111
9/13/13 14:45	251	9/14/13 0:30	126	9/14/13 10:15	106
9/13/13 15:00	253	9/14/13 0:45	124	9/14/13 10:30	113
9/13/13 15:15	246	9/14/13 1:00	121	9/14/13 10:45	107
9/13/13 15:30	238	9/14/13 1:15	128	9/14/13 11:00	109
9/13/13 15:45	242	9/14/13 1:30	134	9/14/13 11:15	109
9/13/13 16:00	238	9/14/13 1:45	118	9/14/13 11:30	109
9/13/13 16:15	224	9/14/13 2:00	129	9/14/13 11:45	105
9/13/13 16:30	234	9/14/13 2:15	117	9/14/13 12:00	103
9/13/13 16:45	232	9/14/13 2:30	128	9/14/13 12:15	110
9/13/13 17:00	209	9/14/13 2:45	124	9/14/13 12:30	103
9/13/13 17:15	196	9/14/13 3:00	125	9/14/13 12:45	105
9/13/13 17:30	215	9/14/13 3:15	126	9/14/13 13:00	103
9/13/13 17:45	207	9/14/13 3:30	135	9/14/13 13:15	105
9/13/13 18:00	217	9/14/13 3:45	125	9/14/13 13:30	97.1
9/13/13 18:15	240	9/14/13 4:00	119	9/14/13 13:45	102
9/13/13 18:30	240	9/14/13 4:15	128	9/14/13 14:00	101
9/13/13 18:45	238	9/14/13 4:30	129	9/14/13 14:15	99.6
9/13/13 19:00	230	9/14/13 4:45	131	9/14/13 14:30	99.6
9/13/13 19:15	224	9/14/13 5:00	125	9/14/13 14:45	98.4
9/13/13 19:30	203	9/14/13 5:15	121	9/14/13 15:00	95.9
9/13/13 19:45	198	9/14/13 5:30	129	9/14/13 15:15	92.3
9/13/13 20:00	192	9/14/13 5:45	121	9/14/13 15:30	95.9
9/13/13 20:15	158	9/14/13 6:00	119	9/14/13 15:45	97.1

9/13/13 20:30	173	9/14/13 6:15	121	9/14/13 16:00	97.1
9/13/13 20:45	154	9/14/13 6:30	114	9/14/13 16:15	97.1
9/13/13 21:00	147	9/14/13 6:45	111	9/14/13 16:30	95.9
9/13/13 21:15	143	9/14/13 7:00	113	9/14/13 16:45	94.7
9/13/13 21:30	146	9/14/13 7:15	111	9/14/13 17:00	92.3
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/14/13 17:15	89.9	9/15/13 3:00	74.2	9/15/13 12:45	79.6
9/14/13 17:30	91.1	9/15/13 3:15	77.4	9/15/13 13:00	81.8
9/14/13 17:45	91.1	9/15/13 3:30	76.3	9/15/13 13:15	94.7
9/14/13 18:00	92.3	9/15/13 3:45	72	9/15/13 13:30	114
9/14/13 18:15	86.4	9/15/13 4:00	74.2	9/15/13 13:45	124
9/14/13 18:30	91.1	9/15/13 4:15	73.1	9/15/13 14:00	135
9/14/13 18:45	89.9	9/15/13 4:30	70	9/15/13 14:15	160
9/14/13 19:00	87.5	9/15/13 4:45	72	9/15/13 14:30	205
9/14/13 19:15	87.5	9/15/13 5:00	71	9/15/13 14:45	211
9/14/13 19:30	89.9	9/15/13 5:15	70	9/15/13 15:00	215
9/14/13 19:45	92.3	9/15/13 5:30	70	9/15/13 15:15	205
9/14/13 20:00	93.5	9/15/13 5:45	72	9/15/13 15:30	230
9/14/13 20:15	97.1	9/15/13 6:00	70	9/15/13 15:45	215
9/14/13 20:30	97.1	9/15/13 6:15	67.9	9/15/13 16:00	220
9/14/13 20:45	101	9/15/13 6:30	68.9	9/15/13 16:15	228
9/14/13 21:00	98.4	9/15/13 6:45	68.9	9/15/13 16:30	203
9/14/13 21:15	97.1	9/15/13 7:00	68.9	9/15/13 16:45	211
9/14/13 21:30	92.3	9/15/13 7:15	66.9	9/15/13 17:00	211
9/14/13 21:45	92.3	9/15/13 7:30	68.9	9/15/13 17:15	198
9/14/13 22:00	94.7	9/15/13 7:45	67.9	9/15/13 17:30	211
9/14/13 22:15	91.1	9/15/13 8:00	66.9	9/15/13 17:45	192
9/14/13 22:30	87.5	9/15/13 8:15	63.9	9/15/13 18:00	192
9/14/13 22:45	89.9	9/15/13 8:30	66.9	9/15/13 18:15	198
9/14/13 23:00	85.2	9/15/13 8:45	64.9	9/15/13 18:30	182
9/14/13 23:15	88.7	9/15/13 9:00	65.9	9/15/13 18:45	177
9/14/13 23:30	85.2	9/15/13 9:15	65.9	9/15/13 19:00	178
9/14/13 23:45	84.1	9/15/13 9:30	65.9	9/15/13 19:15	182
9/15/13 0:00	81.8	9/15/13 9:45	64.9	9/15/13 19:30	172
9/15/13 0:15	81.8	9/15/13 10:00	63	9/15/13 19:45	177
9/15/13 0:30	85.2	9/15/13 10:15	63.9	9/15/13 20:00	178
9/15/13 0:45	80.7	9/15/13 10:30	63.9	9/15/13 20:15	168
9/15/13 1:00	82.9	9/15/13 10:45	63	9/15/13 20:30	185
9/15/13 1:15	80.7	9/15/13 11:00	62	9/15/13 20:45	175
9/15/13 1:30	84.1	9/15/13 11:15	62	9/15/13 21:00	175

9/15/13 1:45	77.4	9/15/13 11:30	62	9/15/13 21:15	192
9/15/13 2:00	78.5	9/15/13 11:45	63	9/15/13 21:30	196
9/15/13 2:15	77.4	9/15/13 12:00	61	9/15/13 21:45	192
9/15/13 2:30	78.5	9/15/13 12:15	62	9/15/13 22:00	191
9/15/13 2:45	76.3	9/15/13 12:30	81.8	9/15/13 22:15	192
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/15/13 22:30	200	9/16/13 8:15	198	9/16/13 18:00	98.4
9/15/13 22:45	194	9/16/13 8:30	191	9/16/13 18:15	99.6
9/15/13 23:00	177	9/16/13 8:45	192	9/16/13 18:30	95.9
9/15/13 23:15	175	9/16/13 9:00	205	9/16/13 18:45	94.7
9/15/13 23:30	200	9/16/13 9:15	203	9/16/13 19:00	89.9
9/15/13 23:45	226	9/16/13 9:30	177	9/16/13 19:15	93.5
9/16/13 0:00	240	9/16/13 9:45	182	9/16/13 19:30	97.1
9/16/13 0:15	242	9/16/13 10:00	162	9/16/13 19:45	99.6
9/16/13 0:30	274	9/16/13 10:15	150	9/16/13 20:00	99.6
9/16/13 0:45	278	9/16/13 10:30	149	9/16/13 20:15	97.1
9/16/13 1:00	272	9/16/13 10:45	141	9/16/13 20:30	99.6
9/16/13 1:15	265	9/16/13 11:00	134	9/16/13 20:45	95.9
9/16/13 1:30	242	9/16/13 11:15	119	9/16/13 21:00	99.6
9/16/13 1:45	257	9/16/13 11:30	131	9/16/13 21:15	93.5
9/16/13 2:00	251	9/16/13 11:45	118	9/16/13 21:30	94.7
9/16/13 2:15	238	9/16/13 12:00	111	9/16/13 21:45	93.5
9/16/13 2:30	238	9/16/13 12:15	101	9/16/13 22:00	94.7
9/16/13 2:45	213	9/16/13 12:30	114	9/16/13 22:15	95.9
9/16/13 3:00	209	9/16/13 12:45	126	9/16/13 22:30	95.9
9/16/13 3:15	226	9/16/13 13:00	119	9/16/13 22:45	99.6
9/16/13 3:30	211	9/16/13 13:15	115	9/16/13 23:00	92.3
9/16/13 3:45	192	9/16/13 13:30	118	9/16/13 23:15	89.9
9/16/13 4:00	205	9/16/13 13:45	111	9/16/13 23:30	94.7
9/16/13 4:15	203	9/16/13 14:00	101	9/16/13 23:45	89.9
9/16/13 4:30	207	9/16/13 14:15	98.4	9/17/13 0:00	95.9
9/16/13 4:45	219	9/16/13 14:30	92.3	9/17/13 0:15	91.1
9/16/13 5:00	217	9/16/13 14:45	103	9/17/13 0:30	93.5
9/16/13 5:15	217	9/16/13 15:00	106	9/17/13 0:45	93.5
9/16/13 5:30	224	9/16/13 15:15	105	9/17/13 1:00	89.9
9/16/13 5:45	202	9/16/13 15:30	106	9/17/13 1:15	91.1
9/16/13 6:00	205	9/16/13 15:45	105	9/17/13 1:30	93.5
9/16/13 6:15	209	9/16/13 16:00	99.6	9/17/13 1:45	87.5
9/16/13 6:30	207	9/16/13 16:15	101	9/17/13 2:00	86.4
9/16/13 6:45	194	9/16/13 16:30	99.6	9/17/13 2:15	87.5

9/16/13 7:00	205	9/16/13 16:45	97.1	9/17/13 2:30	92.3
9/16/13 7:15	219	9/16/13 17:00	99.6	9/17/13 2:45	88.7
9/16/13 7:30	192	9/16/13 17:15	98.4	9/17/13 3:00	89.9
9/16/13 7:45	196	9/16/13 17:30	103	9/17/13 3:15	89.9
9/16/13 8:00	198	9/16/13 17:45	101	9/17/13 3:30	93.5
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/17/13 3:45	88.7	9/17/13 13:30	74.2	9/17/13 23:15	62
9/17/13 4:00	87.5	9/17/13 13:45	75.2	9/17/13 23:30	62
9/17/13 4:15	87.5	9/17/13 14:00	74.2	9/17/13 23:45	61
9/17/13 4:30	93.5	9/17/13 14:15	68.9	9/18/13 0:00	62
9/17/13 4:45	93.5	9/17/13 14:30	74.2	9/18/13 0:15	62
9/17/13 5:00	88.7	9/17/13 14:45	67.9	9/18/13 0:30	63.9
9/17/13 5:15	87.5	9/17/13 15:00	70	9/18/13 0:45	60.1
9/17/13 5:30	87.5	9/17/13 15:15	75.2	9/18/13 1:00	62
9/17/13 5:45	87.5	9/17/13 15:30	65.9	9/18/13 1:15	61
9/17/13 6:00	88.7	9/17/13 15:45	70	9/18/13 1:30	61
9/17/13 6:15	87.5	9/17/13 16:00	67.9	9/18/13 1:45	58.2
9/17/13 6:30	86.4	9/17/13 16:15	71	9/18/13 2:00	61
9/17/13 6:45	84.1	9/17/13 16:30	72	9/18/13 2:15	60.1
9/17/13 7:00	87.5	9/17/13 16:45	68.9	9/18/13 2:30	59.1
9/17/13 7:15	82.9	9/17/13 17:00	70	9/18/13 2:45	60.1
9/17/13 7:30	87.5	9/17/13 17:15	65.9	9/18/13 3:00	60.1
9/17/13 7:45	88.7	9/17/13 17:30	65.9	9/18/13 3:15	56.4
9/17/13 8:00	86.4	9/17/13 17:45	68.9	9/18/13 3:30	60.1
9/17/13 8:15	87.5	9/17/13 18:00	67.9	9/18/13 3:45	59.1
9/17/13 8:30	81.8	9/17/13 18:15	66.9	9/18/13 4:00	58.2
9/17/13 8:45	84.1	9/17/13 18:30	67.9	9/18/13 4:15	57.3
9/17/13 9:00	82.9	9/17/13 18:45	66.9	9/18/13 4:30	58.2
9/17/13 9:15	82.9	9/17/13 19:00	63.9	9/18/13 4:45	58.2
9/17/13 9:30	81.8	9/17/13 19:15	63.9	9/18/13 5:00	57.3
9/17/13 9:45	81.8	9/17/13 19:30	65.9	9/18/13 5:15	56.4
9/17/13 10:00	79.6	9/17/13 19:45	65.9	9/18/13 5:30	58.2
9/17/13 10:15	81.8	9/17/13 20:00	63.9	9/18/13 5:45	53.7
9/17/13 10:30	79.6	9/17/13 20:15	65.9	9/18/13 6:00	55.4
9/17/13 10:45	77.4	9/17/13 20:30	65.9	9/18/13 6:15	55.4
9/17/13 11:00	78.5	9/17/13 20:45	62	9/18/13 6:30	55.4
9/17/13 11:15	77.4	9/17/13 21:00	64.9	9/18/13 6:45	54.5
9/17/13 11:30	77.4	9/17/13 21:15	63.9	9/18/13 7:00	56.4
9/17/13 11:45	80.7	9/17/13 21:30	63.9	9/18/13 7:15	54.5
9/17/13 12:00	77.4	9/17/13 21:45	63.9	9/18/13 7:30	54.5

9/17/13 12:15	75.2	9/17/13 22:00	63.9	9/18/13 7:45	54.5
9/17/13 12:30	75.2	9/17/13 22:15	64.9	9/18/13 8:00	55.4
9/17/13 12:45	74.2	9/17/13 22:30	63.9	9/18/13 8:15	55.4
9/17/13 13:00	76.3	9/17/13 22:45	63.9	9/18/13 8:30	51
9/17/13 13:15	73.1	9/17/13 23:00	61	9/18/13 8:45	52.8
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/18/13 9:00	52.8	9/18/13 18:45	43.6	9/19/13 4:30	37.5
9/18/13 9:15	52.8	9/18/13 19:00	45.2	9/19/13 4:45	40.4
9/18/13 9:30	53.7	9/18/13 19:15	45.2	9/19/13 5:00	38.2
9/18/13 9:45	50.2	9/18/13 19:30	44.3	9/19/13 5:15	38.9
9/18/13 10:00	52.8	9/18/13 19:45	44.3	9/19/13 5:30	38.2
9/18/13 10:15	52.8	9/18/13 20:00	42.8	9/19/13 5:45	38.2
9/18/13 10:30	52.8	9/18/13 20:15	44.3	9/19/13 6:00	38.9
9/18/13 10:45	50.2	9/18/13 20:30	44.3	9/19/13 6:15	37.5
9/18/13 11:00	50.2	9/18/13 20:45	44.3	9/19/13 6:30	39.7
9/18/13 11:15	51.9	9/18/13 21:00	42.8	9/19/13 6:45	37.5
9/18/13 11:30	51	9/18/13 21:15	42	9/19/13 7:00	38.2
9/18/13 11:45	49.3	9/18/13 21:30	43.6	9/19/13 7:15	38.9
9/18/13 12:00	49.3	9/18/13 21:45	43.6	9/19/13 7:30	38.2
9/18/13 12:15	47.6	9/18/13 22:00	43.6	9/19/13 7:45	36.7
9/18/13 12:30	51	9/18/13 22:15	42.8	9/19/13 8:00	36.7
9/18/13 12:45	47.6	9/18/13 22:30	42.8	9/19/13 8:15	36.7
9/18/13 13:00	47.6	9/18/13 22:45	42	9/19/13 8:30	36
9/18/13 13:15	46.8	9/18/13 23:00	42.8	9/19/13 8:45	36.7
9/18/13 13:30	48.5	9/18/13 23:15	42	9/19/13 9:00	38.2
9/18/13 13:45	48.5	9/18/13 23:30	42	9/19/13 9:15	36.7
9/18/13 14:00	46.8	9/18/13 23:45	40.4	9/19/13 9:30	36.7
9/18/13 14:15	46	9/19/13 0:00	42.8	9/19/13 9:45	35.3
9/18/13 14:30	47.6	9/19/13 0:15	42	9/19/13 10:00	35.3
9/18/13 14:45	47.6	9/19/13 0:30	41.2	9/19/13 10:15	36.7
9/18/13 15:00	46	9/19/13 0:45	41.2	9/19/13 10:30	36
9/18/13 15:15	44.3	9/19/13 1:00	41.2	9/19/13 10:45	34.6
9/18/13 15:30	47.6	9/19/13 1:15	41.2	9/19/13 11:00	33.9
9/18/13 15:45	46.8	9/19/13 1:30	40.4	9/19/13 11:15	35.3
9/18/13 16:00	46.8	9/19/13 1:45	40.4	9/19/13 11:30	34.6
9/18/13 16:15	45.2	9/19/13 2:00	40.4	9/19/13 11:45	36.7
9/18/13 16:30	46	9/19/13 2:15	39.7	9/19/13 12:00	35.3
9/18/13 16:45	44.3	9/19/13 2:30	40.4	9/19/13 12:15	34.6
9/18/13 17:00	44.3	9/19/13 2:45	40.4	9/19/13 12:30	34.6
9/18/13 17:15	44.3	9/19/13 3:00	40.4	9/19/13 12:45	33.9

9/18/13 17:30	46	9/19/13 3:15	41.2	9/19/13 13:00	35.3
9/18/13 17:45	46	9/19/13 3:30	39.7	9/19/13 13:15	33.9
9/18/13 18:00	43.6	9/19/13 3:45	38.2	9/19/13 13:30	33.9
9/18/13 18:15	45.2	9/19/13 4:00	39.7	9/19/13 13:45	34.6
9/18/13 18:30	44.3	9/19/13 4:15	39.7	9/19/13 14:00	33.9
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/19/13 14:15	33.2	9/20/13 0:00	31.2	9/20/13 9:45	27.4
9/19/13 14:30	33.2	9/20/13 0:15	30.5	9/20/13 10:00	27.4
9/19/13 14:45	32.5	9/20/13 0:30	30.5	9/20/13 10:15	27.4
9/19/13 15:00	33.2	9/20/13 0:45	29.9	9/20/13 10:30	27.4
9/19/13 15:15	32.5	9/20/13 1:00	30.5	9/20/13 10:45	26.8
9/19/13 15:30	33.9	9/20/13 1:15	29.9	9/20/13 11:00	26.8
9/19/13 15:45	32.5	9/20/13 1:30	30.5	9/20/13 11:15	27.4
9/19/13 16:00	32.5	9/20/13 1:45	29.9	9/20/13 11:30	27.4
9/19/13 16:15	32.5	9/20/13 2:00	29.9	9/20/13 11:45	26.8
9/19/13 16:30	33.2	9/20/13 2:15	29.9	9/20/13 12:00	26.8
9/19/13 16:45	33.2	9/20/13 2:30	29.2	9/20/13 12:15	27.4
9/19/13 17:00	32.5	9/20/13 2:45	29.2	9/20/13 12:30	27.4
9/19/13 17:15	31.9	9/20/13 3:00	29.9	9/20/13 12:45	26.8
9/19/13 17:30	33.2	9/20/13 3:15	29.9	9/20/13 13:00	26.2
9/19/13 17:45	32.5	9/20/13 3:30	28.6	9/20/13 13:15	26.8
9/19/13 18:00	32.5	9/20/13 3:45	29.9	9/20/13 13:30	26.2
9/19/13 18:15	32.5	9/20/13 4:00	29.2	9/20/13 13:45	26.2
9/19/13 18:30	32.5	9/20/13 4:15	29.9	9/20/13 14:00	26.8
9/19/13 18:45	31.9	9/20/13 4:30	29.2	9/20/13 14:15	26.2
9/19/13 19:00	31.9	9/20/13 4:45	29.9	9/20/13 14:30	27.4
9/19/13 19:15	31.9	9/20/13 5:00	29.2	9/20/13 14:45	26.8
9/19/13 19:30	32.5	9/20/13 5:15	29.2	9/20/13 15:00	25.6
9/19/13 19:45	31.9	9/20/13 5:30	29.2	9/20/13 15:15	25
9/19/13 20:00	31.9	9/20/13 5:45	28.6	9/20/13 15:30	26.2
9/19/13 20:15	31.9	9/20/13 6:00	28	9/20/13 15:45	25.6
9/19/13 20:30	31.9	9/20/13 6:15	28	9/20/13 16:00	25.6
9/19/13 20:45	31.2	9/20/13 6:30	28.6	9/20/13 16:15	25.6
9/19/13 21:00	30.5	9/20/13 6:45	28	9/20/13 16:30	26.2
9/19/13 21:15	30.5	9/20/13 7:00	28.6	9/20/13 16:45	25.6
9/19/13 21:30	30.5	9/20/13 7:15	28.6	9/20/13 17:00	25
9/19/13 21:45	29.2	9/20/13 7:30	28	9/20/13 17:15	25
9/19/13 22:00	31.2	9/20/13 7:45	28	9/20/13 17:30	25
9/19/13 22:15	31.2	9/20/13 8:00	28.6	9/20/13 17:45	25.6
9/19/13 22:30	31.2	9/20/13 8:15	28	9/20/13 18:00	25

9/19/13 22:45	30.5	9/20/13 8:30	28.6	9/20/13 18:15	25
9/19/13 23:00	30.5	9/20/13 8:45	27.4	9/20/13 18:30	25.6
9/19/13 23:15	29.2	9/20/13 9:00	27.4	9/20/13 18:45	25.6
9/19/13 23:30	30.5	9/20/13 9:15	27.4	9/20/13 19:00	24.4
9/19/13 23:45	31.2	9/20/13 9:30	28	9/20/13 19:15	25.6
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/20/13 19:30	25.6	9/21/13 5:15	22.7	9/21/13 15:00	20.5
9/20/13 19:45	24.4	9/21/13 5:30	22.7	9/21/13 15:15	20
9/20/13 20:00	25	9/21/13 5:45	22.1	9/21/13 15:30	20
9/20/13 20:15	24.4	9/21/13 6:00	22.7	9/21/13 15:45	20
9/20/13 20:30	25.6	9/21/13 6:15	22.1	9/21/13 16:00	20
9/20/13 20:45	24.4	9/21/13 6:30	22.7	9/21/13 16:15	19.5
9/20/13 21:00	24.4	9/21/13 6:45	22.7	9/21/13 16:30	20
9/20/13 21:15	23.8	9/21/13 7:00	22.7	9/21/13 16:45	20
9/20/13 21:30	23.8	9/21/13 7:15	22.1	9/21/13 17:00	20
9/20/13 21:45	24.4	9/21/13 7:30	22.7	9/21/13 17:15	19.5
9/20/13 22:00	23.8	9/21/13 7:45	21.6	9/21/13 17:30	19
9/20/13 22:15	25	9/21/13 8:00	21.6	9/21/13 17:45	19.5
9/20/13 22:30	24.4	9/21/13 8:15	21.6	9/21/13 18:00	19.5
9/20/13 22:45	24.4	9/21/13 8:30	22.1	9/21/13 18:15	19
9/20/13 23:00	23.3	9/21/13 8:45	22.1	9/21/13 18:30	19
9/20/13 23:15	24.4	9/21/13 9:00	21.6	9/21/13 18:45	19
9/20/13 23:30	25	9/21/13 9:15	21.6	9/21/13 19:00	19.5
9/20/13 23:45	24.4	9/21/13 9:30	22.1	9/21/13 19:15	18.5
9/21/13 0:00	23.8	9/21/13 9:45	21.1	9/21/13 19:30	20
9/21/13 0:15	23.3	9/21/13 10:00	21.6	9/21/13 19:45	19
9/21/13 0:30	23.3	9/21/13 10:15	21.6	9/21/13 20:00	18.5
9/21/13 0:45	22.7	9/21/13 10:30	21.6	9/21/13 20:15	19.5
9/21/13 1:00	23.3	9/21/13 10:45	21.6	9/21/13 20:30	19
9/21/13 1:15	22.7	9/21/13 11:00	21.1	9/21/13 20:45	19
9/21/13 1:30	23.3	9/21/13 11:15	21.6	9/21/13 21:00	18.5
9/21/13 1:45	23.8	9/21/13 11:30	20.5	9/21/13 21:15	19.5
9/21/13 2:00	23.3	9/21/13 11:45	21.1	9/21/13 21:30	19.5
9/21/13 2:15	23.8	9/21/13 12:00	21.6	9/21/13 21:45	18.5
9/21/13 2:30	23.3	9/21/13 12:15	20.5	9/21/13 22:00	19
9/21/13 2:45	23.3	9/21/13 12:30	21.6	9/21/13 22:15	19
9/21/13 3:00	23.3	9/21/13 12:45	20.5	9/21/13 22:30	19.5
9/21/13 3:15	22.1	9/21/13 13:00	20	9/21/13 22:45	19
9/21/13 3:30	23.3	9/21/13 13:15	20.5	9/21/13 23:00	19
9/21/13 3:45	23.3	9/21/13 13:30	21.1	9/21/13 23:15	18.5

9/21/13 4:00	22.1	9/21/13 13:45	22.1	9/21/13 23:30	18.5
9/21/13 4:15	22.7	9/21/13 14:00	20.5	9/21/13 23:45	18.5
9/21/13 4:30	22.1	9/21/13 14:15	20	9/22/13 0:00	19
9/21/13 4:45	22.7	9/21/13 14:30	20.5	9/22/13 0:15	18.5
9/21/13 5:00	22.7	9/21/13 14:45	20	9/22/13 0:30	18.5
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/22/13 0:45	18.5	9/22/13 10:30	17.5	9/22/13 20:15	16.6
9/22/13 1:00	19	9/22/13 10:45	17	9/22/13 20:30	16.6
9/22/13 1:15	18.5	9/22/13 11:00	17	9/22/13 20:45	16.6
9/22/13 1:30	19	9/22/13 11:15	16.6	9/22/13 21:00	16.6
9/22/13 1:45	18.5	9/22/13 11:30	17	9/22/13 21:15	16.6
9/22/13 2:00	18	9/22/13 11:45	17	9/22/13 21:30	16.1
9/22/13 2:15	19	9/22/13 12:00	17	9/22/13 21:45	16.6
9/22/13 2:30	18.5	9/22/13 12:15	16.6	9/22/13 22:00	16.6
9/22/13 2:45	18.5	9/22/13 12:30	16.6	9/22/13 22:15	16.6
9/22/13 3:00	18.5	9/22/13 12:45	16.6	9/22/13 22:30	17
9/22/13 3:15	17.5	9/22/13 13:00	16.6	9/22/13 22:45	15.7
9/22/13 3:30	18.5	9/22/13 13:15	16.1	9/22/13 23:00	16.6
9/22/13 3:45	17.5	9/22/13 13:30	17	9/22/13 23:15	16.1
9/22/13 4:00	18	9/22/13 13:45	16.6	9/22/13 23:30	16.6
9/22/13 4:15	18	9/22/13 14:00	16.6	9/22/13 23:45	16.1
9/22/13 4:30	18	9/22/13 14:15	16.6	9/23/13 0:00	16.1
9/22/13 4:45	18	9/22/13 14:30	16.6	9/23/13 0:15	16.1
9/22/13 5:00	18	9/22/13 14:45	16.1	9/23/13 0:30	16.1
9/22/13 5:15	18	9/22/13 15:00	16.1	9/23/13 0:45	15.7
9/22/13 5:30	18.5	9/22/13 15:15	16.1	9/23/13 1:00	16.1
9/22/13 5:45	17.5	9/22/13 15:30	16.6	9/23/13 1:15	16.1
9/22/13 6:00	17.5	9/22/13 15:45	16.1	9/23/13 1:30	16.6
9/22/13 6:15	17.5	9/22/13 16:00	16.1	9/23/13 1:45	15.7
9/22/13 6:30	18.5	9/22/13 16:15	15.7	9/23/13 2:00	15.7
9/22/13 6:45	17.5	9/22/13 16:30	16.6	9/23/13 2:15	15.7
9/22/13 7:00	18	9/22/13 16:45	16.6	9/23/13 2:30	15.7
9/22/13 7:15	18	9/22/13 17:00	16.6	9/23/13 2:45	16.1
9/22/13 7:30	18	9/22/13 17:15	16.1	9/23/13 3:00	15.7
9/22/13 7:45	17.5	9/22/13 17:30	16.6	9/23/13 3:15	15.7
9/22/13 8:00	17.5	9/22/13 17:45	16.1	9/23/13 3:30	16.1
9/22/13 8:15	17.5	9/22/13 18:00	15.7	9/23/13 3:45	15.7
9/22/13 8:30	18	9/22/13 18:15	16.6	9/23/13 4:00	16.1
9/22/13 8:45	17	9/22/13 18:30	16.1	9/23/13 4:15	16.1
9/22/13 9:00	17.5	9/22/13 18:45	16.1	9/23/13 4:30	16.6

9/22/13 9:15	17	9/22/13 19:00	16.1	9/23/13 4:45	16.1
9/22/13 9:30	17.5	9/22/13 19:15	16.1	9/23/13 5:00	16.1
9/22/13 9:45	17	9/22/13 19:30	16.6	9/23/13 5:15	16.6
9/22/13 10:00	17.5	9/22/13 19:45	16.1	9/23/13 5:30	16.1
9/22/13 10:15	17.5	9/22/13 20:00	16.6	9/23/13 5:45	16.1
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/23/13 6:00	15.7	9/23/13 15:45	13.9	9/24/13 1:30	13.9
9/23/13 6:15	15.7	9/23/13 16:00	13.9	9/24/13 1:45	13.5
9/23/13 6:30	16.1	9/23/13 16:15	13.9	9/24/13 2:00	13.1
9/23/13 6:45	15.7	9/23/13 16:30	14.3	9/24/13 2:15	13.1
9/23/13 7:00	15.7	9/23/13 16:45	13.9	9/24/13 2:30	13.5
9/23/13 7:15	15.7	9/23/13 17:00	13.9	9/24/13 2:45	13.1
9/23/13 7:30	16.1	9/23/13 17:15	13.5	9/24/13 3:00	13.1
9/23/13 7:45	15.7	9/23/13 17:30	13.9	9/24/13 3:15	13.5
9/23/13 8:00	15.2	9/23/13 17:45	13.9	9/24/13 3:30	13.1
9/23/13 8:15	15.7	9/23/13 18:00	13.5	9/24/13 3:45	13.1
9/23/13 8:30	15.7	9/23/13 18:15	13.9	9/24/13 4:00	13.1
9/23/13 8:45	15.7	9/23/13 18:30	14.3	9/24/13 4:15	13.1
9/23/13 9:00	15.2	9/23/13 18:45	13.9	9/24/13 4:30	13.1
9/23/13 9:15	15.7	9/23/13 19:00	13.9	9/24/13 4:45	13.1
9/23/13 9:30	15.7	9/23/13 19:15	13.9	9/24/13 5:00	12.7
9/23/13 9:45	15.7	9/23/13 19:30	13.9	9/24/13 5:15	13.1
9/23/13 10:00	15.2	9/23/13 19:45	13.9	9/24/13 5:30	13.1
9/23/13 10:15	15.2	9/23/13 20:00	13.5	9/24/13 5:45	13.1
9/23/13 10:30	15.2	9/23/13 20:15	13.5	9/24/13 6:00	12.7
9/23/13 10:45	15.2	9/23/13 20:30	13.9	9/24/13 6:15	13.1
9/23/13 11:00	15.2	9/23/13 20:45	13.9	9/24/13 6:30	12.7
9/23/13 11:15	15.2	9/23/13 21:00	13.5	9/24/13 6:45	13.1
9/23/13 11:30	15.2	9/23/13 21:15	13.9	9/24/13 7:00	13.1
9/23/13 11:45	14.8	9/23/13 21:30	13.9	9/24/13 7:15	12.7
9/23/13 12:00	15.2	9/23/13 21:45	13.5	9/24/13 7:30	12.7
9/23/13 12:15	15.2	9/23/13 22:00	13.9	9/24/13 7:45	13.1
9/23/13 12:30	14.8	9/23/13 22:15	13.5	9/24/13 8:00	12.7
9/23/13 12:45	14.8	9/23/13 22:30	13.5	9/24/13 8:15	13.1
9/23/13 13:00	14.3	9/23/13 22:45	13.5	9/24/13 8:30	13.1
9/23/13 13:15	14.8	9/23/13 23:00	13.5	9/24/13 8:45	12.7
9/23/13 13:30	14.8	9/23/13 23:15	13.5	9/24/13 9:00	12.7
9/23/13 13:45	14.3	9/23/13 23:30	13.5	9/24/13 9:15	12.3
9/23/13 14:00	14.3	9/23/13 23:45	13.5	9/24/13 9:30	12.7
9/23/13 14:15	14.3	9/24/13 0:00	13.5	9/24/13 9:45	12.7

9/23/13 14:30	14.8	9/24/13 0:15	13.5	9/24/13 10:00	11.1
9/23/13 14:45	14.3	9/24/13 0:30	13.9	9/24/13 10:15	13.5
9/23/13 15:00	14.3	9/24/13 0:45	13.5	9/24/13 10:30	11.9
9/23/13 15:15	14.3	9/24/13 1:00	13.5	9/24/13 10:45	11.9
9/23/13 15:30	13.9	9/24/13 1:15	13.5	9/24/13 11:45	12.3
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/24/13 12:00	12.3	9/24/13 21:45	11.1	9/25/13 7:30	10.7
9/24/13 12:15	12.3	9/24/13 22:00	11.5	9/25/13 7:45	10.7
9/24/13 12:30	12.3	9/24/13 22:15	11.1	9/25/13 8:00	10.7
9/24/13 12:45	11.9	9/24/13 22:30	11.1	9/25/13 8:15	10.7
9/24/13 13:00	11.9	9/24/13 22:45	11.5	9/25/13 8:30	10.7
9/24/13 13:15	11.9	9/24/13 23:00	11.1	9/25/13 8:45	10.7
9/24/13 13:30	11.9	9/24/13 23:15	11.5	9/25/13 9:00	10.7
9/24/13 13:45	11.9	9/24/13 23:30	11.1	9/25/13 9:15	10.7
9/24/13 14:00	11.9	9/24/13 23:45	11.1	9/25/13 9:30	10.4
9/24/13 14:15	11.9	9/25/13 0:00	11.5	9/25/13 9:45	10.7
9/24/13 14:30	11.5	9/25/13 0:15	11.1	9/25/13 10:00	10.7
9/24/13 14:45	11.5	9/25/13 0:30	11.1	9/25/13 10:15	10.4
9/24/13 15:00	11.9	9/25/13 0:45	11.1	9/25/13 10:30	10.4
9/24/13 15:15	11.5	9/25/13 1:00	11.1	9/25/13 10:45	10.4
9/24/13 15:30	11.5	9/25/13 1:15	11.5	9/25/13 11:00	10.7
9/24/13 15:45	11.5	9/25/13 1:30	11.1	9/25/13 11:15	10.4
9/24/13 16:00	11.5	9/25/13 1:45	11.1	9/25/13 11:30	10.7
9/24/13 16:15	11.5	9/25/13 2:00	11.1	9/25/13 11:45	10.4
9/24/13 16:30	11.5	9/25/13 2:15	11.1	9/25/13 12:00	10.4
9/24/13 16:45	11.1	9/25/13 2:30	11.1	9/25/13 12:15	10.4
9/24/13 17:00	11.5	9/25/13 2:45	11.1	9/25/13 12:30	10.4
9/24/13 17:15	11.5	9/25/13 3:00	11.1	9/25/13 12:45	10.4
9/24/13 17:30	11.5	9/25/13 3:15	10.7	9/25/13 13:00	10.4
9/24/13 17:45	11.5	9/25/13 3:30	11.1	9/25/13 13:15	10.4
9/24/13 18:00	11.5	9/25/13 3:45	11.1	9/25/13 13:30	10
9/24/13 18:15	11.5	9/25/13 4:00	11.1	9/25/13 13:45	10
9/24/13 18:30	11.1	9/25/13 4:15	10.7	9/25/13 14:00	10
9/24/13 18:45	11.5	9/25/13 4:30	10.7	9/25/13 14:15	10
9/24/13 19:00	11.5	9/25/13 4:45	10.7	9/25/13 14:30	10
9/24/13 19:15	11.5	9/25/13 5:00	11.1	9/25/13 14:45	10
9/24/13 19:30	11.5	9/25/13 5:15	10.7	9/25/13 15:00	10
9/24/13 19:45	11.5	9/25/13 5:30	10.7	9/25/13 15:15	10
9/24/13 20:00	11.5	9/25/13 5:45	10.7	9/25/13 15:30	9.67
9/24/13 20:15	11.5	9/25/13 6:00	10.7	9/25/13 15:45	10

9/24/13 20:30	11.5	9/25/13 6:15	10.7	9/25/13 16:00	10
9/24/13 20:45	11.1	9/25/13 6:30	10.7	9/25/13 16:15	9.67
9/24/13 21:00	11.5	9/25/13 6:45	10.7	9/25/13 16:30	9.67
9/24/13 21:15	11.5	9/25/13 7:00	10.7	9/25/13 16:45	10
9/24/13 21:30	11.5	9/25/13 7:15	10.7	9/25/13 17:00	9.67
Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s	Date Time: MDT (MM/DD/YR)	Discharge Rock Creek m^3/s
9/25/13 17:15	9.67				
9/25/13 17:30	9.67				
9/25/13 17:45	9.67				
9/25/13 18:00	9.67				
9/25/13 18:15	9.67				
9/25/13 18:30	9.67				
9/25/13 18:45	9.67				
9/25/13 19:00	10				
9/25/13 19:15	9.67				
9/25/13 19:30	9.67				
9/25/13 19:45	9.67				
9/25/13 20:00	9.67				
9/25/13 20:15	9.67				
9/25/13 20:30	9.67				
9/25/13 20:45	9.67				
9/25/13 21:00	9.67				
9/25/13 21:15	9.67				
9/25/13 21:30	9.67				
9/25/13 21:45	9.67				
9/25/13 22:00	9.67				
9/25/13 22:15	9.67				
9/25/13 22:30	9.67				
9/25/13 22:45	9.67				
9/25/13 23:00	9.67				
9/25/13 23:15	9.67				
9/25/13 23:30	9.67				
9/25/13 23:45	9.67				

A.2– Historical Daily Discharge Data

Table 2. Historical average daily discharge data for the Rock Creek above Fort Carson and now inactive Little Fountain Creek above Keeton Reservoir stream Gauges (1978-1998).

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
5/23/78	0.07	5/23/78	0.05	6/24/78	0.01	6/24/78	0.01
5/24/78	0.06	5/24/78	0.05	6/25/78	0.01	6/25/78	0.01
5/25/78	0.05	5/25/78	0.04	6/26/78	0.01	6/26/78	0.01
5/26/78	0.04	5/26/78	0.04	6/27/78	0.00	6/27/78	0.01
5/27/78	0.05	5/27/78	0.04	6/28/78	0.00	6/28/78	0.01
5/28/78	0.05	5/28/78	0.06	6/29/78	0.00	6/29/78	0.01
5/29/78	0.05	5/29/78	0.06	6/30/78	0.00	6/30/78	0.01
5/30/78	0.04	5/30/78	0.05	7/1/78	0.00	7/1/78	0.01
5/31/78	0.04	5/31/78	0.05	7/2/78	0.00	7/2/78	0.01
6/1/78	0.04	6/1/78	0.05	7/3/78	0.00	7/3/78	0.01
6/2/78	0.04	6/2/78	0.05	7/4/78	0.00	7/4/78	0.01
6/3/78	0.04	6/3/78	0.06	7/5/78	0.00	7/5/78	0.00
6/4/78	0.05	6/4/78	0.06	7/6/78		7/6/78	0.00
6/5/78	0.05	6/5/78	0.05	7/7/78		7/7/78	0.00
6/6/78	0.05	6/6/78	0.05	7/8/78		7/8/78	0.00
6/7/78	0.06	6/7/78	0.05	7/9/78		7/9/78	0.00
6/8/78	0.07	6/8/78	0.05	7/10/78		7/10/78	0.01
6/9/78	0.06	6/9/78	0.05	7/11/78		7/11/78	0.01
6/10/78	0.05	6/10/78	0.05	7/12/78		7/12/78	0.00
6/11/78	0.05	6/11/78	0.04	7/13/78		7/13/78	0.00
6/12/78	0.05	6/12/78	0.04	7/14/78		7/14/78	0.01
6/13/78	0.05	6/13/78	0.04	7/15/78		7/15/78	0.01
6/14/78	0.04	6/14/78	0.03	7/16/78		7/16/78	0.01
6/15/78	0.04	6/15/78	0.03	7/17/78		7/17/78	0.01
6/16/78	0.03	6/16/78	0.03	7/18/78		7/18/78	0.00
6/17/78	0.03	6/17/78	0.02	7/19/78		7/19/78	0.00
6/18/78	0.03	6/18/78	0.02	7/20/78		7/20/78	0.00
6/19/78	0.03	6/19/78	0.02	7/21/78		7/21/78	0.00
6/20/78	0.03	6/20/78	0.02	7/22/78		7/22/78	0.01
6/21/78	0.02	6/21/78	0.02	7/23/78		7/23/78	0.00
6/22/78	0.02	6/22/78	0.01	7/24/78		7/24/78	0.00
6/23/78	0.02	6/23/78	0.01	7/25/78		7/25/78	0.00

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
7/26/78		7/26/78	0.00	9/2/78		9/2/78	0.00
7/27/78		7/27/78	0.00	9/3/78		9/3/78	0.00
7/28/78		7/28/78	0.00	9/4/78		9/4/78	0.00
7/29/78		7/29/78	0.00	9/5/78		9/5/78	0.00
7/30/78		7/30/78	0.00	9/6/78		9/6/78	0.00
7/31/78		7/31/78	0.00	9/7/78		9/7/78	0.00
8/1/78		8/1/78	0.01	9/8/78		9/8/78	
8/2/78		8/2/78	0.01	9/9/78		9/9/78	
8/3/78		8/3/78	0.01	9/10/78		9/10/78	
8/4/78		8/4/78	0.01	9/11/78		9/11/78	
8/5/78		8/5/78	0.01	9/12/78		9/12/78	
8/6/78		8/6/78	0.00	9/13/78		9/13/78	
8/7/78		8/7/78	0.00	9/14/78		9/14/78	
8/8/78		8/8/78	0.00	9/15/78		9/15/78	
8/9/78		8/9/78	0.00	9/16/78		9/16/78	
8/10/78		8/10/78	0.00	9/17/78		9/17/78	
8/11/78		8/11/78	0.00	9/18/78		9/18/78	
8/12/78		8/12/78	0.00	9/19/78		9/19/78	
8/13/78		8/13/78	0.00	9/20/78		9/20/78	
8/14/78		8/14/78	0.00	9/21/78		9/21/78	
8/15/78		8/15/78	0.00	9/22/78		9/22/78	
8/16/78		8/16/78	0.00	9/23/78		9/23/78	
8/17/78		8/17/78	0.00	9/24/78		9/24/78	
8/18/78		8/18/78	0.00	9/25/78		9/25/78	0.00
8/19/78		8/19/78	0.00	9/26/78		9/26/78	0.00
8/20/78		8/20/78	0.00	9/27/78		9/27/78	0.00
8/21/78		8/21/78	0.00	9/28/78		9/28/78	0.00
8/22/78		8/22/78		9/29/78		9/29/78	0.00
8/23/78		8/23/78		9/30/78		9/30/78	0.00
8/24/78		8/24/78		10/1/78		10/1/78	0.00
8/25/78		8/25/78		10/2/78		10/2/78	0.00
8/26/78		8/26/78		10/3/78		10/3/78	0.00
8/27/78		8/27/78		10/4/78		10/4/78	0.00
8/28/78		8/28/78		10/5/78		10/5/78	0.00
8/29/78		8/29/78	0.00	10/6/78		10/6/78	0.00
8/30/78		8/30/78	0.01	10/7/78		10/7/78	0.00
8/31/78		8/31/78	0.01	10/8/78		10/8/78	0.00
9/1/78		9/1/78	0.01	10/9/78		10/9/78	0.00

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
10/10/78		10/10/78	0.00	11/17/78	0.00	11/17/78	0.01
10/11/78		10/11/78	0.00	11/18/78	0.00	11/18/78	0.01
10/12/78		10/12/78	0.00	11/19/78	0.00	11/19/78	0.01
10/13/78		10/13/78	0.00	11/20/78	0.00	11/20/78	0.01
10/14/78		10/14/78	0.00	11/21/78	0.00	11/21/78	0.01
10/15/78		10/15/78	0.00	11/22/78	0.00	11/22/78	0.01
10/16/78		10/16/78	0.00	11/23/78	0.00	11/23/78	0.01
10/17/78		10/17/78	0.00	11/24/78	0.00	11/24/78	0.01
10/18/78		10/18/78	0.00	11/25/78	0.00	11/25/78	0.01
10/19/78		10/19/78	0.00	11/26/78	0.00	11/26/78	0.01
10/20/78		10/20/78	0.00	11/27/78	0.00	11/27/78	0.01
10/21/78		10/21/78	0.00	11/28/78	0.00	11/28/78	0.01
10/22/78		10/22/78	0.02	11/29/78	0.00	11/29/78	0.01
10/23/78		10/23/78	0.01	11/30/78	0.00	11/30/78	0.01
10/24/78		10/24/78	0.01	12/1/78	0.00	12/1/78	0.01
10/25/78		10/25/78	0.02	12/2/78	0.00	12/2/78	0.01
10/26/78		10/26/78	0.01	12/3/78	0.00	12/3/78	0.01
10/27/78		10/27/78	0.01	12/4/78	0.00	12/4/78	0.01
10/28/78		10/28/78	0.01	12/5/78	0.00	12/5/78	0.01
10/29/78		10/29/78	0.01	12/6/78	0.00	12/6/78	0.01
10/30/78		10/30/78	0.01	12/7/78	0.00	12/7/78	0.01
10/31/78		10/31/78	0.01	12/8/78	0.00	12/8/78	0.01
11/1/78		11/1/78	0.01	12/9/78	0.00	12/9/78	0.01
11/2/78		11/2/78	0.01	12/10/78	0.00	12/10/78	0.01
11/3/78		11/3/78	0.01	12/11/78	0.00	12/11/78	0.01
11/4/78		11/4/78	0.01	12/12/78	0.00	12/12/78	0.01
11/5/78		11/5/78	0.01	12/13/78	0.00	12/13/78	0.01
11/6/78		11/6/78	0.01	12/14/78	0.00	12/14/78	0.01
11/7/78		11/7/78	0.01	12/15/78	0.00	12/15/78	0.01
11/8/78		11/8/78	0.01	12/16/78	0.00	12/16/78	0.01
11/9/78		11/9/78	0.01	12/17/78	0.00	12/17/78	0.01
11/10/78		11/10/78	0.01	12/18/78	0.00	12/18/78	0.01
11/11/78		11/11/78	0.01	12/19/78	0.00	12/19/78	0.01
11/12/78		11/12/78	0.01	12/20/78	0.00	12/20/78	0.01
11/13/78		11/13/78	0.01	12/21/78	0.00	12/21/78	0.01
11/14/78	0.00	11/14/78	0.01	12/22/78	0.00	12/22/78	0.01
11/15/78	0.00	11/15/78	0.01	12/23/78	0.00	12/23/78	0.01
11/16/78	0.00	11/16/78	0.01	12/24/78	0.00	12/24/78	0.01

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
12/25/78	0.00	12/25/78	0.01	2/1/79	0.00	2/1/79	0.01
12/26/78	0.00	12/26/78	0.01	2/2/79	0.00	2/2/79	0.01
12/27/78	0.00	12/27/78	0.01	2/3/79	0.00	2/3/79	0.01
12/28/78	0.00	12/28/78	0.01	2/4/79	0.00	2/4/79	0.01
12/29/78	0.00	12/29/78	0.01	2/5/79	0.00	2/5/79	0.01
12/30/78	0.00	12/30/78	0.01	2/6/79	0.00	2/6/79	0.01
12/31/78	0.00	12/31/78	0.01	2/7/79	0.00	2/7/79	0.01
1/1/79	0.00	1/1/79	0.01	2/8/79	0.00	2/8/79	0.01
1/2/79	0.00	1/2/79	0.01	2/9/79	0.00	2/9/79	0.01
1/3/79	0.00	1/3/79	0.01	2/10/79	0.00	2/10/79	0.01
1/4/79	0.00	1/4/79	0.01	2/11/79	0.00	2/11/79	0.01
1/5/79	0.00	1/5/79	0.01	2/12/79	0.00	2/12/79	0.01
1/6/79	0.00	1/6/79	0.01	2/13/79	0.00	2/13/79	0.02
1/7/79	0.00	1/7/79	0.01	2/14/79	0.01	2/14/79	0.02
1/8/79	0.00	1/8/79	0.01	2/15/79	0.00	2/15/79	0.01
1/9/79	0.00	1/9/79	0.01	2/16/79	0.00	2/16/79	0.01
1/10/79	0.00	1/10/79	0.01	2/17/79	0.00	2/17/79	0.01
1/11/79	0.00	1/11/79	0.01	2/18/79	0.00	2/18/79	0.01
1/12/79	0.00	1/12/79	0.01	2/19/79	0.00	2/19/79	0.02
1/13/79	0.00	1/13/79	0.01	2/20/79	0.00	2/20/79	0.02
1/14/79	0.00	1/14/79	0.01	2/21/79	0.00	2/21/79	0.02
1/15/79	0.00	1/15/79	0.01	2/22/79	0.00	2/22/79	0.02
1/16/79	0.00	1/16/79	0.01	2/23/79	0.00	2/23/79	0.02
1/17/79	0.00	1/17/79	0.01	2/24/79	0.00	2/24/79	0.02
1/18/79	0.00	1/18/79	0.01	2/25/79	0.00	2/25/79	0.02
1/19/79	0.00	1/19/79	0.01	2/26/79	0.00	2/26/79	0.02
1/20/79	0.00	1/20/79	0.01	2/27/79	0.01	2/27/79	0.02
1/21/79	0.00	1/21/79	0.01	2/28/79	0.00	2/28/79	0.02
1/22/79	0.00	1/22/79	0.01	3/1/79	0.01	3/1/79	0.02
1/23/79	0.00	1/23/79	0.01	3/2/79	0.00	3/2/79	0.02
1/24/79	0.00	1/24/79	0.01	3/3/79	0.00	3/3/79	0.01
1/25/79	0.00	1/25/79	0.01	3/4/79	0.00	3/4/79	0.01
1/26/79	0.00	1/26/79	0.01	3/5/79	0.00	3/5/79	0.01
1/27/79	0.00	1/27/79	0.01	3/6/79	0.00	3/6/79	0.01
1/28/79	0.00	1/28/79	0.01	3/7/79	0.01	3/7/79	0.01
1/29/79	0.00	1/29/79	0.01	3/8/79	0.01	3/8/79	0.02
1/30/79	0.00	1/30/79	0.01	3/9/79	0.01	3/9/79	0.02
1/31/79	0.00	1/31/79	0.01	3/10/79	0.01	3/10/79	0.01

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
3/11/79	0.01	3/11/79	0.02	4/18/79	0.40	4/18/79	0.54
3/12/79	0.01	3/12/79	0.02	4/19/79	0.37	4/19/79	0.57
3/13/79	0.01	3/13/79	0.02	4/20/79	0.34	4/20/79	0.48
3/14/79	0.01	3/14/79	0.02	4/21/79	0.31	4/21/79	0.42
3/15/79	0.01	3/15/79	0.02	4/22/79	0.28	4/22/79	0.40
3/16/79	0.01	3/16/79	0.02	4/23/79	0.28	4/23/79	0.40
3/17/79	0.02	3/17/79	0.02	4/24/79	0.28	4/24/79	0.42
3/18/79	0.02	3/18/79	0.02	4/25/79	0.27	4/25/79	0.42
3/19/79	0.02	3/19/79	0.02	4/26/79	0.24	4/26/79	0.37
3/20/79	0.02	3/20/79	0.02	4/27/79	0.22	4/27/79	0.34
3/21/79	0.02	3/21/79	0.02	4/28/79	0.19	4/28/79	0.31
3/22/79	0.02	3/22/79	0.02	4/29/79	0.17	4/29/79	0.28
3/23/79	0.02	3/23/79	0.02	4/30/79	0.16	4/30/79	0.25
3/24/79	0.03	3/24/79	0.02	5/1/79	0.14	5/1/79	0.23
3/25/79	0.03	3/25/79	0.03	5/2/79	0.15	5/2/79	0.22
3/26/79	0.03	3/26/79	0.04	5/3/79	0.15	5/3/79	0.21
3/27/79	0.04	3/27/79	0.05	5/4/79	0.15	5/4/79	0.20
3/28/79	0.07	3/28/79	0.07	5/5/79	0.15	5/5/79	0.20
3/29/79	0.08	3/29/79	0.08	5/6/79	0.16	5/6/79	0.21
3/30/79	0.07	3/30/79	0.09	5/7/79	0.18	5/7/79	0.24
3/31/79	0.06	3/31/79	0.08	5/8/79	0.18	5/8/79	0.24
4/1/79	0.05	4/1/79	0.08	5/9/79	0.18	5/9/79	0.24
4/2/79	0.04	4/2/79	0.07	5/10/79	0.16	5/10/79	0.23
4/3/79	0.05	4/3/79	0.08	5/11/79	0.15	5/11/79	0.22
4/4/79	0.04	4/4/79	0.07	5/12/79	0.14	5/12/79	0.20
4/5/79	0.06	4/5/79	0.07	5/13/79	0.12	5/13/79	0.19
4/6/79	0.12	4/6/79	0.10	5/14/79	0.11	5/14/79	0.18
4/7/79	0.20	4/7/79	0.16	5/15/79	0.10	5/15/79	0.17
4/8/79	0.24	4/8/79	0.24	5/16/79	0.11	5/16/79	0.17
4/9/79	0.23	4/9/79	0.25	5/17/79	0.11	5/17/79	0.17
4/10/79	0.23	4/10/79	0.24	5/18/79	0.10	5/18/79	0.17
4/11/79	0.23	4/11/79	0.22	5/19/79	0.11	5/19/79	0.18
4/12/79	0.20	4/12/79	0.20	5/20/79	0.14	5/20/79	0.20
4/13/79	0.19	4/13/79	0.18	5/21/79	0.13	5/21/79	0.21
4/14/79	0.23	4/14/79	0.20	5/22/79	0.11	5/22/79	0.21
4/15/79	0.31	4/15/79	0.27	5/23/79	0.12	5/23/79	0.23
4/16/79	0.37	4/16/79	0.40	5/24/79	0.12	5/24/79	0.24
4/17/79	0.40	4/17/79	0.51	5/25/79	0.12	5/25/79	0.24

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
5/26/79	0.11	5/26/79	0.24	7/3/79	0.05	7/3/79	0.11
5/27/79	0.10	5/27/79	0.24	7/4/79	0.07	7/4/79	0.10
5/28/79	0.10	5/28/79	0.24	7/5/79	0.05	7/5/79	0.10
5/29/79	0.10	5/29/79	0.27	7/6/79	0.05	7/6/79	0.11
5/30/79	0.11	5/30/79	0.31	7/7/79	0.05	7/7/79	0.10
5/31/79	0.21	5/31/79	0.40	7/8/79	0.03	7/8/79	0.08
6/1/79	0.22	6/1/79	0.48	7/9/79	0.03	7/9/79	0.08
6/2/79	0.26	6/2/79	0.59	7/10/79	0.02	7/10/79	0.07
6/3/79	0.28	6/3/79	0.71	7/11/79	0.02	7/11/79	0.06
6/4/79	0.27	6/4/79	0.74	7/12/79	0.02	7/12/79	0.06
6/5/79	0.25	6/5/79	0.71	7/13/79	0.02	7/13/79	0.05
6/6/79	0.23	6/6/79	0.65	7/14/79	0.02	7/14/79	0.05
6/7/79	0.22	6/7/79	0.62	7/15/79	0.03	7/15/79	0.08
6/8/79	0.25	6/8/79	0.65	7/16/79	0.02	7/16/79	0.07
6/9/79	0.37	6/9/79	0.76	7/17/79	0.02	7/17/79	0.06
6/10/79	0.40	6/10/79	0.79	7/18/79	0.02	7/18/79	0.06
6/11/79	0.34	6/11/79	0.76	7/19/79	0.02	7/19/79	0.06
6/12/79	0.31	6/12/79	0.74	7/20/79	0.01	7/20/79	0.06
6/13/79	0.27	6/13/79	0.68	7/21/79	0.01	7/21/79	0.05
6/14/79	0.24	6/14/79	0.62	7/22/79	0.01	7/22/79	0.05
6/15/79	0.22	6/15/79	0.57	7/23/79	0.01	7/23/79	0.05
6/16/79	0.20	6/16/79	0.48	7/24/79	0.01	7/24/79	0.05
6/17/79	0.18	6/17/79	0.42	7/25/79	0.01	7/25/79	0.06
6/18/79	0.16	6/18/79	0.37	7/26/79	0.01	7/26/79	0.05
6/19/79	0.14	6/19/79	0.34	7/27/79	0.01	7/27/79	0.05
6/20/79	0.13	6/20/79	0.28	7/28/79	0.01	7/28/79	0.03
6/21/79	0.12	6/21/79	0.26	7/29/79	0.01	7/29/79	0.03
6/22/79	0.11	6/22/79	0.25	7/30/79	0.01	7/30/79	0.03
6/23/79	0.10	6/23/79	0.23	7/31/79	0.01	7/31/79	0.04
6/24/79	0.09	6/24/79	0.18	8/1/79	0.01	8/1/79	0.04
6/25/79	0.08	6/25/79	0.17	8/2/79	0.01	8/2/79	0.03
6/26/79	0.08	6/26/79	0.14	8/3/79	0.01	8/3/79	0.03
6/27/79	0.07	6/27/79	0.12	8/4/79	0.01	8/4/79	0.03
6/28/79	0.06	6/28/79	0.12	8/5/79	0.01	8/5/79	0.02
6/29/79	0.06	6/29/79	0.12	8/6/79	0.00	8/6/79	0.02
6/30/79	0.05	6/30/79	0.11	8/7/79	0.00	8/7/79	0.02
7/1/79	0.05	7/1/79	0.10	8/8/79	0.00	8/8/79	0.02
7/2/79	0.04	7/2/79	0.10	8/9/79	0.00	8/9/79	0.02

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
8/10/79	0.01	8/10/79	0.02	9/17/79	0.01	9/17/79	0.03
8/11/79	0.01	8/11/79	0.03	9/18/79	0.01	9/18/79	0.02
8/12/79	0.01	8/12/79	0.02	9/19/79	0.01	9/19/79	0.02
8/13/79	0.01	8/13/79	0.03	9/20/79	0.01	9/20/79	0.02
8/14/79	0.03	8/14/79	0.07	9/21/79	0.01	9/21/79	0.02
8/15/79	0.06	8/15/79	0.06	9/22/79	0.01	9/22/79	0.03
8/16/79	0.14	8/16/79	0.05	9/23/79	0.01	9/23/79	0.02
8/17/79	0.08	8/17/79	0.04	9/24/79	0.01	9/24/79	0.02
8/18/79	0.10	8/18/79	0.09	9/25/79	0.01	9/25/79	0.02
8/19/79	0.15	8/19/79	0.20	9/26/79	0.01	9/26/79	0.02
8/20/79	0.12	8/20/79	0.15	9/27/79	0.01	9/27/79	0.02
8/21/79	0.09	8/21/79	0.13	9/28/79	0.01	9/28/79	0.02
8/22/79	0.08	8/22/79	0.12	9/29/79	0.01	9/29/79	0.02
8/23/79	0.07	8/23/79	0.11	9/30/79	0.00	9/30/79	0.02
8/24/79	0.06	8/24/79	0.10	10/1/79	0.00	10/1/79	0.01
8/25/79	0.05	8/25/79	0.09	10/2/79	0.00	10/2/79	0.01
8/26/79	0.07	8/26/79	0.09	10/3/79	0.00	10/3/79	0.01
8/27/79	0.07	8/27/79	0.09	10/4/79	0.01	10/4/79	0.01
8/28/79	0.05	8/28/79	0.08	10/5/79	0.00	10/5/79	0.01
8/29/79	0.04	8/29/79	0.07	10/6/79	0.00	10/6/79	0.01
8/30/79	0.03	8/30/79	0.06	10/7/79	0.00	10/7/79	0.01
8/31/79	0.03	8/31/79	0.05	10/8/79	0.00	10/8/79	0.01
9/1/79	0.02	9/1/79	0.05	10/9/79	0.00	10/9/79	0.01
9/2/79	0.02	9/2/79	0.04	10/10/79	0.01	10/10/79	0.01
9/3/79	0.02	9/3/79	0.04	10/11/79	0.01	10/11/79	0.01
9/4/79	0.02	9/4/79	0.03	10/12/79	0.01	10/12/79	0.01
9/5/79	0.02	9/5/79	0.03	10/13/79	0.01	10/13/79	0.01
9/6/79	0.01	9/6/79	0.03	10/14/79	0.01	10/14/79	0.01
9/7/79	0.01	9/7/79	0.03	10/15/79	0.01	10/15/79	0.01
9/8/79	0.01	9/8/79	0.03	10/16/79	0.01	10/16/79	0.01
9/9/79	0.01	9/9/79	0.03	10/17/79	0.01	10/17/79	0.01
9/10/79	0.01	9/10/79	0.02	10/18/79	0.01	10/18/79	0.01
9/11/79	0.01	9/11/79	0.03	10/19/79	0.01	10/19/79	0.01
9/12/79	0.01	9/12/79	0.03	10/20/79	0.01	10/20/79	0.01
9/13/79	0.01	9/13/79	0.02	10/21/79	0.01	10/21/79	0.02
9/14/79	0.02	9/14/79	0.05	10/22/79	0.02	10/22/79	0.01
9/15/79	0.02	9/15/79	0.03	10/23/79	0.01	10/23/79	0.01
9/16/79	0.01	9/16/79	0.03	10/24/79	0.01	10/24/79	0.01

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
10/25/79	0.01	10/25/79	0.01	12/2/79	0.01	12/2/79	0.01
10/26/79	0.01	10/26/79	0.01	12/3/79	0.01	12/3/79	0.02
10/27/79	0.01	10/27/79	0.01	12/4/79	0.01	12/4/79	0.02
10/28/79	0.01	10/28/79	0.01	12/5/79	0.01	12/5/79	0.02
10/29/79	0.01	10/29/79	0.01	12/6/79	0.01	12/6/79	0.02
10/30/79	0.02	10/30/79	0.02	12/7/79	0.01	12/7/79	0.02
10/31/79	0.02	10/31/79	0.02	12/8/79	0.01	12/8/79	0.02
11/1/79	0.01	11/1/79	0.02	12/9/79	0.01	12/9/79	0.02
11/2/79	0.02	11/2/79	0.02	12/10/79	0.01	12/10/79	0.02
11/3/79	0.02	11/3/79	0.02	12/11/79	0.01	12/11/79	0.02
11/4/79	0.01	11/4/79	0.02	12/12/79	0.01	12/12/79	0.02
11/5/79	0.02	11/5/79	0.02	12/13/79	0.01	12/13/79	0.02
11/6/79	0.02	11/6/79	0.02	12/14/79	0.01	12/14/79	0.02
11/7/79	0.02	11/7/79	0.02	12/15/79	0.01	12/15/79	0.02
11/8/79	0.02	11/8/79	0.02	12/16/79	0.01	12/16/79	0.02
11/9/79	0.02	11/9/79	0.02	12/17/79	0.01	12/17/79	0.02
11/10/79	0.02	11/10/79	0.02	12/18/79	0.01	12/18/79	0.02
11/11/79	0.02	11/11/79	0.02	12/19/79	0.01	12/19/79	0.02
11/12/79	0.02	11/12/79	0.02	12/20/79	0.01	12/20/79	0.02
11/13/79	0.01	11/13/79	0.02	12/21/79	0.01	12/21/79	0.02
11/14/79	0.01	11/14/79	0.02	12/22/79	0.01	12/22/79	0.02
11/15/79	0.01	11/15/79	0.02	12/23/79	0.01	12/23/79	0.02
11/16/79	0.01	11/16/79	0.02	12/24/79	0.01	12/24/79	0.02
11/17/79	0.01	11/17/79	0.02	12/25/79	0.01	12/25/79	0.02
11/18/79	0.01	11/18/79	0.02	12/26/79	0.01	12/26/79	0.02
11/19/79	0.01	11/19/79	0.02	12/27/79	0.01	12/27/79	0.02
11/20/79	0.01	11/20/79	0.02	12/28/79	0.01	12/28/79	0.02
11/21/79	0.01	11/21/79	0.02	12/29/79	0.01	12/29/79	0.02
11/22/79	0.01	11/22/79	0.02	12/30/79	0.01	12/30/79	0.02
11/23/79	0.01	11/23/79	0.02	12/31/79	0.01	12/31/79	0.02
11/24/79	0.01	11/24/79	0.02	1/1/80	0.01	1/1/80	0.02
11/25/79	0.01	11/25/79	0.01	1/2/80	0.01	1/2/80	0.02
11/26/79	0.01	11/26/79	0.01	1/3/80	0.01	1/3/80	0.02
11/27/79	0.01	11/27/79	0.01	1/4/80	0.01	1/4/80	0.02
11/28/79	0.01	11/28/79	0.01	1/5/80	0.01	1/5/80	0.02
11/29/79	0.01	11/29/79	0.01	1/6/80	0.01	1/6/80	0.02
11/30/79	0.01	11/30/79	0.01	1/7/80	0.01	1/7/80	0.02
12/1/79	0.01	12/1/79	0.01	1/8/80	0.01	1/8/80	0.02

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
1/9/80	0.01	1/9/80	0.02	2/16/80	0.01	2/16/80	0.02
1/10/80	0.01	1/10/80	0.02	2/17/80	0.01	2/17/80	0.02
1/11/80	0.01	1/11/80	0.02	2/18/80	0.01	2/18/80	0.02
1/12/80	0.01	1/12/80	0.02	2/19/80	0.01	2/19/80	0.02
1/13/80	0.01	1/13/80	0.02	2/20/80	0.01	2/20/80	0.02
1/14/80	0.01	1/14/80	0.03	2/21/80	0.01	2/21/80	0.02
1/15/80	0.02	1/15/80	0.03	2/22/80	0.01	2/22/80	0.02
1/16/80	0.02	1/16/80	0.02	2/23/80	0.01	2/23/80	0.02
1/17/80	0.01	1/17/80	0.03	2/24/80	0.01	2/24/80	0.02
1/18/80	0.01	1/18/80	0.02	2/25/80	0.01	2/25/80	0.03
1/19/80	0.01	1/19/80	0.02	2/26/80	0.01	2/26/80	0.05
1/20/80	0.01	1/20/80	0.02	2/27/80	0.01	2/27/80	0.06
1/21/80	0.01	1/21/80	0.02	2/28/80	0.01	2/28/80	0.03
1/22/80	0.01	1/22/80	0.02	2/29/80	0.01	2/29/80	0.02
1/23/80	0.01	1/23/80	0.02	3/1/80	0.01	3/1/80	0.02
1/24/80	0.01	1/24/80	0.02	3/2/80	0.01	3/2/80	0.02
1/25/80	0.01	1/25/80	0.01	3/3/80	0.01	3/3/80	0.02
1/26/80	0.01	1/26/80	0.01	3/4/80	0.01	3/4/80	0.02
1/27/80	0.01	1/27/80	0.01	3/5/80	0.01	3/5/80	0.05
1/28/80	0.01	1/28/80	0.01	3/6/80	0.01	3/6/80	0.02
1/29/80	0.01	1/29/80	0.01	3/7/80	0.01	3/7/80	0.02
1/30/80	0.01	1/30/80	0.01	3/8/80	0.01	3/8/80	0.02
1/31/80	0.01	1/31/80	0.01	3/9/80	0.01	3/9/80	0.03
2/1/80	0.01	2/1/80	0.01	3/10/80	0.01	3/10/80	0.03
2/2/80	0.01	2/2/80	0.02	3/11/80	0.01	3/11/80	0.02
2/3/80	0.01	2/3/80	0.02	3/12/80	0.01	3/12/80	0.02
2/4/80	0.01	2/4/80	0.02	3/13/80	0.01	3/13/80	0.03
2/5/80	0.01	2/5/80	0.02	3/14/80	0.01	3/14/80	0.03
2/6/80	0.01	2/6/80	0.02	3/15/80	0.01	3/15/80	0.02
2/7/80	0.01	2/7/80	0.02	3/16/80	0.02	3/16/80	0.02
2/8/80	0.01	2/8/80	0.01	3/17/80	0.01	3/17/80	0.02
2/9/80	0.01	2/9/80	0.01	3/18/80	0.02	3/18/80	0.03
2/10/80	0.01	2/10/80	0.02	3/19/80	0.02	3/19/80	0.02
2/11/80	0.01	2/11/80	0.02	3/20/80	0.02	3/20/80	0.02
2/12/80	0.01	2/12/80	0.02	3/21/80	0.02	3/21/80	0.02
2/13/80	0.01	2/13/80	0.02	3/22/80	0.02	3/22/80	0.02
2/14/80	0.01	2/14/80	0.02	3/23/80	0.02	3/23/80	0.02
2/15/80	0.01	2/15/80	0.02	3/24/80	0.02	3/24/80	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
3/25/80	0.02	3/25/80	0.02	5/2/80	1.13	5/2/80	1.25
3/26/80	0.02	3/26/80	0.02	5/3/80	1.02	5/3/80	1.22
3/27/80	0.02	3/27/80	0.02	5/4/80	0.96	5/4/80	1.27
3/28/80	0.02	3/28/80	0.02	5/5/80	1.13	5/5/80	1.50
3/29/80	0.02	3/29/80	0.02	5/6/80	1.08	5/6/80	1.44
3/30/80	0.02	3/30/80	0.03	5/7/80	0.99	5/7/80	1.78
3/31/80	0.02	3/31/80	0.02	5/8/80	2.83	5/8/80	3.82
4/1/80	0.02	4/1/80	0.02	5/9/80	2.27	5/9/80	2.97
4/2/80	0.02	4/2/80	0.02	5/10/80	1.70	5/10/80	2.75
4/3/80	0.02	4/3/80	0.02	5/11/80	1.13	5/11/80	2.55
4/4/80	0.02	4/4/80	0.02	5/12/80	0.99	5/12/80	2.27
4/5/80	0.02	4/5/80	0.03	5/13/80	0.91	5/13/80	2.10
4/6/80	0.02	4/6/80	0.05	5/14/80	0.82	5/14/80	2.10
4/7/80	0.03	4/7/80	0.05	5/15/80	1.10	5/15/80	2.01
4/8/80	0.03	4/8/80	0.06	5/16/80	1.78	5/16/80	2.44
4/9/80	0.03	4/9/80	0.07	5/17/80	1.47	5/17/80	2.04
4/10/80	0.04	4/10/80	0.07	5/18/80	1.22	5/18/80	1.95
4/11/80	0.04	4/11/80	0.08	5/19/80	1.02	5/19/80	1.93
4/12/80	0.04	4/12/80	0.08	5/20/80	0.96	5/20/80	1.87
4/13/80	0.04	4/13/80	0.08	5/21/80	0.96	5/21/80	1.87
4/14/80	0.04	4/14/80	0.08	5/22/80	0.96	5/22/80	1.87
4/15/80	0.05	4/15/80	0.09	5/23/80	0.96	5/23/80	2.12
4/16/80	0.05	4/16/80	0.10	5/24/80	0.91	5/24/80	2.27
4/17/80	0.07	4/17/80	0.11	5/25/80	0.85	5/25/80	2.04
4/18/80	0.08	4/18/80	0.13	5/26/80	0.76	5/26/80	1.78
4/19/80	0.11	4/19/80	0.16	5/27/80	0.68	5/27/80	1.56
4/20/80	0.14	4/20/80	0.19	5/28/80	0.65	5/28/80	1.36
4/21/80	0.17	4/21/80	0.21	5/29/80	0.59	5/29/80	1.25
4/22/80	0.20	4/22/80	0.23	5/30/80	0.57	5/30/80	1.16
4/23/80	0.22	4/23/80	0.28	5/31/80	0.54	5/31/80	1.05
4/24/80	0.34	4/24/80	0.40	6/1/80	0.48	6/1/80	0.96
4/25/80	0.31	4/25/80	0.37	6/2/80	0.45	6/2/80	0.88
4/26/80	0.25	4/26/80	0.34	6/3/80	0.42	6/3/80	0.79
4/27/80	0.23	4/27/80	0.34	6/4/80	0.40	6/4/80	0.74
4/28/80	0.28	4/28/80	0.37	6/5/80	0.37	6/5/80	0.68
4/29/80	0.48	4/29/80	0.54	6/6/80	0.34	6/6/80	0.62
4/30/80	0.85	4/30/80	1.08	6/7/80	0.34	6/7/80	0.57
5/1/80	1.27	5/1/80	1.47	6/8/80	0.31	6/8/80	0.54

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
6/9/80	0.31	6/9/80	0.51	7/17/80	0.02	7/17/80	0.05
6/10/80	0.31	6/10/80	0.54	7/18/80	0.02	7/18/80	0.04
6/11/80	0.25	6/11/80	0.57	7/19/80	0.02	7/19/80	0.04
6/12/80	0.19	6/12/80	0.54	7/20/80	0.02	7/20/80	0.04
6/13/80	0.16	6/13/80	0.51	7/21/80	0.04	7/21/80	0.05
6/14/80	0.14	6/14/80	0.48	7/22/80	0.04	7/22/80	0.04
6/15/80	0.13	6/15/80	0.42	7/23/80	0.03	7/23/80	0.04
6/16/80	0.13	6/16/80	0.34	7/24/80	0.03	7/24/80	0.04
6/17/80	0.12	6/17/80	0.31	7/25/80	0.02	7/25/80	0.04
6/18/80	0.10	6/18/80	0.27	7/26/80	0.03	7/26/80	0.04
6/19/80	0.10	6/19/80	0.25	7/27/80	0.03	7/27/80	0.04
6/20/80	0.10	6/20/80	0.23	7/28/80	0.02	7/28/80	0.04
6/21/80	0.10	6/21/80	0.21	7/29/80	0.01	7/29/80	0.03
6/22/80	0.09	6/22/80	0.20	7/30/80	0.01	7/30/80	0.03
6/23/80	0.08	6/23/80	0.18	7/31/80	0.01	7/31/80	0.03
6/24/80	0.07	6/24/80	0.16	8/1/80	0.01	8/1/80	0.03
6/25/80	0.06	6/25/80	0.16	8/2/80	0.02	8/2/80	0.03
6/26/80	0.05	6/26/80	0.14	8/3/80	0.01	8/3/80	0.03
6/27/80	0.04	6/27/80	0.13	8/4/80	0.00	8/4/80	0.03
6/28/80	0.04	6/28/80	0.12	8/5/80	0.01	8/5/80	0.02
6/29/80	0.03	6/29/80	0.12	8/6/80	0.00	8/6/80	0.02
6/30/80	0.03	6/30/80	0.11	8/7/80	0.00	8/7/80	0.02
7/1/80	0.03	7/1/80	0.11	8/8/80	0.00	8/8/80	0.02
7/2/80	0.05	7/2/80	0.12	8/9/80	0.00	8/9/80	0.02
7/3/80	0.05	7/3/80	0.11	8/10/80	0.00	8/10/80	0.03
7/4/80	0.04	7/4/80	0.10	8/11/80	0.00	8/11/80	0.03
7/5/80	0.03	7/5/80	0.09	8/12/80	0.00	8/12/80	0.03
7/6/80	0.03	7/6/80	0.08	8/13/80	0.00	8/13/80	0.03
7/7/80	0.02	7/7/80	0.08	8/14/80	0.05	8/14/80	0.04
7/8/80	0.02	7/8/80	0.07	8/15/80	0.05	8/15/80	0.05
7/9/80	0.02	7/9/80	0.07	8/16/80	0.01	8/16/80	0.04
7/10/80	0.02	7/10/80	0.07	8/17/80	0.01	8/17/80	0.03
7/11/80	0.02	7/11/80	0.06	8/18/80	0.01	8/18/80	0.03
7/12/80	0.02	7/12/80	0.06	8/19/80	0.01	8/19/80	0.02
7/13/80	0.02	7/13/80	0.06	8/20/80	0.01	8/20/80	0.02
7/14/80	0.02	7/14/80	0.06	8/21/80	0.01	8/21/80	0.02
7/15/80	0.02	7/15/80	0.06	8/22/80	0.01	8/22/80	0.02
7/16/80	0.02	7/16/80	0.05	8/23/80	0.00	8/23/80	0.02

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
8/24/80	0.00	8/24/80	0.02	10/1/80	0.00	10/1/80	0.01
8/25/80	0.00	8/25/80	0.02	10/2/80	0.00	10/2/80	0.01
8/26/80	0.02	8/26/80	0.05	10/3/80	0.00	10/3/80	0.01
8/27/80	0.05	8/27/80	0.04	10/4/80	0.00	10/4/80	0.01
8/28/80	0.02	8/28/80	0.03	10/5/80	0.00	10/5/80	0.01
8/29/80	0.01	8/29/80	0.03	10/6/80	0.00	10/6/80	0.01
8/30/80	0.02	8/30/80	0.03	10/7/80	0.00	10/7/80	0.01
8/31/80	0.02	8/31/80	0.03	10/8/80	0.00	10/8/80	0.01
9/1/80	0.01	9/1/80	0.02	10/9/80	0.00	10/9/80	0.01
9/2/80	0.01	9/2/80	0.02	10/10/80	0.00	10/10/80	0.01
9/3/80	0.01	9/3/80	0.02	10/11/80	0.00	10/11/80	0.01
9/4/80	0.01	9/4/80	0.02	10/12/80	0.00	10/12/80	0.01
9/5/80	0.01	9/5/80	0.02	10/13/80	0.00	10/13/80	0.01
9/6/80	0.01	9/6/80	0.02	10/14/80	0.00	10/14/80	0.01
9/7/80	0.01	9/7/80	0.02	10/15/80	0.00	10/15/80	0.01
9/8/80	0.01	9/8/80	0.02	10/16/80	0.00	10/16/80	0.01
9/9/80	0.05	9/9/80	0.05	10/17/80	0.00	10/17/80	0.01
9/10/80	0.03	9/10/80	0.05	10/18/80	0.00	10/18/80	0.02
9/11/80	0.02	9/11/80	0.04	10/19/80	0.00	10/19/80	0.02
9/12/80	0.02	9/12/80	0.03	10/20/80	0.00	10/20/80	0.01
9/13/80	0.02	9/13/80	0.03	10/21/80	0.00	10/21/80	0.01
9/14/80	0.02	9/14/80	0.02	10/22/80	0.00	10/22/80	0.01
9/15/80	0.01	9/15/80	0.02	10/23/80	0.00	10/23/80	0.01
9/16/80	0.01	9/16/80	0.02	10/24/80	0.01	10/24/80	0.02
9/17/80	0.01	9/17/80	0.02	10/25/80	0.01	10/25/80	0.02
9/18/80	0.01	9/18/80	0.02	10/26/80	0.01	10/26/80	0.02
9/19/80	0.01	9/19/80	0.01	10/27/80	0.01	10/27/80	0.02
9/20/80	0.01	9/20/80	0.01	10/28/80	0.01	10/28/80	0.02
9/21/80	0.01	9/21/80	0.01	10/29/80	0.01	10/29/80	0.02
9/22/80	0.01	9/22/80	0.01	10/30/80	0.01	10/30/80	0.02
9/23/80	0.01	9/23/80	0.01	10/31/80	0.01	10/31/80	0.02
9/24/80	0.01	9/24/80	0.01	11/1/80	0.01	11/1/80	0.02
9/25/80	0.01	9/25/80	0.01	11/2/80	0.01	11/2/80	0.02
9/26/80	0.01	9/26/80	0.02	11/3/80	0.01	11/3/80	0.02
9/27/80	0.01	9/27/80	0.02	11/4/80	0.01	11/4/80	0.02
9/28/80	0.01	9/28/80	0.01	11/5/80	0.01	11/5/80	0.01
9/29/80	0.01	9/29/80	0.01	11/6/80	0.01	11/6/80	0.01
9/30/80	0.01	9/30/80	0.01	11/7/80	0.01	11/7/80	0.01

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
11/8/80	0.01	11/8/80	0.01	12/16/80	0.01	12/16/80	0.02
11/9/80	0.01	11/9/80	0.01	12/17/80	0.01	12/17/80	0.02
11/10/80	0.01	11/10/80	0.01	12/18/80	0.01	12/18/80	0.02
11/11/80	0.01	11/11/80	0.01	12/19/80	0.01	12/19/80	0.01
11/12/80	0.01	11/12/80	0.01	12/20/80	0.01	12/20/80	0.01
11/13/80	0.01	11/13/80	0.01	12/21/80	0.01	12/21/80	0.01
11/14/80	0.01	11/14/80	0.01	12/22/80	0.01	12/22/80	0.01
11/15/80	0.01	11/15/80	0.01	12/23/80	0.01	12/23/80	0.02
11/16/80	0.01	11/16/80	0.01	12/24/80	0.01	12/24/80	0.02
11/17/80	0.01	11/17/80	0.01	12/25/80	0.02	12/25/80	0.02
11/18/80	0.01	11/18/80	0.01	12/26/80	0.01	12/26/80	0.02
11/19/80	0.01	11/19/80	0.01	12/27/80	0.01	12/27/80	0.02
11/20/80	0.01	11/20/80	0.01	12/28/80	0.01	12/28/80	0.02
11/21/80	0.01	11/21/80	0.01	12/29/80	0.01	12/29/80	0.02
11/22/80	0.01	11/22/80	0.01	12/30/80	0.01	12/30/80	0.02
11/23/80	0.01	11/23/80	0.01	12/31/80	0.01	12/31/80	0.02
11/24/80	0.01	11/24/80	0.01	1/1/81	0.01	1/1/81	0.01
11/25/80	0.01	11/25/80	0.01	1/2/81	0.01	1/2/81	0.01
11/26/80	0.01	11/26/80	0.01	1/3/81	0.01	1/3/81	0.02
11/27/80	0.01	11/27/80	0.01	1/4/81	0.01	1/4/81	0.02
11/28/80	0.01	11/28/80	0.01	1/5/81	0.01	1/5/81	0.02
11/29/80	0.01	11/29/80	0.01	1/6/81	0.01	1/6/81	0.03
11/30/80	0.01	11/30/80	0.02	1/7/81	0.01	1/7/81	0.03
12/1/80	0.01	12/1/80	0.02	1/8/81	0.01	1/8/81	0.03
12/2/80	0.01	12/2/80	0.02	1/9/81	0.01	1/9/81	0.02
12/3/80	0.01	12/3/80	0.02	1/10/81	0.01	1/10/81	0.02
12/4/80	0.01	12/4/80	0.02	1/11/81	0.01	1/11/81	0.02
12/5/80	0.01	12/5/80	0.02	1/12/81	0.01	1/12/81	0.02
12/6/80	0.01	12/6/80	0.02	1/13/81	0.01	1/13/81	0.02
12/7/80	0.01	12/7/80	0.02	1/14/81	0.01	1/14/81	0.02
12/8/80	0.01	12/8/80	0.02	1/15/81	0.01	1/15/81	0.02
12/9/80	0.01	12/9/80	0.02	1/16/81	0.01	1/16/81	0.01
12/10/80	0.01	12/10/80	0.02	1/17/81	0.01	1/17/81	0.01
12/11/80	0.01	12/11/80	0.02	1/18/81	0.01	1/18/81	0.01
12/12/80	0.01	12/12/80	0.02	1/19/81	0.01	1/19/81	0.01
12/13/80	0.01	12/13/80	0.02	1/20/81	0.01	1/20/81	0.01
12/14/80	0.01	12/14/80	0.02	1/21/81	0.01	1/21/81	0.01
12/15/80	0.01	12/15/80	0.02	1/22/81	0.01	1/22/81	0.01

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
1/23/81	0.01	1/23/81	0.01	3/2/81	0.01	3/2/81	0.01
1/24/81	0.01	1/24/81	0.01	3/3/81	0.01	3/3/81	0.01
1/25/81	0.01	1/25/81	0.01	3/4/81	0.01	3/4/81	0.01
1/26/81	0.01	1/26/81	0.01	3/5/81	0.01	3/5/81	0.01
1/27/81	0.01	1/27/81	0.01	3/6/81	0.01	3/6/81	0.01
1/28/81	0.01	1/28/81	0.01	3/7/81	0.01	3/7/81	0.01
1/29/81	0.01	1/29/81	0.01	3/8/81	0.01	3/8/81	0.01
1/30/81	0.01	1/30/81	0.01	3/9/81	0.01	3/9/81	0.01
1/31/81	0.01	1/31/81	0.01	3/10/81	0.01	3/10/81	0.01
2/1/81	0.01	2/1/81	0.01	3/11/81	0.01	3/11/81	0.01
2/2/81	0.01	2/2/81	0.01	3/12/81	0.01	3/12/81	0.01
2/3/81	0.01	2/3/81	0.01	3/13/81	0.01	3/13/81	0.01
2/4/81	0.01	2/4/81	0.01	3/14/81	0.01	3/14/81	0.01
2/5/81	0.01	2/5/81	0.01	3/15/81	0.01	3/15/81	0.01
2/6/81	0.01	2/6/81	0.01	3/16/81	0.01	3/16/81	0.01
2/7/81	0.01	2/7/81	0.01	3/17/81	0.01	3/17/81	0.02
2/8/81	0.01	2/8/81	0.01	3/18/81	0.01	3/18/81	0.02
2/9/81	0.01	2/9/81	0.01	3/19/81	0.01	3/19/81	0.02
2/10/81	0.01	2/10/81	0.01	3/20/81	0.01	3/20/81	0.02
2/11/81	0.01	2/11/81	0.01	3/21/81	0.01	3/21/81	0.02
2/12/81	0.01	2/12/81	0.01	3/22/81	0.01	3/22/81	0.02
2/13/81	0.01	2/13/81	0.01	3/23/81	0.01	3/23/81	0.02
2/14/81	0.01	2/14/81	0.01	3/24/81	0.01	3/24/81	0.02
2/15/81	0.01	2/15/81	0.01	3/25/81	0.01	3/25/81	0.02
2/16/81	0.01	2/16/81	0.01	3/26/81	0.01	3/26/81	0.02
2/17/81	0.01	2/17/81	0.01	3/27/81	0.01	3/27/81	0.02
2/18/81	0.00	2/18/81	0.01	3/28/81	0.01	3/28/81	0.02
2/19/81	0.00	2/19/81	0.01	3/29/81	0.01	3/29/81	0.02
2/20/81	0.01	2/20/81	0.01	3/30/81	0.01	3/30/81	0.02
2/21/81	0.01	2/21/81	0.01	3/31/81	0.01	3/31/81	0.02
2/22/81	0.01	2/22/81	0.01	4/1/81	0.01	4/1/81	0.02
2/23/81	0.01	2/23/81	0.01	4/2/81	0.01	4/2/81	0.02
2/24/81	0.01	2/24/81	0.01	4/3/81	0.01	4/3/81	0.03
2/25/81	0.01	2/25/81	0.01	4/4/81	0.01	4/4/81	0.02
2/26/81	0.01	2/26/81	0.01	4/5/81	0.01	4/5/81	0.02
2/27/81	0.01	2/27/81	0.01	4/6/81	0.01	4/6/81	0.02
2/28/81	0.01	2/28/81	0.01	4/7/81	0.01	4/7/81	0.02
3/1/81	0.01	3/1/81	0.01	4/8/81	0.01	4/8/81	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
4/9/81	0.01	4/9/81	0.02	5/17/81	0.02	5/17/81	0.03
4/10/81	0.01	4/10/81	0.03	5/18/81	0.02	5/18/81	0.03
4/11/81	0.01	4/11/81	0.03	5/19/81	0.02	5/19/81	0.02
4/12/81	0.01	4/12/81	0.03	5/20/81	0.01	5/20/81	0.02
4/13/81	0.01	4/13/81	0.03	5/21/81	0.01	5/21/81	0.02
4/14/81	0.01	4/14/81	0.02	5/22/81	0.00	5/22/81	0.02
4/15/81	0.01	4/15/81	0.03	5/23/81	0.01	5/23/81	0.02
4/16/81	0.01	4/16/81	0.02	5/24/81	0.02	5/24/81	0.03
4/17/81	0.01	4/17/81	0.02	5/25/81	0.04	5/25/81	0.05
4/18/81	0.01	4/18/81	0.03	5/26/81	0.03	5/26/81	0.05
4/19/81	0.01	4/19/81	0.02	5/27/81	0.03	5/27/81	0.05
4/20/81	0.01	4/20/81	0.02	5/28/81	0.02	5/28/81	0.05
4/21/81	0.01	4/21/81	0.02	5/29/81	0.03	5/29/81	0.05
4/22/81	0.01	4/22/81	0.02	5/30/81	0.04	5/30/81	0.05
4/23/81	0.01	4/23/81	0.02	5/31/81	0.07	5/31/81	0.07
4/24/81	0.01	4/24/81	0.02	6/1/81	0.10	6/1/81	0.11
4/25/81	0.00	4/25/81	0.02	6/2/81	0.08	6/2/81	0.11
4/26/81	0.00	4/26/81	0.02	6/3/81	0.82	6/3/81	2.83
4/27/81	0.00	4/27/81	0.01	6/4/81	0.71	6/4/81	1.98
4/28/81	0.00	4/28/81	0.02	6/5/81	0.57	6/5/81	1.42
4/29/81	0.00	4/29/81	0.01	6/6/81	0.48	6/6/81	1.13
4/30/81	0.00	4/30/81	0.01	6/7/81	0.40	6/7/81	0.85
5/1/81	0.00	5/1/81	0.01	6/8/81	0.31	6/8/81	0.71
5/2/81	0.01	5/2/81	0.01	6/9/81	0.24	6/9/81	0.57
5/3/81	0.01	5/3/81	0.02	6/10/81	0.20	6/10/81	0.42
5/4/81	0.01	5/4/81	0.02	6/11/81	0.16	6/11/81	0.34
5/5/81	0.00	5/5/81	0.02	6/12/81	0.13	6/12/81	0.31
5/6/81	0.04	5/6/81	0.03	6/13/81	0.10	6/13/81	0.25
5/7/81	0.02	5/7/81	0.02	6/14/81	0.10	6/14/81	0.22
5/8/81	0.01	5/8/81	0.01	6/15/81	0.10	6/15/81	0.18
5/9/81	0.01	5/9/81	0.02	6/16/81	0.08	6/16/81	0.16
5/10/81	0.01	5/10/81	0.02	6/17/81	0.07	6/17/81	0.13
5/11/81	0.01	5/11/81	0.01	6/18/81	0.06	6/18/81	0.11
5/12/81	0.01	5/12/81	0.01	6/19/81	0.05	6/19/81	0.09
5/13/81	0.01	5/13/81	0.02	6/20/81	0.04	6/20/81	0.07
5/14/81	0.00	5/14/81	0.02	6/21/81	0.02	6/21/81	0.05
5/15/81	0.00	5/15/81	0.01	6/22/81	0.02	6/22/81	0.04
5/16/81	0.00	5/16/81	0.01	6/23/81	0.02	6/23/81	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
6/24/81	0.01	6/24/81	0.02	8/1/81	0.03	8/1/81	0.10
6/25/81	0.01	6/25/81	0.02	8/2/81	0.03	8/2/81	0.08
6/26/81	0.01	6/26/81	0.02	8/3/81	0.05	8/3/81	0.14
6/27/81	0.00	6/27/81	0.02	8/4/81	0.03	8/4/81	0.11
6/28/81	0.02	6/28/81	0.02	8/5/81	0.03	8/5/81	0.10
6/29/81	0.03	6/29/81	0.06	8/6/81	0.05	8/6/81	0.25
6/30/81	0.02	6/30/81	0.04	8/7/81	0.05	8/7/81	0.23
7/1/81	0.04	7/1/81	0.05	8/8/81	0.04	8/8/81	0.23
7/2/81	0.18	7/2/81	0.09	8/9/81	0.05	8/9/81	0.24
7/3/81	0.06	7/3/81	0.11	8/10/81	0.09	8/10/81	0.31
7/4/81	0.04	7/4/81	0.09	8/11/81	0.12	8/11/81	0.42
7/5/81	0.03	7/5/81	0.08	8/12/81	0.18	8/12/81	0.62
7/6/81	0.02	7/6/81	0.05	8/13/81	0.19	8/13/81	0.68
7/7/81	0.02	7/7/81	0.04	8/14/81	0.18	8/14/81	0.59
7/8/81	0.01	7/8/81	0.04	8/15/81	0.16	8/15/81	0.57
7/9/81	0.01	7/9/81	0.04	8/16/81	0.17	8/16/81	0.51
7/10/81	0.01	7/10/81	0.06	8/17/81	0.17	8/17/81	0.48
7/11/81	0.01	7/11/81	0.13	8/18/81	0.17	8/18/81	0.42
7/12/81	0.03	7/12/81	0.12	8/19/81	0.14	8/19/81	0.37
7/13/81	0.06	7/13/81	0.12	8/20/81	0.12	8/20/81	0.34
7/14/81	0.05	7/14/81	0.28	8/21/81	0.11	8/21/81	0.31
7/15/81	0.04	7/15/81	0.31	8/22/81	0.11	8/22/81	0.31
7/16/81	0.09	7/16/81	0.40	8/23/81	0.10	8/23/81	0.28
7/17/81	0.11	7/17/81	0.40	8/24/81	0.08	8/24/81	0.26
7/18/81	0.13	7/18/81	0.34	8/25/81	0.07	8/25/81	0.23
7/19/81	0.12	7/19/81	0.31	8/26/81	0.07	8/26/81	0.22
7/20/81	0.11	7/20/81	0.28	8/27/81	0.07	8/27/81	0.22
7/21/81	0.10	7/21/81	0.26	8/28/81	0.06	8/28/81	0.20
7/22/81	0.09	7/22/81	0.24	8/29/81	0.05	8/29/81	0.19
7/23/81	0.08	7/23/81	0.23	8/30/81	0.04	8/30/81	0.17
7/24/81	0.07	7/24/81	0.20	8/31/81	0.05	8/31/81	0.18
7/25/81	0.07	7/25/81	0.19	9/1/81	0.09	9/1/81	0.23
7/26/81	0.06	7/26/81	0.19	9/2/81	0.06	9/2/81	0.19
7/27/81	0.06	7/27/81	0.18	9/3/81	0.06	9/3/81	0.19
7/28/81	0.05	7/28/81	0.15	9/4/81	0.05	9/4/81	0.19
7/29/81	0.04	7/29/81	0.14	9/5/81	0.05	9/5/81	0.18
7/30/81	0.04	7/30/81	0.11	9/6/81	0.04	9/6/81	0.17
7/31/81	0.03	7/31/81	0.11	9/7/81	0.04	9/7/81	0.18

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
9/8/81	0.04	9/8/81	0.17	10/16/81	0.01	10/16/81	0.07
9/9/81	0.03	9/9/81	0.16	10/17/81	0.01	10/17/81	0.06
9/10/81	0.03	9/10/81	0.15	10/18/81	0.01	10/18/81	0.06
9/11/81	0.03	9/11/81	0.16	10/19/81	0.01	10/19/81	0.06
9/12/81	0.03	9/12/81	0.16	10/20/81	0.01	10/20/81	0.05
9/13/81	0.03	9/13/81	0.17	10/21/81	0.01	10/21/81	0.05
9/14/81	0.02	9/14/81	0.16	10/22/81	0.01	10/22/81	0.05
9/15/81	0.02	9/15/81	0.15	10/23/81	0.01	10/23/81	0.05
9/16/81	0.03	9/16/81	0.17	10/24/81	0.01	10/24/81	0.05
9/17/81	0.03	9/17/81	0.16	10/25/81	0.01	10/25/81	0.05
9/18/81	0.02	9/18/81	0.15	10/26/81	0.01	10/26/81	0.05
9/19/81	0.02	9/19/81	0.14	10/27/81	0.01	10/27/81	0.05
9/20/81	0.02	9/20/81	0.13	10/28/81	0.01	10/28/81	0.05
9/21/81	0.02	9/21/81	0.13	10/29/81	0.01	10/29/81	0.05
9/22/81	0.02	9/22/81	0.12	10/30/81	0.01	10/30/81	0.05
9/23/81	0.02	9/23/81	0.11	10/31/81	0.02	10/31/81	0.05
9/24/81	0.02	9/24/81	0.11	11/1/81	0.02	11/1/81	0.05
9/25/81	0.02	9/25/81	0.11	11/2/81	0.02	11/2/81	0.05
9/26/81	0.02	9/26/81	0.10	11/3/81	0.02	11/3/81	0.05
9/27/81	0.02	9/27/81	0.09	11/4/81	0.02	11/4/81	0.05
9/28/81	0.02	9/28/81	0.09	11/5/81	0.02	11/5/81	0.05
9/29/81	0.01	9/29/81	0.08	11/6/81	0.02	11/6/81	0.04
9/30/81	0.01	9/30/81	0.08	11/7/81	0.01	11/7/81	0.04
10/1/81	0.01	10/1/81	0.08	11/8/81	0.01	11/8/81	0.04
10/2/81	0.01	10/2/81	0.08	11/9/81	0.02	11/9/81	0.04
10/3/81	0.01	10/3/81	0.07	11/10/81	0.01	11/10/81	0.04
10/4/81	0.01	10/4/81	0.07	11/11/81	0.01	11/11/81	0.04
10/5/81	0.01	10/5/81	0.07	11/12/81	0.01	11/12/81	0.04
10/6/81	0.01	10/6/81	0.07	11/13/81	0.01	11/13/81	0.04
10/7/81	0.01	10/7/81	0.07	11/14/81	0.01	11/14/81	0.04
10/8/81	0.01	10/8/81	0.06	11/15/81	0.01	11/15/81	0.04
10/9/81	0.01	10/9/81	0.07	11/16/81	0.01	11/16/81	0.04
10/10/81	0.01	10/10/81	0.07	11/17/81	0.01	11/17/81	0.03
10/11/81	0.01	10/11/81	0.07	11/18/81	0.01	11/18/81	0.03
10/12/81	0.01	10/12/81	0.06	11/19/81	0.01	11/19/81	0.03
10/13/81	0.01	10/13/81	0.06	11/20/81	0.01	11/20/81	0.03
10/14/81	0.01	10/14/81	0.06	11/21/81	0.01	11/21/81	0.03
10/15/81	0.01	10/15/81	0.07	11/22/81	0.01	11/22/81	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
11/23/81	0.01	11/23/81	0.03	12/31/81	0.01	12/31/81	0.04
11/24/81	0.01	11/24/81	0.03	1/1/82	0.01	1/1/82	0.04
11/25/81	0.01	11/25/81	0.03	1/2/82	0.01	1/2/82	0.04
11/26/81	0.01	11/26/81	0.03	1/3/82	0.01	1/3/82	0.03
11/27/81	0.01	11/27/81	0.03	1/4/82	0.01	1/4/82	0.03
11/28/81	0.01	11/28/81	0.04	1/5/82	0.01	1/5/82	0.04
11/29/81	0.01	11/29/81	0.04	1/6/82	0.01	1/6/82	0.03
11/30/81	0.01	11/30/81	0.03	1/7/82	0.01	1/7/82	0.03
12/1/81	0.01	12/1/81	0.03	1/8/82	0.01	1/8/82	0.03
12/2/81	0.01	12/2/81	0.03	1/9/82	0.01	1/9/82	0.03
12/3/81	0.01	12/3/81	0.03	1/10/82	0.01	1/10/82	0.03
12/4/81	0.01	12/4/81	0.03	1/11/82	0.01	1/11/82	0.03
12/5/81	0.01	12/5/81	0.03	1/12/82	0.01	1/12/82	0.03
12/6/81	0.01	12/6/81	0.03	1/13/82	0.01	1/13/82	0.03
12/7/81	0.01	12/7/81	0.03	1/14/82	0.01	1/14/82	0.03
12/8/81	0.01	12/8/81	0.03	1/15/82	0.01	1/15/82	0.03
12/9/81	0.01	12/9/81	0.03	1/16/82	0.01	1/16/82	0.03
12/10/81	0.01	12/10/81	0.03	1/17/82	0.01	1/17/82	0.03
12/11/81	0.01	12/11/81	0.03	1/18/82	0.01	1/18/82	0.04
12/12/81	0.01	12/12/81	0.03	1/19/82	0.01	1/19/82	0.04
12/13/81	0.01	12/13/81	0.03	1/20/82	0.01	1/20/82	0.04
12/14/81	0.01	12/14/81	0.03	1/21/82	0.01	1/21/82	0.03
12/15/81	0.01	12/15/81	0.03	1/22/82	0.01	1/22/82	0.03
12/16/81	0.01	12/16/81	0.03	1/23/82	0.01	1/23/82	0.03
12/17/81	0.01	12/17/81	0.03	1/24/82	0.01	1/24/82	0.03
12/18/81	0.01	12/18/81	0.03	1/25/82	0.01	1/25/82	0.03
12/19/81	0.01	12/19/81	0.03	1/26/82	0.01	1/26/82	0.03
12/20/81	0.01	12/20/81	0.04	1/27/82	0.01	1/27/82	0.03
12/21/81	0.01	12/21/81	0.03	1/28/82	0.01	1/28/82	0.03
12/22/81	0.01	12/22/81	0.03	1/29/82	0.01	1/29/82	0.03
12/23/81	0.01	12/23/81	0.02	1/30/82	0.01	1/30/82	0.03
12/24/81	0.01	12/24/81	0.02	1/31/82	0.01	1/31/82	0.03
12/25/81	0.01	12/25/81	0.02	2/1/82	0.01	2/1/82	0.03
12/26/81	0.01	12/26/81	0.03	2/2/82	0.01	2/2/82	0.03
12/27/81	0.01	12/27/81	0.03	2/3/82	0.01	2/3/82	0.03
12/28/81	0.01	12/28/81	0.03	2/4/82	0.01	2/4/82	0.03
12/29/81	0.01	12/29/81	0.03	2/5/82	0.01	2/5/82	0.03
12/30/81	0.01	12/30/81	0.03	2/6/82	0.01	2/6/82	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
2/7/82	0.01	2/7/82	0.03	3/17/82	0.04	3/17/82	0.06
2/8/82	0.01	2/8/82	0.03	3/18/82	0.04	3/18/82	0.06
2/9/82	0.00	2/9/82	0.03	3/19/82	0.04	3/19/82	0.06
2/10/82	0.01	2/10/82	0.03	3/20/82	0.03	3/20/82	0.05
2/11/82	0.00	2/11/82	0.03	3/21/82	0.03	3/21/82	0.05
2/12/82	0.00	2/12/82	0.03	3/22/82	0.03	3/22/82	0.06
2/13/82	0.00	2/13/82	0.05	3/23/82	0.03	3/23/82	0.05
2/14/82	0.01	2/14/82	0.05	3/24/82	0.03	3/24/82	0.05
2/15/82	0.01	2/15/82	0.04	3/25/82	0.02	3/25/82	0.05
2/16/82	0.01	2/16/82	0.04	3/26/82	0.02	3/26/82	0.05
2/17/82	0.01	2/17/82	0.04	3/27/82	0.02	3/27/82	0.05
2/18/82	0.01	2/18/82	0.03	3/28/82	0.02	3/28/82	0.04
2/19/82	0.01	2/19/82	0.03	3/29/82	0.02	3/29/82	0.04
2/20/82	0.01	2/20/82	0.03	3/30/82	0.02	3/30/82	0.04
2/21/82	0.01	2/21/82	0.03	3/31/82	0.02	3/31/82	0.04
2/22/82	0.02	2/22/82	0.04	4/1/82	0.02	4/1/82	0.04
2/23/82	0.02	2/23/82	0.05	4/2/82	0.02	4/2/82	0.04
2/24/82	0.02	2/24/82	0.05	4/3/82	0.02	4/3/82	0.04
2/25/82	0.02	2/25/82	0.05	4/4/82	0.02	4/4/82	0.04
2/26/82	0.02	2/26/82	0.04	4/5/82	0.02	4/5/82	0.04
2/27/82	0.02	2/27/82	0.04	4/6/82	0.02	4/6/82	0.04
2/28/82	0.01	2/28/82	0.05	4/7/82	0.02	4/7/82	0.04
3/1/82	0.01	3/1/82	0.04	4/8/82	0.02	4/8/82	0.03
3/2/82	0.01	3/2/82	0.04	4/9/82	0.02	4/9/82	0.03
3/3/82	0.02	3/3/82	0.04	4/10/82	0.02	4/10/82	0.04
3/4/82	0.02	3/4/82	0.03	4/11/82	0.02	4/11/82	0.04
3/5/82	0.01	3/5/82	0.02	4/12/82	0.02	4/12/82	0.05
3/6/82	0.02	3/6/82	0.03	4/13/82	0.02	4/13/82	0.05
3/7/82	0.02	3/7/82	0.04	4/14/82	0.02	4/14/82	0.05
3/8/82	0.02	3/8/82	0.04	4/15/82	0.02	4/15/82	0.05
3/9/82	0.02	3/9/82	0.04	4/16/82	0.02	4/16/82	0.05
3/10/82	0.02	3/10/82	0.05	4/17/82	0.02	4/17/82	0.05
3/11/82	0.03	3/11/82	0.05	4/18/82	0.02	4/18/82	0.04
3/12/82	0.04	3/12/82	0.06	4/19/82	0.02	4/19/82	0.05
3/13/82	0.05	3/13/82	0.06	4/20/82	0.02	4/20/82	0.04
3/14/82	0.05	3/14/82	0.06	4/21/82	0.02	4/21/82	0.05
3/15/82	0.05	3/15/82	0.06	4/22/82	0.03	4/22/82	0.05
3/16/82	0.04	3/16/82	0.06	4/23/82	0.03	4/23/82	0.05

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
4/24/82	0.03	4/24/82	0.05	6/1/82	0.15	6/1/82	0.45
4/25/82	0.03	4/25/82	0.05	6/2/82	0.14	6/2/82	0.40
4/26/82	0.03	4/26/82	0.05	6/3/82	0.76	6/3/82	1.27
4/27/82	0.03	4/27/82	0.06	6/4/82	0.54	6/4/82	1.47
4/28/82	0.03	4/28/82	0.06	6/5/82	0.37	6/5/82	1.33
4/29/82	0.03	4/29/82	0.06	6/6/82	0.31	6/6/82	1.05
4/30/82	0.03	4/30/82	0.07	6/7/82	0.25	6/7/82	0.82
5/1/82	0.03	5/1/82	0.06	6/8/82	0.20	6/8/82	0.65
5/2/82	0.03	5/2/82	0.07	6/9/82	0.18	6/9/82	0.54
5/3/82	0.03	5/3/82	0.08	6/10/82	0.15	6/10/82	0.48
5/4/82	0.03	5/4/82	0.07	6/11/82	0.14	6/11/82	0.40
5/5/82	0.04	5/5/82	0.10	6/12/82	0.13	6/12/82	0.37
5/6/82	0.04	5/6/82	0.10	6/13/82	0.11	6/13/82	0.31
5/7/82	0.04	5/7/82	0.11	6/14/82	0.13	6/14/82	0.28
5/8/82	0.04	5/8/82	0.11	6/15/82	0.12	6/15/82	0.28
5/9/82	0.05	5/9/82	0.14	6/16/82	0.09	6/16/82	0.26
5/10/82	0.05	5/10/82	0.14	6/17/82	0.09	6/17/82	0.24
5/11/82	0.05	5/11/82	0.14	6/18/82	0.13	6/18/82	0.31
5/12/82	0.05	5/12/82	0.16	6/19/82	0.18	6/19/82	0.54
5/13/82	0.06	5/13/82	0.17	6/20/82	0.17	6/20/82	0.57
5/14/82	0.07	5/14/82	0.18	6/21/82	0.16	6/21/82	0.54
5/15/82	0.08	5/15/82	0.19	6/22/82	0.15	6/22/82	0.51
5/16/82	0.08	5/16/82	0.23	6/23/82	0.14	6/23/82	0.45
5/17/82	0.09	5/17/82	0.26	6/24/82	0.13	6/24/82	0.42
5/18/82	0.10	5/18/82	0.28	6/25/82	0.12	6/25/82	0.37
5/19/82	0.10	5/19/82	0.31	6/26/82	0.11	6/26/82	0.34
5/20/82	0.10	5/20/82	0.31	6/27/82	0.10	6/27/82	0.31
5/21/82	0.10	5/21/82	0.31	6/28/82	0.09	6/28/82	0.28
5/22/82	0.09	5/22/82	0.28	6/29/82	0.08	6/29/82	0.25
5/23/82	0.09	5/23/82	0.27	6/30/82	0.08	6/30/82	0.22
5/24/82	0.09	5/24/82	0.28	7/1/82	0.07	7/1/82	0.20
5/25/82	0.15	5/25/82	0.37	7/2/82	0.06	7/2/82	0.18
5/26/82	0.16	5/26/82	0.45	7/3/82	0.06	7/3/82	0.17
5/27/82	0.16	5/27/82	0.59	7/4/82	0.05	7/4/82	0.16
5/28/82	0.15	5/28/82	0.59	7/5/82	0.05	7/5/82	0.14
5/29/82	0.15	5/29/82	0.54	7/6/82	0.05	7/6/82	0.13
5/30/82	0.14	5/30/82	0.48	7/7/82	0.05	7/7/82	0.13
5/31/82	0.16	5/31/82	0.48	7/8/82	0.04	7/8/82	0.12

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
7/9/82	0.04	7/9/82	0.11	8/16/82	0.59	8/16/82	1.95
7/10/82	0.04	7/10/82	0.10	8/17/82	0.51	8/17/82	1.73
7/11/82	0.04	7/11/82	0.10	8/18/82	0.45	8/18/82	1.95
7/12/82	0.04	7/12/82	0.11	8/19/82	0.48	8/19/82	1.56
7/13/82	0.04	7/13/82	0.11	8/20/82	0.54	8/20/82	1.36
7/14/82	0.04	7/14/82	0.10	8/21/82	1.13	8/21/82	2.10
7/15/82	0.03	7/15/82	0.09	8/22/82	0.79	8/22/82	2.01
7/16/82	0.03	7/16/82	0.07	8/23/82	0.65	8/23/82	1.64
7/17/82	0.03	7/17/82	0.07	8/24/82	0.57	8/24/82	1.36
7/18/82	0.02	7/18/82	0.06	8/25/82	0.48	8/25/82	1.10
7/19/82	0.02	7/19/82	0.05	8/26/82	0.42	8/26/82	0.88
7/20/82	0.02	7/20/82	0.05	8/27/82	0.37	8/27/82	0.71
7/21/82	0.02	7/21/82	0.05	8/28/82	0.34	8/28/82	0.57
7/22/82	0.02	7/22/82	0.04	8/29/82	0.31	8/29/82	0.45
7/23/82	0.01	7/23/82	0.04	8/30/82	0.28	8/30/82	0.42
7/24/82	0.02	7/24/82	0.03	8/31/82	0.26	8/31/82	0.37
7/25/82	0.01	7/25/82	0.03	9/1/82	0.24	9/1/82	0.34
7/26/82	0.01	7/26/82	0.03	9/2/82	0.22	9/2/82	0.28
7/27/82	0.02	7/27/82	0.05	9/3/82	0.21	9/3/82	0.26
7/28/82	1.53	7/28/82	0.65	9/4/82	0.19	9/4/82	0.24
7/29/82	1.93	7/29/82	1.25	9/5/82	0.18	9/5/82	0.22
7/30/82	0.74	7/30/82	0.40	9/6/82	0.18	9/6/82	0.21
7/31/82	0.54	7/31/82	0.31	9/7/82	0.18	9/7/82	0.48
8/1/82	0.42	8/1/82	0.25	9/8/82	0.15	9/8/82	0.34
8/2/82	0.34	8/2/82	0.20	9/9/82	0.15	9/9/82	0.27
8/3/82	0.31	8/3/82	0.16	9/10/82	0.14	9/10/82	0.22
8/4/82	0.28	8/4/82	0.17	9/11/82	0.14	9/11/82	0.21
8/5/82	0.28	8/5/82	0.19	9/12/82	0.15	9/12/82	0.22
8/6/82	0.28	8/6/82	0.17	9/13/82	0.17	9/13/82	0.24
8/7/82	0.28	8/7/82	0.18	9/14/82	0.21	9/14/82	0.37
8/8/82	0.28	8/8/82	0.16	9/15/82	0.48	9/15/82	0.88
8/9/82	0.27	8/9/82	0.15	9/16/82	0.45	9/16/82	0.93
8/10/82	0.31	8/10/82	0.23	9/17/82	0.37	9/17/82	0.76
8/11/82	0.31	8/11/82	0.31	9/18/82	0.34	9/18/82	0.62
8/12/82	0.31	8/12/82	0.34	9/19/82	0.28	9/19/82	0.51
8/13/82	0.31	8/13/82	0.37	9/20/82	0.31	9/20/82	0.54
8/14/82	0.31	8/14/82	0.37	9/21/82	0.27	9/21/82	0.48
8/15/82	0.51	8/15/82	1.30	9/22/82	0.24	9/22/82	0.42

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
9/23/82	0.22	9/23/82	0.40	10/31/82	0.05	10/31/82	0.08
9/24/82	0.20	9/24/82	0.37	11/1/82	0.05	11/1/82	0.08
9/25/82	0.18	9/25/82	0.34	11/2/82	0.05	11/2/82	0.08
9/26/82	0.17	9/26/82	0.31	11/3/82	0.05	11/3/82	0.08
9/27/82	0.16	9/27/82	0.28	11/4/82	0.04	11/4/82	0.08
9/28/82	0.15	9/28/82	0.27	11/5/82	0.04	11/5/82	0.08
9/29/82	0.14	9/29/82	0.25	11/6/82	0.04	11/6/82	0.08
9/30/82	0.13	9/30/82	0.23	11/7/82	0.04	11/7/82	0.08
10/1/82	0.13	10/1/82	0.22	11/8/82	0.04	11/8/82	0.08
10/2/82	0.11	10/2/82	0.20	11/9/82	0.04	11/9/82	0.07
10/3/82	0.11	10/3/82	0.19	11/10/82	0.04	11/10/82	0.07
10/4/82	0.10	10/4/82	0.18	11/11/82	0.04	11/11/82	0.07
10/5/82	0.09	10/5/82	0.17	11/12/82	0.03	11/12/82	0.07
10/6/82	0.08	10/6/82	0.16	11/13/82	0.03	11/13/82	0.07
10/7/82	0.08	10/7/82	0.15	11/14/82	0.03	11/14/82	0.07
10/8/82	0.08	10/8/82	0.15	11/15/82	0.03	11/15/82	0.08
10/9/82	0.08	10/9/82	0.14	11/16/82	0.03	11/16/82	0.07
10/10/82	0.08	10/10/82	0.14	11/17/82	0.03	11/17/82	0.07
10/11/82	0.08	10/11/82	0.13	11/18/82	0.03	11/18/82	0.07
10/12/82	0.07	10/12/82	0.13	11/19/82	0.03	11/19/82	0.07
10/13/82	0.07	10/13/82	0.12	11/20/82	0.03	11/20/82	0.06
10/14/82	0.07	10/14/82	0.12	11/21/82	0.03	11/21/82	0.06
10/15/82	0.07	10/15/82	0.12	11/22/82	0.03	11/22/82	0.07
10/16/82	0.07	10/16/82	0.11	11/23/82	0.03	11/23/82	0.05
10/17/82	0.06	10/17/82	0.11	11/24/82	0.03	11/24/82	0.06
10/18/82	0.06	10/18/82	0.10	11/25/82	0.03	11/25/82	0.08
10/19/82	0.06	10/19/82	0.10	11/26/82	0.03	11/26/82	0.07
10/20/82	0.06	10/20/82	0.11	11/27/82	0.03	11/27/82	0.06
10/21/82	0.05	10/21/82	0.10	11/28/82	0.03	11/28/82	0.06
10/22/82	0.05	10/22/82	0.10	11/29/82	0.03	11/29/82	0.06
10/23/82	0.05	10/23/82	0.09	11/30/82	0.02	11/30/82	0.06
10/24/82	0.05	10/24/82	0.09	12/1/82	0.02	12/1/82	0.06
10/25/82	0.05	10/25/82	0.09	12/2/82	0.03	12/2/82	0.06
10/26/82	0.05	10/26/82	0.09	12/3/82	0.03	12/3/82	0.07
10/27/82	0.07	10/27/82	0.08	12/4/82	0.03	12/4/82	0.06
10/28/82	0.07	10/28/82	0.08	12/5/82	0.02	12/5/82	0.05
10/29/82	0.06	10/29/82	0.08	12/6/82	0.02	12/6/82	0.06
10/30/82	0.05	10/30/82	0.08	12/7/82	0.02	12/7/82	0.06

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
12/8/82	0.03	12/8/82	0.05	1/15/83	0.03	1/15/83	0.05
12/9/82	0.02	12/9/82	0.05	1/16/83	0.03	1/16/83	0.05
12/10/82	0.02	12/10/82	0.05	1/17/83	0.02	1/17/83	0.05
12/11/82	0.02	12/11/82	0.06	1/18/83	0.02	1/18/83	0.05
12/12/82	0.02	12/12/82	0.06	1/19/83	0.02	1/19/83	0.04
12/13/82	0.02	12/13/82	0.07	1/20/83	0.02	1/20/83	0.04
12/14/82	0.02	12/14/82	0.07	1/21/83	0.03	1/21/83	0.05
12/15/82	0.02	12/15/82	0.06	1/22/83	0.03	1/22/83	0.05
12/16/82	0.02	12/16/82	0.06	1/23/83	0.02	1/23/83	0.05
12/17/82	0.02	12/17/82	0.07	1/24/83	0.03	1/24/83	0.06
12/18/82	0.02	12/18/82	0.07	1/25/83	0.02	1/25/83	0.06
12/19/82	0.02	12/19/82	0.06	1/26/83	0.02	1/26/83	0.06
12/20/82	0.02	12/20/82	0.06	1/27/83	0.02	1/27/83	0.06
12/21/82	0.02	12/21/82	0.06	1/28/83	0.02	1/28/83	0.06
12/22/82	0.02	12/22/82	0.06	1/29/83	0.02	1/29/83	0.05
12/23/82	0.02	12/23/82	0.05	1/30/83	0.02	1/30/83	0.05
12/24/82	0.02	12/24/82	0.05	1/31/83	0.02	1/31/83	0.04
12/25/82	0.02	12/25/82	0.04	2/1/83	0.02	2/1/83	0.04
12/26/82	0.02	12/26/82	0.04	2/2/83	0.02	2/2/83	0.04
12/27/82	0.02	12/27/82	0.05	2/3/83	0.03	2/3/83	0.04
12/28/82	0.02	12/28/82	0.05	2/4/83	0.02	2/4/83	0.04
12/29/82	0.02	12/29/82	0.05	2/5/83	0.02	2/5/83	0.04
12/30/82	0.02	12/30/82	0.05	2/6/83	0.02	2/6/83	0.04
12/31/82	0.02	12/31/82	0.05	2/7/83	0.02	2/7/83	0.05
1/1/83	0.02	1/1/83	0.05	2/8/83	0.02	2/8/83	0.05
1/2/83	0.03	1/2/83	0.05	2/9/83	0.02	2/9/83	0.05
1/3/83	0.03	1/3/83	0.05	2/10/83	0.02	2/10/83	0.05
1/4/83	0.03	1/4/83	0.05	2/11/83	0.02	2/11/83	0.05
1/5/83	0.03	1/5/83	0.05	2/12/83	0.02	2/12/83	0.05
1/6/83	0.03	1/6/83	0.05	2/13/83	0.02	2/13/83	0.06
1/7/83	0.03	1/7/83	0.05	2/14/83	0.02	2/14/83	0.06
1/8/83	0.03	1/8/83	0.05	2/15/83	0.02	2/15/83	0.06
1/9/83	0.03	1/9/83	0.05	2/16/83	0.02	2/16/83	0.06
1/10/83	0.03	1/10/83	0.05	2/17/83	0.02	2/17/83	0.05
1/11/83	0.03	1/11/83	0.05	2/18/83	0.02	2/18/83	0.05
1/12/83	0.03	1/12/83	0.05	2/19/83	0.02	2/19/83	0.05
1/13/83	0.03	1/13/83	0.05	2/20/83	0.02	2/20/83	0.05
1/14/83	0.03	1/14/83	0.05	2/21/83	0.02	2/21/83	0.05

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
2/22/83	0.02	2/22/83	0.05	4/1/83	0.08	4/1/83	0.07
2/23/83	0.02	2/23/83	0.06	4/2/83	0.08	4/2/83	0.08
2/24/83	0.02	2/24/83	0.06	4/3/83	0.07	4/3/83	0.08
2/25/83	0.02	2/25/83	0.06	4/4/83	0.06	4/4/83	0.07
2/26/83	0.02	2/26/83	0.06	4/5/83	0.07	4/5/83	0.08
2/27/83	0.02	2/27/83	0.06	4/6/83	0.08	4/6/83	0.09
2/28/83	0.02	2/28/83	0.06	4/7/83	0.07	4/7/83	0.08
3/1/83	0.02	3/1/83	0.05	4/8/83	0.06	4/8/83	0.07
3/2/83	0.02	3/2/83	0.05	4/9/83	0.06	4/9/83	0.07
3/3/83	0.03	3/3/83	0.05	4/10/83	0.06	4/10/83	0.07
3/4/83	0.03	3/4/83	0.05	4/11/83	0.08	4/11/83	0.07
3/5/83	0.03	3/5/83	0.04	4/12/83	0.08	4/12/83	0.07
3/6/83	0.02	3/6/83	0.04	4/13/83	0.08	4/13/83	0.07
3/7/83	0.02	3/7/83	0.04	4/14/83	0.08	4/14/83	0.07
3/8/83	0.03	3/8/83	0.04	4/15/83	0.07	4/15/83	0.07
3/9/83	0.03	3/9/83	0.04	4/16/83	0.07	4/16/83	0.07
3/10/83	0.03	3/10/83	0.04	4/17/83	0.08	4/17/83	0.07
3/11/83	0.03	3/11/83	0.04	4/18/83	0.10	4/18/83	0.10
3/12/83	0.04	3/12/83	0.05	4/19/83	0.12	4/19/83	0.14
3/13/83	0.04	3/13/83	0.05	4/20/83	0.15	4/20/83	0.22
3/14/83	0.04	3/14/83	0.06	4/21/83	0.23	4/21/83	0.28
3/15/83	0.03	3/15/83	0.05	4/22/83	0.34	4/22/83	0.37
3/16/83	0.03	3/16/83	0.04	4/23/83	0.31	4/23/83	0.40
3/17/83	0.03	3/17/83	0.04	4/24/83	0.31	4/24/83	0.42
3/18/83	0.03	3/18/83	0.04	4/25/83	0.42	4/25/83	0.48
3/19/83	0.03	3/19/83	0.03	4/26/83	0.45	4/26/83	0.51
3/20/83	0.03	3/20/83	0.03	4/27/83	0.42	4/27/83	0.48
3/21/83	0.03	3/21/83	0.03	4/28/83	0.37	4/28/83	0.45
3/22/83	0.03	3/22/83	0.04	4/29/83	0.40	4/29/83	0.48
3/23/83	0.03	3/23/83	0.04	4/30/83	0.40	4/30/83	0.45
3/24/83	0.03	3/24/83	0.04	5/1/83	0.37	5/1/83	0.45
3/25/83	0.04	3/25/83	0.05	5/2/83	0.37	5/2/83	0.45
3/26/83	0.04	3/26/83	0.05	5/3/83	0.34	5/3/83	0.42
3/27/83	0.03	3/27/83	0.05	5/4/83	0.34	5/4/83	0.42
3/28/83	0.04	3/28/83	0.06	5/5/83	0.37	5/5/83	0.48
3/29/83	0.04	3/29/83	0.07	5/6/83	0.40	5/6/83	0.54
3/30/83	0.05	3/30/83	0.07	5/7/83	0.37	5/7/83	0.54
3/31/83	0.07	3/31/83	0.08	5/8/83	0.34	5/8/83	0.54

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
5/9/83	0.34	5/9/83	0.54	6/16/83	0.22	6/16/83	0.57
5/10/83	0.37	5/10/83	0.59	6/17/83	0.20	6/17/83	0.48
5/11/83	0.37	5/11/83	0.62	6/18/83	0.19	6/18/83	0.42
5/12/83	0.34	5/12/83	0.59	6/19/83	0.17	6/19/83	0.37
5/13/83	0.34	5/13/83	0.57	6/20/83	0.16	6/20/83	0.34
5/14/83	0.28	5/14/83	0.51	6/21/83	0.16	6/21/83	0.31
5/15/83	0.25	5/15/83	0.45	6/22/83	0.16	6/22/83	0.28
5/16/83	0.23	5/16/83	0.42	6/23/83	0.15	6/23/83	0.26
5/17/83	0.21	5/17/83	0.37	6/24/83	0.14	6/24/83	0.25
5/18/83	0.19	5/18/83	0.34	6/25/83	0.13	6/25/83	0.23
5/19/83	0.18	5/19/83	0.31	6/26/83	0.19	6/26/83	0.28
5/20/83	0.22	5/20/83	0.34	6/27/83	0.19	6/27/83	0.31
5/21/83	0.23	5/21/83	0.34	6/28/83	0.19	6/28/83	0.31
5/22/83	0.28	5/22/83	0.37	6/29/83	0.20	6/29/83	0.34
5/23/83	0.37	5/23/83	0.45	6/30/83	0.17	6/30/83	0.31
5/24/83	0.45	5/24/83	0.51	7/1/83	0.16	7/1/83	0.31
5/25/83	0.48	5/25/83	0.59	7/2/83	0.15	7/2/83	0.31
5/26/83	0.51	5/26/83	0.65	7/3/83	0.14	7/3/83	0.28
5/27/83	0.48	5/27/83	0.68	7/4/83	0.12	7/4/83	0.27
5/28/83	0.42	5/28/83	0.65	7/5/83	0.12	7/5/83	0.25
5/29/83	0.42	5/29/83	0.68	7/6/83	0.10	7/6/83	0.24
5/30/83	0.40	5/30/83	0.71	7/7/83	0.08	7/7/83	0.22
5/31/83	0.40	5/31/83	0.74	7/8/83	0.08	7/8/83	0.21
6/1/83	0.37	6/1/83	0.74	7/9/83	0.07	7/9/83	0.20
6/2/83	0.34	6/2/83	0.76	7/10/83	0.07	7/10/83	0.18
6/3/83	0.31	6/3/83	0.71	7/11/83	0.08	7/11/83	0.18
6/4/83	0.28	6/4/83	0.68	7/12/83	0.07	7/12/83	0.18
6/5/83	0.34	6/5/83	0.62	7/13/83	0.06	7/13/83	0.17
6/6/83	0.40	6/6/83	0.65	7/14/83	0.06	7/14/83	0.16
6/7/83	0.37	6/7/83	0.68	7/15/83	0.06	7/15/83	0.15
6/8/83	0.37	6/8/83	0.71	7/16/83	0.05	7/16/83	0.14
6/9/83	0.34	6/9/83	0.74	7/17/83	0.05	7/17/83	0.13
6/10/83	0.34	6/10/83	0.79	7/18/83	0.04	7/18/83	0.13
6/11/83	0.31	6/11/83	0.85	7/19/83	0.04	7/19/83	0.12
6/12/83	0.28	6/12/83	0.85	7/20/83	0.04	7/20/83	0.10
6/13/83	0.28	6/13/83	0.79	7/21/83	0.12	7/21/83	0.12
6/14/83	0.25	6/14/83	0.74	7/22/83	0.31	7/22/83	0.28
6/15/83	0.23	6/15/83	0.65	7/23/83	0.20	7/23/83	0.20

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
7/24/83	0.18	7/24/83	0.20	8/31/83	0.06	8/31/83	0.22
7/25/83	0.18	7/25/83	0.25	9/1/83	0.06	9/1/83	0.20
7/26/83	0.16	7/26/83	0.22	9/2/83	0.05	9/2/83	0.18
7/27/83	0.16	7/27/83	0.22	9/3/83	0.05	9/3/83	0.17
7/28/83	0.15	7/28/83	0.21	9/4/83	0.05	9/4/83	0.15
7/29/83	0.13	7/29/83	0.19	9/5/83	0.04	9/5/83	0.14
7/30/83	0.12	7/30/83	0.18	9/6/83	0.04	9/6/83	0.13
7/31/83	0.12	7/31/83	0.17	9/7/83	0.04	9/7/83	0.12
8/1/83	0.12	8/1/83	0.31	9/8/83	0.03	9/8/83	0.11
8/2/83	0.12	8/2/83	0.34	9/9/83	0.03	9/9/83	0.10
8/3/83	0.12	8/3/83	0.34	9/10/83	0.03	9/10/83	0.09
8/4/83	0.13	8/4/83	0.31	9/11/83	0.03	9/11/83	0.09
8/5/83	0.12	8/5/83	0.31	9/12/83	0.03	9/12/83	0.08
8/6/83	0.12	8/6/83	0.28	9/13/83	0.03	9/13/83	0.08
8/7/83	0.12	8/7/83	0.25	9/14/83	0.03	9/14/83	0.08
8/8/83	0.11	8/8/83	0.23	9/15/83	0.02	9/15/83	0.07
8/9/83	0.10	8/9/83	0.21	9/16/83	0.02	9/16/83	0.07
8/10/83	0.10	8/10/83	0.19	9/17/83	0.02	9/17/83	0.07
8/11/83	0.10	8/11/83	0.17	9/18/83	0.02	9/18/83	0.06
8/12/83	0.09	8/12/83	0.16	9/19/83	0.02	9/19/83	0.06
8/13/83	0.09	8/13/83	0.15	9/20/83	0.02	9/20/83	0.06
8/14/83	0.10	8/14/83	0.15	9/21/83	0.02	9/21/83	0.06
8/15/83	0.09	8/15/83	0.14	9/22/83	0.02	9/22/83	0.06
8/16/83	0.08	8/16/83	0.13	9/23/83	0.02	9/23/83	0.06
8/17/83	0.08	8/17/83	0.12	9/24/83	0.02	9/24/83	0.05
8/18/83	0.08	8/18/83	0.11	9/25/83	0.02	9/25/83	0.07
8/19/83	0.08	8/19/83	0.11	9/26/83	0.02	9/26/83	0.06
8/20/83	0.10	8/20/83	0.18	9/27/83	0.01	9/27/83	0.05
8/21/83	0.08	8/21/83	0.14	9/28/83	0.01	9/28/83	0.05
8/22/83	0.07	8/22/83	0.13	9/29/83	0.01	9/29/83	0.05
8/23/83	0.07	8/23/83	0.14	9/30/83	0.01	9/30/83	0.05
8/24/83	0.07	8/24/83	0.15	10/1/83	0.01	10/1/83	0.05
8/25/83	0.07	8/25/83	0.14	10/2/83	0.01	10/2/83	0.05
8/26/83	0.08	8/26/83	0.16	10/3/83	0.01	10/3/83	0.04
8/27/83	0.10	8/27/83	0.25	10/4/83	0.01	10/4/83	0.05
8/28/83	0.07	8/28/83	0.24	10/5/83	0.01	10/5/83	0.05
8/29/83	0.07	8/29/83	0.23	10/6/83	0.01	10/6/83	0.04
8/30/83	0.07	8/30/83	0.23	10/7/83	0.01	10/7/83	0.04

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
10/8/83	0.01	10/8/83	0.04	11/15/83	0.02	11/15/83	0.03
10/9/83	0.01	10/9/83	0.04	11/16/83	0.02	11/16/83	0.03
10/10/83	0.01	10/10/83	0.03	11/17/83	0.02	11/17/83	0.03
10/11/83	0.01	10/11/83	0.03	11/18/83	0.02	11/18/83	0.05
10/12/83	0.01	10/12/83	0.04	11/19/83	0.02	11/19/83	0.03
10/13/83	0.01	10/13/83	0.04	11/20/83	0.02	11/20/83	0.03
10/14/83	0.01	10/14/83	0.04	11/21/83	0.02	11/21/83	0.02
10/15/83	0.01	10/15/83	0.04	11/22/83	0.02	11/22/83	0.02
10/16/83	0.01	10/16/83	0.04	11/23/83	0.02	11/23/83	0.02
10/17/83	0.01	10/17/83	0.04	11/24/83	0.01	11/24/83	0.03
10/18/83	0.01	10/18/83	0.04	11/25/83	0.02	11/25/83	0.03
10/19/83	0.01	10/19/83	0.03	11/26/83	0.02	11/26/83	0.02
10/20/83	0.01	10/20/83	0.03	11/27/83	0.02	11/27/83	0.02
10/21/83	0.01	10/21/83	0.03	11/28/83	0.02	11/28/83	0.02
10/22/83	0.01	10/22/83	0.03	11/29/83	0.01	11/29/83	0.03
10/23/83	0.01	10/23/83	0.03	11/30/83	0.01	11/30/83	0.03
10/24/83	0.01	10/24/83	0.03	12/1/83	0.01	12/1/83	0.03
10/25/83	0.01	10/25/83	0.03	12/2/83	0.01	12/2/83	0.03
10/26/83	0.01	10/26/83	0.03	12/3/83	0.01	12/3/83	0.03
10/27/83	0.01	10/27/83	0.03	12/4/83	0.02	12/4/83	0.03
10/28/83	0.01	10/28/83	0.03	12/5/83	0.02	12/5/83	0.03
10/29/83	0.01	10/29/83	0.03	12/6/83	0.02	12/6/83	0.03
10/30/83	0.01	10/30/83	0.03	12/7/83	0.01	12/7/83	0.03
10/31/83	0.01	10/31/83	0.03	12/8/83	0.01	12/8/83	0.03
11/1/83	0.02	11/1/83	0.03	12/9/83	0.01	12/9/83	0.03
11/2/83	0.02	11/2/83	0.03	12/10/83	0.01	12/10/83	0.03
11/3/83	0.01	11/3/83	0.03	12/11/83	0.01	12/11/83	0.03
11/4/83	0.02	11/4/83	0.03	12/12/83	0.01	12/12/83	0.03
11/5/83	0.02	11/5/83	0.04	12/13/83	0.01	12/13/83	0.03
11/6/83	0.02	11/6/83	0.04	12/14/83	0.01	12/14/83	0.03
11/7/83	0.01	11/7/83	0.04	12/15/83	0.01	12/15/83	0.03
11/8/83	0.01	11/8/83	0.05	12/16/83	0.01	12/16/83	0.03
11/9/83	0.02	11/9/83	0.03	12/17/83	0.01	12/17/83	0.03
11/10/83	0.02	11/10/83	0.03	12/18/83	0.01	12/18/83	0.03
11/11/83	0.02	11/11/83	0.03	12/19/83	0.01	12/19/83	0.03
11/12/83	0.02	11/12/83	0.03	12/20/83	0.01	12/20/83	0.02
11/13/83	0.02	11/13/83	0.03	12/21/83	0.01	12/21/83	0.02
11/14/83	0.02	11/14/83	0.03	12/22/83	0.01	12/22/83	0.02

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
12/23/83	0.01	12/23/83	0.02	1/30/84	0.01	1/30/84	0.02
12/24/83	0.01	12/24/83	0.02	1/31/84	0.02	1/31/84	0.03
12/25/83	0.01	12/25/83	0.02	2/1/84	0.02	2/1/84	0.03
12/26/83	0.01	12/26/83	0.02	2/2/84	0.02	2/2/84	0.03
12/27/83	0.01	12/27/83	0.03	2/3/84	0.02	2/3/84	0.02
12/28/83	0.01	12/28/83	0.03	2/4/84	0.02	2/4/84	0.02
12/29/83	0.01	12/29/83	0.03	2/5/84	0.02	2/5/84	0.02
12/30/83	0.01	12/30/83	0.03	2/6/84	0.02	2/6/84	0.02
12/31/83	0.01	12/31/83	0.03	2/7/84	0.01	2/7/84	0.02
1/1/84	0.01	1/1/84	0.03	2/8/84	0.01	2/8/84	0.02
1/2/84	0.01	1/2/84	0.03	2/9/84	0.02	2/9/84	0.02
1/3/84	0.01	1/3/84	0.03	2/10/84	0.02	2/10/84	0.03
1/4/84	0.01	1/4/84	0.03	2/11/84	0.02	2/11/84	0.02
1/5/84	0.02	1/5/84	0.03	2/12/84	0.02	2/12/84	0.03
1/6/84	0.02	1/6/84	0.03	2/13/84	0.02	2/13/84	0.03
1/7/84	0.02	1/7/84	0.03	2/14/84	0.02	2/14/84	0.03
1/8/84	0.02	1/8/84	0.03	2/15/84	0.02	2/15/84	0.03
1/9/84	0.02	1/9/84	0.03	2/16/84	0.02	2/16/84	0.03
1/10/84	0.02	1/10/84	0.02	2/17/84	0.02	2/17/84	0.02
1/11/84	0.02	1/11/84	0.02	2/18/84	0.02	2/18/84	0.02
1/12/84	0.01	1/12/84	0.02	2/19/84	0.02	2/19/84	0.03
1/13/84	0.01	1/13/84	0.02	2/20/84	0.02	2/20/84	0.02
1/14/84	0.01	1/14/84	0.02	2/21/84	0.02	2/21/84	0.02
1/15/84	0.01	1/15/84	0.02	2/22/84	0.02	2/22/84	0.02
1/16/84	0.01	1/16/84	0.02	2/23/84	0.02	2/23/84	0.02
1/17/84	0.01	1/17/84	0.02	2/24/84	0.02	2/24/84	0.02
1/18/84	0.01	1/18/84	0.02	2/25/84	0.02	2/25/84	0.02
1/19/84	0.01	1/19/84	0.02	2/26/84	0.02	2/26/84	0.02
1/20/84	0.01	1/20/84	0.02	2/27/84	0.02	2/27/84	0.02
1/21/84	0.01	1/21/84	0.02	2/28/84	0.02	2/28/84	0.02
1/22/84	0.02	1/22/84	0.02	2/29/84	0.02	2/29/84	0.02
1/23/84	0.01	1/23/84	0.02	3/1/84	0.02	3/1/84	0.02
1/24/84	0.01	1/24/84	0.02	3/2/84	0.01	3/2/84	0.02
1/25/84	0.01	1/25/84	0.02	3/3/84	0.01	3/3/84	0.02
1/26/84	0.01	1/26/84	0.02	3/4/84	0.01	3/4/84	0.02
1/27/84	0.01	1/27/84	0.02	3/5/84	0.02	3/5/84	0.02
1/28/84	0.01	1/28/84	0.02	3/6/84	0.01	3/6/84	0.02
1/29/84	0.01	1/29/84	0.02	3/7/84	0.02	3/7/84	0.02

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
3/8/84	0.02	3/8/84	0.02	4/15/84	0.09	4/15/84	0.12
3/9/84	0.02	3/9/84	0.02	4/16/84	0.09	4/16/84	0.12
3/10/84	0.02	3/10/84	0.03	4/17/84	0.09	4/17/84	0.13
3/11/84	0.02	3/11/84	0.03	4/18/84	0.09	4/18/84	0.14
3/12/84	0.02	3/12/84	0.04	4/19/84	0.09	4/19/84	0.13
3/13/84	0.02	3/13/84	0.04	4/20/84	0.10	4/20/84	0.14
3/14/84	0.02	3/14/84	0.03	4/21/84	0.10	4/21/84	0.13
3/15/84	0.02	3/15/84	0.03	4/22/84	0.10	4/22/84	0.14
3/16/84	0.02	3/16/84	0.03	4/23/84	0.12	4/23/84	0.15
3/17/84	0.02	3/17/84	0.03	4/24/84	0.17	4/24/84	0.20
3/18/84	0.02	3/18/84	0.03	4/25/84	0.21	4/25/84	0.28
3/19/84	0.02	3/19/84	0.03	4/26/84	0.20	4/26/84	0.31
3/20/84	0.02	3/20/84	0.03	4/27/84	0.18	4/27/84	0.27
3/21/84	0.02	3/21/84	0.03	4/28/84	0.16	4/28/84	0.25
3/22/84	0.02	3/22/84	0.03	4/29/84	0.14	4/29/84	0.23
3/23/84	0.02	3/23/84	0.02	4/30/84	0.13	4/30/84	0.21
3/24/84	0.02	3/24/84	0.03	5/1/84	0.13	5/1/84	0.21
3/25/84	0.02	3/25/84	0.03	5/2/84	0.14	5/2/84	0.22
3/26/84	0.02	3/26/84	0.04	5/3/84	0.14	5/3/84	0.23
3/27/84	0.02	3/27/84	0.03	5/4/84	0.15	5/4/84	0.24
3/28/84	0.02	3/28/84	0.04	5/5/84	0.16	5/5/84	0.25
3/29/84	0.02	3/29/84	0.03	5/6/84	0.16	5/6/84	0.26
3/30/84	0.02	3/30/84	0.03	5/7/84	0.17	5/7/84	0.27
3/31/84	0.03	3/31/84	0.03	5/8/84	0.16	5/8/84	0.26
4/1/84	0.03	4/1/84	0.04	5/9/84	0.16	5/9/84	0.27
4/2/84	0.02	4/2/84	0.05	5/10/84	0.19	5/10/84	0.31
4/3/84	0.02	4/3/84	0.05	5/11/84	0.24	5/11/84	0.37
4/4/84	0.02	4/4/84	0.05	5/12/84	0.28	5/12/84	0.45
4/5/84	0.03	4/5/84	0.05	5/13/84	0.37	5/13/84	0.51
4/6/84	0.04	4/6/84	0.07	5/14/84	0.40	5/14/84	0.45
4/7/84	0.06	4/7/84	0.08	5/15/84	0.34	5/15/84	0.42
4/8/84	0.07	4/8/84	0.10	5/16/84	0.27	5/16/84	0.40
4/9/84	0.10	4/9/84	0.11	5/17/84	0.22	5/17/84	0.37
4/10/84	0.12	4/10/84	0.15	5/18/84	0.18	5/18/84	0.31
4/11/84	0.12	4/11/84	0.16	5/19/84	0.15	5/19/84	0.27
4/12/84	0.11	4/12/84	0.14	5/20/84	0.12	5/20/84	0.23
4/13/84	0.10	4/13/84	0.14	5/21/84	0.11	5/21/84	0.20
4/14/84	0.09	4/14/84	0.13	5/22/84	0.10	5/22/84	0.18

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
5/23/84	0.10	5/23/84	0.17	6/30/84	0.04	6/30/84	0.03
5/24/84	0.09	5/24/84	0.16	7/1/84	0.04	7/1/84	0.03
5/25/84	0.08	5/25/84	0.14	7/2/84	0.04	7/2/84	0.03
5/26/84	0.08	5/26/84	0.14	7/3/84	0.03	7/3/84	0.03
5/27/84	0.08	5/27/84	0.13	7/4/84	0.03	7/4/84	0.04
5/28/84	0.08	5/28/84	0.13	7/5/84	0.02	7/5/84	0.04
5/29/84	0.07	5/29/84	0.12	7/6/84	0.02	7/6/84	0.03
5/30/84	0.07	5/30/84	0.12	7/7/84	0.02	7/7/84	0.03
5/31/84	0.07	5/31/84	0.11	7/8/84	0.02	7/8/84	0.03
6/1/84	0.07	6/1/84	0.11	7/9/84	0.02	7/9/84	0.03
6/2/84	0.08	6/2/84	0.17	7/10/84	0.03	7/10/84	0.03
6/3/84	0.07	6/3/84	0.15	7/11/84	0.08	7/11/84	0.06
6/4/84	0.07	6/4/84	0.13	7/12/84	0.08	7/12/84	0.05
6/5/84	0.06	6/5/84	0.12	7/13/84	0.07	7/13/84	0.04
6/6/84	0.06	6/6/84	0.11	7/14/84	0.06	7/14/84	0.04
6/7/84	0.06	6/7/84	0.10	7/15/84	0.06	7/15/84	0.04
6/8/84	0.05	6/8/84	0.08	7/16/84	0.06	7/16/84	0.04
6/9/84	0.05	6/9/84	0.10	7/17/84	0.05	7/17/84	0.04
6/10/84	0.05	6/10/84	0.10	7/18/84	0.05	7/18/84	0.03
6/11/84	0.05	6/11/84	0.09	7/19/84	0.05	7/19/84	0.03
6/12/84	0.04	6/12/84	0.08	7/20/84	0.05	7/20/84	0.03
6/13/84	0.07	6/13/84	0.07	7/21/84	0.05	7/21/84	0.03
6/14/84	0.08	6/14/84	0.11	7/22/84	0.04	7/22/84	0.01
6/15/84	0.07	6/15/84	0.08	7/23/84	0.04	7/23/84	0.02
6/16/84	0.07	6/16/84	0.09	7/24/84	0.04	7/24/84	0.02
6/17/84	0.07	6/17/84	0.11	7/25/84	0.03	7/25/84	0.02
6/18/84	0.07	6/18/84	0.10	7/26/84	0.04	7/26/84	0.02
6/19/84	0.07	6/19/84	0.08	7/27/84	0.06	7/27/84	0.03
6/20/84	0.06	6/20/84	0.10	7/28/84	0.05	7/28/84	0.02
6/21/84	0.06	6/21/84	0.08	7/29/84	0.10	7/29/84	0.05
6/22/84	0.06	6/22/84	0.07	7/30/84	0.07	7/30/84	0.03
6/23/84	0.06	6/23/84	0.06	7/31/84	0.07	7/31/84	0.05
6/24/84	0.06	6/24/84	0.05	8/1/84	0.07	8/1/84	0.06
6/25/84	0.05	6/25/84	0.04	8/2/84	0.07	8/2/84	0.08
6/26/84	0.05	6/26/84	0.03	8/3/84	0.05	8/3/84	0.07
6/27/84	0.05	6/27/84	0.03	8/4/84	0.03	8/4/84	0.08
6/28/84	0.05	6/28/84	0.03	8/5/84	0.02	8/5/84	0.07
6/29/84	0.04	6/29/84	0.03	8/6/84	0.02	8/6/84	0.06

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
8/7/84	0.02	8/7/84	0.06	9/14/84	0.03	9/14/84	0.16
8/8/84	0.01	8/8/84	0.05	9/15/84	0.03	9/15/84	0.12
8/9/84	0.02	8/9/84	0.06	9/16/84	0.04	9/16/84	0.15
8/10/84	0.02	8/10/84	0.08	9/17/84	0.04	9/17/84	0.15
8/11/84	0.01	8/11/84	0.06	9/18/84	0.03	9/18/84	0.12
8/12/84	0.01	8/12/84	0.06	9/19/84	0.02	9/19/84	0.11
8/13/84	0.01	8/13/84	0.06	9/20/84	0.02	9/20/84	0.10
8/14/84	0.01	8/14/84	0.07	9/21/84	0.02	9/21/84	0.10
8/15/84	0.02	8/15/84	0.10	9/22/84	0.02	9/22/84	0.09
8/16/84	0.01	8/16/84	0.09	9/23/84	0.02	9/23/84	0.08
8/17/84	0.01	8/17/84	0.09	9/24/84	0.02	9/24/84	0.07
8/18/84	0.06	8/18/84	0.12	9/25/84	0.01	9/25/84	0.07
8/19/84	0.25	8/19/84	0.31	9/26/84	0.02	9/26/84	0.08
8/20/84	0.31	8/20/84	0.48	9/27/84	0.01	9/27/84	0.08
8/21/84	0.42	8/21/84	0.45	9/28/84	0.01	9/28/84	0.08
8/22/84	0.54	8/22/84	0.65	9/29/84	0.01	9/29/84	0.07
8/23/84	0.45	8/23/84	0.71	9/30/84	0.02	9/30/84	0.07
8/24/84	0.54	8/24/84	0.51	10/1/84	0.01	10/1/84	0.07
8/25/84	0.62	8/25/84	1.25	10/2/84	0.01	10/2/84	0.16
8/26/84	0.48	8/26/84	1.10	10/3/84	0.03	10/3/84	0.13
8/27/84	0.34	8/27/84	0.93	10/4/84	3.20	10/4/84	3.71
8/28/84	0.27	8/28/84	0.85	10/5/84	2.89	10/5/84	2.97
8/29/84	0.21	8/29/84	0.57	10/6/84	1.87	10/6/84	2.41
8/30/84	0.15	8/30/84	0.51	10/7/84	1.25	10/7/84	1.84
8/31/84	0.12	8/31/84	0.45	10/8/84	0.79	10/8/84	1.42
9/1/84	0.10	9/1/84	0.42	10/9/84	0.51	10/9/84	0.99
9/2/84	0.08	9/2/84	0.37	10/10/84	0.40	10/10/84	0.91
9/3/84	0.08	9/3/84	0.34	10/11/84	0.34	10/11/84	0.74
9/4/84	0.07	9/4/84	0.31	10/12/84	0.26	10/12/84	0.57
9/5/84	0.05	9/5/84	0.25	10/13/84	0.23	10/13/84	0.48
9/6/84	0.04	9/6/84	0.23	10/14/84	0.22	10/14/84	0.45
9/7/84	0.04	9/7/84	0.20	10/15/84	0.21	10/15/84	0.42
9/8/84	0.03	9/8/84	0.18	10/16/84	0.20	10/16/84	0.48
9/9/84	0.03	9/9/84	0.16	10/17/84	0.24	10/17/84	0.40
9/10/84	0.03	9/10/84	0.15	10/18/84	0.28	10/18/84	0.40
9/11/84	0.03	9/11/84	0.14	10/19/84	0.28	10/19/84	0.40
9/12/84	0.04	9/12/84	0.12	10/20/84	0.31	10/20/84	0.42
9/13/84	0.03	9/13/84	0.12	10/21/84	0.28	10/21/84	0.42

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
10/22/84	0.28	10/22/84	0.40	11/29/84	0.11	11/29/84	0.14
10/23/84	0.28	10/23/84	0.40	11/30/84	0.10	11/30/84	0.16
10/24/84	0.27	10/24/84	0.37	12/1/84	0.10	12/1/84	0.15
10/25/84	0.28	10/25/84	0.37	12/2/84	0.09	12/2/84	0.14
10/26/84	0.40	10/26/84	0.45	12/3/84	0.09	12/3/84	0.14
10/27/84	0.57	10/27/84	0.71	12/4/84	0.08	12/4/84	0.14
10/28/84	0.57	10/28/84	0.74	12/5/84	0.08	12/5/84	0.13
10/29/84	0.51	10/29/84	0.71	12/6/84	0.08	12/6/84	0.13
10/30/84	0.57	10/30/84	0.74	12/7/84	0.08	12/7/84	0.14
10/31/84	0.68	10/31/84	0.79	12/8/84	0.08	12/8/84	0.13
11/1/84	0.76	11/1/84	0.85	12/9/84	0.08	12/9/84	0.12
11/2/84	0.68	11/2/84	0.91	12/10/84	0.08	12/10/84	0.11
11/3/84	0.79	11/3/84	1.02	12/11/84	0.08	12/11/84	0.11
11/4/84	0.68	11/4/84	0.93	12/12/84	0.07	12/12/84	0.11
11/5/84	0.57	11/5/84	0.74	12/13/84	0.07	12/13/84	0.10
11/6/84	0.48	11/6/84	0.61	12/14/84	0.06	12/14/84	0.10
11/7/84	0.45	11/7/84	0.54	12/15/84	0.05	12/15/84	0.12
11/8/84	0.42	11/8/84	0.48	12/16/84	0.05	12/16/84	0.11
11/9/84	0.40	11/9/84	0.44	12/17/84	0.06	12/17/84	0.11
11/10/84	0.34	11/10/84	0.39	12/18/84	0.05	12/18/84	0.10
11/11/84	0.31	11/11/84	0.36	12/19/84	0.05	12/19/84	0.11
11/12/84	0.28	11/12/84	0.33	12/20/84	0.05	12/20/84	0.10
11/13/84	0.26	11/13/84	0.31	12/21/84	0.05	12/21/84	0.10
11/14/84	0.25	11/14/84	0.29	12/22/84	0.05	12/22/84	0.09
11/15/84	0.23	11/15/84	0.26	12/23/84	0.05	12/23/84	0.10
11/16/84	0.21	11/16/84	0.23	12/24/84	0.05	12/24/84	0.09
11/17/84	0.20	11/17/84	0.22	12/25/84	0.05	12/25/84	0.09
11/18/84	0.18	11/18/84	0.21	12/26/84	0.05	12/26/84	0.09
11/19/84	0.18	11/19/84	0.20	12/27/84	0.05	12/27/84	0.09
11/20/84	0.16	11/20/84	0.18	12/28/84	0.05	12/28/84	0.09
11/21/84	0.15	11/21/84	0.16	12/29/84	0.05	12/29/84	0.09
11/22/84	0.15	11/22/84	0.16	12/30/84	0.05	12/30/84	0.08
11/23/84	0.14	11/23/84	0.15	12/31/84	0.05	12/31/84	0.08
11/24/84	0.14	11/24/84	0.15	1/1/85	0.04	1/1/85	0.07
11/25/84	0.13	11/25/84	0.15	1/2/85	0.03	1/2/85	0.08
11/26/84	0.12	11/26/84	0.15	1/3/85	0.04	1/3/85	0.08
11/27/84	0.11	11/27/84	0.15	1/4/85	0.04	1/4/85	0.08
11/28/84	0.12	11/28/84	0.16	1/5/85	0.04	1/5/85	0.08

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
1/6/85	0.05	1/6/85	0.08	2/13/85	0.03	2/13/85	0.05
1/7/85	0.05	1/7/85	0.07	2/14/85	0.03	2/14/85	0.05
1/8/85	0.05	1/8/85	0.07	2/15/85	0.03	2/15/85	0.05
1/9/85	0.04	1/9/85	0.07	2/16/85	0.04	2/16/85	0.05
1/10/85	0.04	1/10/85	0.07	2/17/85	0.04	2/17/85	0.05
1/11/85	0.04	1/11/85	0.07	2/18/85	0.05	2/18/85	0.05
1/12/85	0.04	1/12/85	0.07	2/19/85	0.05	2/19/85	0.05
1/13/85	0.04	1/13/85	0.07	2/20/85	0.05	2/20/85	0.05
1/14/85	0.04	1/14/85	0.06	2/21/85	0.05	2/21/85	0.05
1/15/85	0.04	1/15/85	0.06	2/22/85	0.05	2/22/85	0.05
1/16/85	0.04	1/16/85	0.06	2/23/85	0.05	2/23/85	0.05
1/17/85	0.04	1/17/85	0.06	2/24/85	0.06	2/24/85	0.05
1/18/85	0.04	1/18/85	0.06	2/25/85	0.05	2/25/85	0.05
1/19/85	0.04	1/19/85	0.06	2/26/85	0.05	2/26/85	0.05
1/20/85	0.04	1/20/85	0.06	2/27/85	0.06	2/27/85	0.05
1/21/85	0.04	1/21/85	0.06	2/28/85	0.05	2/28/85	0.05
1/22/85	0.04	1/22/85	0.06	3/1/85	0.05	3/1/85	0.05
1/23/85	0.04	1/23/85	0.06	3/2/85	0.05	3/2/85	0.05
1/24/85	0.04	1/24/85	0.06	3/3/85	0.05	3/3/85	0.06
1/25/85	0.04	1/25/85	0.05	3/4/85	0.05	3/4/85	0.06
1/26/85	0.04	1/26/85	0.05	3/5/85	0.04	3/5/85	0.06
1/27/85	0.04	1/27/85	0.05	3/6/85	0.05	3/6/85	0.06
1/28/85	0.04	1/28/85	0.05	3/7/85	0.05	3/7/85	0.06
1/29/85	0.04	1/29/85	0.05	3/8/85	0.05	3/8/85	0.06
1/30/85	0.04	1/30/85	0.05	3/9/85	0.05	3/9/85	0.06
1/31/85	0.03	1/31/85	0.05	3/10/85	0.05	3/10/85	0.06
2/1/85	0.03	2/1/85	0.04	3/11/85	0.06	3/11/85	0.08
2/2/85	0.03	2/2/85	0.04	3/12/85	0.06	3/12/85	0.07
2/3/85	0.03	2/3/85	0.04	3/13/85	0.06	3/13/85	0.07
2/4/85	0.03	2/4/85	0.04	3/14/85	0.06	3/14/85	0.07
2/5/85	0.03	2/5/85	0.04	3/15/85	0.06	3/15/85	0.08
2/6/85	0.03	2/6/85	0.04	3/16/85	0.06	3/16/85	0.08
2/7/85	0.03	2/7/85	0.04	3/17/85	0.06	3/17/85	0.08
2/8/85	0.03	2/8/85	0.04	3/18/85	0.06	3/18/85	0.08
2/9/85	0.03	2/9/85	0.04	3/19/85	0.06	3/19/85	0.07
2/10/85	0.03	2/10/85	0.04	3/20/85	0.06	3/20/85	0.07
2/11/85	0.03	2/11/85	0.04	3/21/85	0.06	3/21/85	0.07
2/12/85	0.03	2/12/85	0.04	3/22/85	0.06	3/22/85	0.08

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
3/23/85	0.06	3/23/85	0.07	4/30/85	1.87	4/30/85	2.35
3/24/85	0.06	3/24/85	0.08	5/1/85	1.50	5/1/85	2.33
3/25/85	0.06	3/25/85	0.08	5/2/85	1.16	5/2/85	2.03
3/26/85	0.07	3/26/85	0.09	5/3/85	0.93	5/3/85	1.80
3/27/85	0.07	3/27/85	0.09	5/4/85	0.79	5/4/85	1.66
3/28/85	0.08	3/28/85	0.09	5/5/85	0.68	5/5/85	1.55
3/29/85	0.07	3/29/85	0.06	5/6/85	0.65	5/6/85	1.56
3/30/85	0.07	3/30/85	0.08	5/7/85	0.54	5/7/85	1.51
3/31/85	0.08	3/31/85	0.09	5/8/85	0.48	5/8/85	1.41
4/1/85	0.08	4/1/85	0.09	5/9/85	0.42	5/9/85	1.30
4/2/85	0.10	4/2/85	0.10	5/10/85	0.34	5/10/85	1.15
4/3/85	0.16	4/3/85	0.16	5/11/85	0.28	5/11/85	0.99
4/4/85	0.24	4/4/85	0.25	5/12/85	0.34	5/12/85	0.95
4/5/85	0.24	4/5/85	0.28	5/13/85	0.42	5/13/85	0.88
4/6/85	0.24	4/6/85	0.27	5/14/85	0.37	5/14/85	0.79
4/7/85	0.23	4/7/85	0.27	5/15/85	0.37	5/15/85	0.74
4/8/85	0.22	4/8/85	0.26	5/16/85	0.31	5/16/85	0.69
4/9/85	0.21	4/9/85	0.26	5/17/85	0.31	5/17/85	0.70
4/10/85	0.22	4/10/85	0.26	5/18/85	0.40	5/18/85	0.78
4/11/85	0.23	4/11/85	0.29	5/19/85	0.45	5/19/85	0.80
4/12/85	0.25	4/12/85	0.32	5/20/85	0.48	5/20/85	0.86
4/13/85	0.26	4/13/85	0.35	5/21/85	0.99	5/21/85	1.15
4/14/85	0.26	4/14/85	0.36	5/22/85	1.50	5/22/85	1.84
4/15/85	0.27	4/15/85	0.42	5/23/85	1.39	5/23/85	2.01
4/16/85	0.31	4/16/85	0.51	5/24/85	1.16	5/24/85	1.83
4/17/85	0.37	4/17/85	0.58	5/25/85	0.96	5/25/85	1.62
4/18/85	0.42	4/18/85	0.65	5/26/85	0.82	5/26/85	1.44
4/19/85	0.45	4/19/85	0.70	5/27/85	0.68	5/27/85	1.25
4/20/85	0.40	4/20/85	0.65	5/28/85	0.62	5/28/85	1.12
4/21/85	0.34	4/21/85	0.60	5/29/85	0.51	5/29/85	0.99
4/22/85	0.31	4/22/85	0.57	5/30/85	0.45	5/30/85	0.85
4/23/85	0.27	4/23/85	0.52	5/31/85	0.40	5/31/85	0.70
4/24/85	0.24	4/24/85	0.47	6/1/85	0.34	6/1/85	0.56
4/25/85	0.24	4/25/85	0.47	6/2/85	0.28	6/2/85	0.50
4/26/85	0.22	4/26/85	0.43	6/3/85	0.25	6/3/85	0.44
4/27/85	0.23	4/27/85	0.44	6/4/85	0.23	6/4/85	0.42
4/28/85	0.31	4/28/85	0.56	6/5/85	0.21	6/5/85	0.38
4/29/85	1.22	4/29/85	1.31	6/6/85	0.18	6/6/85	0.34

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
6/7/85	0.16	6/7/85	0.31	7/15/85	0.03	7/15/85	0.07
6/8/85	0.14	6/8/85	0.29	7/16/85	0.03	7/16/85	0.07
6/9/85	0.14	6/9/85	0.27	7/17/85	0.03	7/17/85	0.07
6/10/85	0.13	6/10/85	0.25	7/18/85	0.03	7/18/85	0.07
6/11/85	0.13	6/11/85	0.24	7/19/85	0.12	7/19/85	0.14
6/12/85	0.12	6/12/85	0.23	7/20/85	0.42	7/20/85	1.15
6/13/85	0.11	6/13/85	0.20	7/21/85	0.34	7/21/85	0.93
6/14/85	0.10	6/14/85	0.17	7/22/85	0.31	7/22/85	0.75
6/15/85	0.10	6/15/85	0.16	7/23/85	0.31	7/23/85	0.64
6/16/85	0.09	6/16/85	0.15	7/24/85	0.27	7/24/85	0.60
6/17/85	0.09	6/17/85	0.14	7/25/85	0.65	7/25/85	0.75
6/18/85	0.08	6/18/85	0.14	7/26/85	0.79	7/26/85	0.91
6/19/85	0.08	6/19/85	0.14	7/27/85	0.54	7/27/85	0.80
6/20/85	0.07	6/20/85	0.13	7/28/85	0.48	7/28/85	0.67
6/21/85	0.07	6/21/85	0.13	7/29/85	0.54	7/29/85	0.62
6/22/85	0.07	6/22/85	0.12	7/30/85	0.51	7/30/85	0.52
6/23/85	0.06	6/23/85	0.11	7/31/85	0.45	7/31/85	0.46
6/24/85	0.06	6/24/85	0.11	8/1/85	0.40	8/1/85	0.42
6/25/85	0.05	6/25/85	0.10	8/2/85	0.34	8/2/85	0.39
6/26/85	0.06	6/26/85	0.10	8/3/85	0.28	8/3/85	0.44
6/27/85	0.05	6/27/85	0.10	8/4/85	0.26	8/4/85	0.52
6/28/85	0.05	6/28/85	0.09	8/5/85	0.23	8/5/85	0.47
6/29/85	0.05	6/29/85	0.09	8/6/85	0.20	8/6/85	0.41
6/30/85	0.05	6/30/85	0.08	8/7/85	0.18	8/7/85	0.37
7/1/85	0.04	7/1/85	0.08	8/8/85	0.16	8/8/85	0.32
7/2/85	0.04	7/2/85	0.08	8/9/85	0.14	8/9/85	0.28
7/3/85	0.04	7/3/85	0.07	8/10/85	0.13	8/10/85	0.26
7/4/85	0.04	7/4/85	0.07	8/11/85	0.11	8/11/85	0.23
7/5/85	0.03	7/5/85	0.07	8/12/85	0.10	8/12/85	0.20
7/6/85	0.03	7/6/85	0.07	8/13/85	0.08	8/13/85	0.19
7/7/85	0.03	7/7/85	0.06	8/14/85	0.08	8/14/85	0.18
7/8/85	0.03	7/8/85	0.06	8/15/85	0.08	8/15/85	0.16
7/9/85	0.03	7/9/85	0.06	8/16/85	0.07	8/16/85	0.14
7/10/85	0.04	7/10/85	0.07	8/17/85	0.07	8/17/85	0.13
7/11/85	0.03	7/11/85	0.07	8/18/85	0.07	8/18/85	0.12
7/12/85	0.03	7/12/85	0.07	8/19/85	0.07	8/19/85	0.12
7/13/85	0.04	7/13/85	0.08	8/20/85	0.06	8/20/85	0.11
7/14/85	0.04	7/14/85	0.08	8/21/85	0.06	8/21/85	0.11

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
8/22/85	0.06	8/22/85	0.11	9/29/85	0.03	9/29/85	0.08
8/23/85	0.05	8/23/85	0.11	9/30/85	0.03	9/30/85	0.07
8/24/85	0.05	8/24/85	0.11	10/1/85	0.03	10/1/85	0.07
8/25/85	0.05	8/25/85	0.10	10/2/85	0.03	10/2/85	0.07
8/26/85	0.05	8/26/85	0.10	10/3/85	0.03	10/3/85	0.07
8/27/85	0.05	8/27/85	0.10	10/4/85	0.03	10/4/85	0.06
8/28/85	0.05	8/28/85	0.10	10/5/85	0.03	10/5/85	0.06
8/29/85	0.04	8/29/85	0.10	10/6/85	0.03	10/6/85	0.06
8/30/85	0.04	8/30/85	0.10	10/7/85	0.03	10/7/85	0.06
8/31/85	0.04	8/31/85	0.09	10/8/85	0.04	10/8/85	0.06
9/1/85	0.04	9/1/85	0.09	10/9/85	0.04	10/9/85	0.06
9/2/85	0.04	9/2/85	0.10	10/10/85	0.04	10/10/85	0.06
9/3/85	0.04	9/3/85	0.09	10/11/85	0.05	10/11/85	0.07
9/4/85	0.04	9/4/85	0.09	10/12/85	0.04	10/12/85	0.07
9/5/85	0.04	9/5/85	0.09	10/13/85	0.04	10/13/85	0.07
9/6/85	0.03	9/6/85	0.09	10/14/85	0.04	10/14/85	0.07
9/7/85	0.03	9/7/85	0.08	10/15/85	0.04	10/15/85	0.06
9/8/85	0.03	9/8/85	0.08	10/16/85	0.03	10/16/85	0.06
9/9/85	0.03	9/9/85	0.08	10/17/85	0.03	10/17/85	0.06
9/10/85	0.03	9/10/85	0.08	10/18/85	0.03	10/18/85	0.06
9/11/85	0.13	9/11/85	0.17	10/19/85	0.03	10/19/85	0.06
9/12/85	0.20	9/12/85	0.26	10/20/85	0.03	10/20/85	0.06
9/13/85	0.08	9/13/85	0.14	10/21/85	0.03	10/21/85	0.06
9/14/85	0.07	9/14/85	0.13	10/22/85	0.03	10/22/85	0.05
9/15/85	0.06	9/15/85	0.12	10/23/85	0.03	10/23/85	0.05
9/16/85	0.05	9/16/85	0.10	10/24/85	0.03	10/24/85	0.05
9/17/85	0.05	9/17/85	0.10	10/25/85	0.03	10/25/85	0.05
9/18/85	0.05	9/18/85	0.09	10/26/85	0.03	10/26/85	0.05
9/19/85	0.04	9/19/85	0.09	10/27/85	0.03	10/27/85	0.05
9/20/85	0.05	9/20/85	0.09	10/28/85	0.03	10/28/85	0.05
9/21/85	0.05	9/21/85	0.10	10/29/85	0.03	10/29/85	0.05
9/22/85	0.04	9/22/85	0.09	10/30/85	0.03	10/30/85	0.05
9/23/85	0.04	9/23/85	0.08	10/31/85	0.03	10/31/85	0.05
9/24/85	0.04	9/24/85	0.08	11/1/85	0.03	11/1/85	0.06
9/25/85	0.05	9/25/85	0.09	11/2/85	0.03	11/2/85	0.05
9/26/85	0.04	9/26/85	0.09	11/3/85	0.03	11/3/85	0.05
9/27/85	0.03	9/27/85	0.09	11/4/85	0.03	11/4/85	0.05
9/28/85	0.03	9/28/85	0.08	11/5/85	0.03	11/5/85	0.05

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
11/6/85	0.03	11/6/85	0.05	12/14/85	0.02	12/14/85	0.03
11/7/85	0.03	11/7/85	0.05	12/15/85	0.02	12/15/85	0.03
11/8/85	0.02	11/8/85	0.05	12/16/85	0.02	12/16/85	0.03
11/9/85	0.02	11/9/85	0.05	12/17/85	0.02	12/17/85	0.03
11/10/85	0.02	11/10/85	0.05	12/18/85	0.02	12/18/85	0.03
11/11/85	0.02	11/11/85	0.05	12/19/85	0.02	12/19/85	0.03
11/12/85	0.02	11/12/85	0.05	12/20/85	0.02	12/20/85	0.03
11/13/85	0.02	11/13/85	0.05	12/21/85	0.02	12/21/85	0.03
11/14/85	0.02	11/14/85	0.05	12/22/85	0.02	12/22/85	0.03
11/15/85	0.02	11/15/85	0.05	12/23/85	0.02	12/23/85	0.03
11/16/85	0.02	11/16/85	0.05	12/24/85	0.02	12/24/85	0.03
11/17/85	0.02	11/17/85	0.05	12/25/85	0.02	12/25/85	0.03
11/18/85	0.02	11/18/85	0.05	12/26/85	0.02	12/26/85	0.03
11/19/85	0.02	11/19/85	0.05	12/27/85	0.02	12/27/85	0.03
11/20/85	0.02	11/20/85	0.04	12/28/85	0.02	12/28/85	0.03
11/21/85	0.02	11/21/85	0.05	12/29/85	0.02	12/29/85	0.03
11/22/85	0.02	11/22/85	0.05	12/30/85	0.02	12/30/85	0.03
11/23/85	0.02	11/23/85	0.04	12/31/85	0.02	12/31/85	0.03
11/24/85	0.02	11/24/85	0.05	1/1/86	0.02	1/1/86	0.03
11/25/85	0.02	11/25/85	0.05	1/2/86	0.02	1/2/86	0.03
11/26/85	0.02	11/26/85	0.05	1/3/86	0.02	1/3/86	0.03
11/27/85	0.02	11/27/85	0.05	1/4/86	0.02	1/4/86	0.03
11/28/85	0.02	11/28/85	0.04	1/5/86	0.02	1/5/86	0.03
11/29/85	0.02	11/29/85	0.04	1/6/86	0.02	1/6/86	0.03
11/30/85	0.02	11/30/85	0.03	1/7/86	0.02	1/7/86	0.03
12/1/85	0.02	12/1/85	0.03	1/8/86	0.02	1/8/86	0.03
12/2/85	0.02	12/2/85	0.03	1/9/86	0.02	1/9/86	0.03
12/3/85	0.02	12/3/85	0.04	1/10/86	0.02	1/10/86	0.03
12/4/85	0.02	12/4/85	0.04	1/11/86	0.02	1/11/86	0.03
12/5/85	0.02	12/5/85	0.04	1/12/86	0.02	1/12/86	0.03
12/6/85	0.02	12/6/85	0.04	1/13/86	0.02	1/13/86	0.03
12/7/85	0.02	12/7/85	0.04	1/14/86	0.02	1/14/86	0.03
12/8/85	0.02	12/8/85	0.03	1/15/86	0.02	1/15/86	0.03
12/9/85	0.02	12/9/85	0.03	1/16/86	0.02	1/16/86	0.03
12/10/85	0.02	12/10/85	0.03	1/17/86	0.02	1/17/86	0.03
12/11/85	0.02	12/11/85	0.03	1/18/86	0.02	1/18/86	0.03
12/12/85	0.02	12/12/85	0.03	1/19/86	0.02	1/19/86	0.03
12/13/85	0.02	12/13/85	0.03	1/20/86	0.02	1/20/86	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
1/21/86	0.02	1/21/86	0.03	2/28/86	0.02	2/28/86	0.03
1/22/86	0.02	1/22/86	0.03	3/1/86	0.02	3/1/86	0.03
1/23/86	0.02	1/23/86	0.03	3/2/86	0.02	3/2/86	0.03
1/24/86	0.02	1/24/86	0.03	3/3/86	0.01	3/3/86	0.03
1/25/86	0.02	1/25/86	0.03	3/4/86	0.01	3/4/86	0.03
1/26/86	0.03	1/26/86	0.03	3/5/86	0.01	3/5/86	0.03
1/27/86	0.03	1/27/86	0.03	3/6/86	0.01	3/6/86	0.03
1/28/86	0.02	1/28/86	0.03	3/7/86	0.01	3/7/86	0.03
1/29/86	0.02	1/29/86	0.03	3/8/86	0.01	3/8/86	0.03
1/30/86	0.02	1/30/86	0.03	3/9/86	0.01	3/9/86	0.03
1/31/86	0.02	1/31/86	0.03	3/10/86	0.01	3/10/86	0.03
2/1/86	0.02	2/1/86	0.03	3/11/86	0.01	3/11/86	0.03
2/2/86	0.02	2/2/86	0.03	3/12/86	0.01	3/12/86	0.03
2/3/86	0.02	2/3/86	0.03	3/13/86	0.01	3/13/86	0.03
2/4/86	0.02	2/4/86	0.03	3/14/86	0.01	3/14/86	0.04
2/5/86	0.02	2/5/86	0.03	3/15/86	0.01	3/15/86	0.03
2/6/86	0.02	2/6/86	0.03	3/16/86	0.01	3/16/86	0.03
2/7/86	0.02	2/7/86	0.03	3/17/86	0.01	3/17/86	0.03
2/8/86	0.02	2/8/86	0.03	3/18/86	0.01	3/18/86	0.03
2/9/86	0.02	2/9/86	0.03	3/19/86	0.01	3/19/86	0.03
2/10/86	0.02	2/10/86	0.03	3/20/86	0.01	3/20/86	0.03
2/11/86	0.02	2/11/86	0.03	3/21/86	0.01	3/21/86	0.04
2/12/86	0.02	2/12/86	0.03	3/22/86	0.01	3/22/86	0.04
2/13/86	0.02	2/13/86	0.03	3/23/86	0.02	3/23/86	0.04
2/14/86	0.02	2/14/86	0.03	3/24/86	0.02	3/24/86	0.05
2/15/86	0.04	2/15/86	0.03	3/25/86	0.02	3/25/86	0.05
2/16/86	0.03	2/16/86	0.03	3/26/86	0.02	3/26/86	0.05
2/17/86	0.02	2/17/86	0.03	3/27/86	0.02	3/27/86	0.05
2/18/86	0.02	2/18/86	0.03	3/28/86	0.02	3/28/86	0.06
2/19/86	0.02	2/19/86	0.03	3/29/86	0.02	3/29/86	0.06
2/20/86	0.02	2/20/86	0.03	3/30/86	0.02	3/30/86	0.06
2/21/86	0.02	2/21/86	0.03	3/31/86	0.02	3/31/86	0.06
2/22/86	0.02	2/22/86	0.04	4/1/86	0.03	4/1/86	0.07
2/23/86	0.02	2/23/86	0.03	4/2/86	0.03	4/2/86	0.07
2/24/86	0.02	2/24/86	0.03	4/3/86	0.03	4/3/86	0.07
2/25/86	0.02	2/25/86	0.03	4/4/86	0.03	4/4/86	0.06
2/26/86	0.02	2/26/86	0.03	4/5/86	0.03	4/5/86	0.07
2/27/86	0.02	2/27/86	0.03	4/6/86	0.03	4/6/86	0.07

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
4/7/86	0.03	4/7/86	0.08	5/15/86	0.01	5/15/86	0.05
4/8/86	0.03	4/8/86	0.08	5/16/86	0.02	5/16/86	0.05
4/9/86	0.03	4/9/86	0.09	5/17/86	0.02	5/17/86	0.06
4/10/86	0.03	4/10/86	0.10	5/18/86	0.02	5/18/86	0.05
4/11/86	0.03	4/11/86	0.10	5/19/86	0.02	5/19/86	0.06
4/12/86	0.03	4/12/86	0.10	5/20/86	0.02	5/20/86	0.06
4/13/86	0.04	4/13/86	0.10	5/21/86	0.02	5/21/86	0.06
4/14/86	0.04	4/14/86	0.10	5/22/86	0.02	5/22/86	0.05
4/15/86	0.04	4/15/86	0.09	5/23/86	0.02	5/23/86	0.05
4/16/86	0.04	4/16/86	0.09	5/24/86	0.02	5/24/86	0.05
4/17/86	0.03	4/17/86	0.09	5/25/86	0.02	5/25/86	0.05
4/18/86	0.03	4/18/86	0.09	5/26/86	0.02	5/26/86	0.05
4/19/86	0.03	4/19/86	0.08	5/27/86	0.02	5/27/86	0.05
4/20/86	0.03	4/20/86	0.08	5/28/86	0.01	5/28/86	0.04
4/21/86	0.03	4/21/86	0.08	5/29/86	0.02	5/29/86	0.05
4/22/86	0.03	4/22/86	0.08	5/30/86	0.02	5/30/86	0.05
4/23/86	0.03	4/23/86	0.08	5/31/86	0.01	5/31/86	0.05
4/24/86	0.03	4/24/86	0.08	6/1/86	0.01	6/1/86	0.05
4/25/86	0.02	4/25/86	0.08	6/2/86	0.05	6/2/86	0.12
4/26/86	0.02	4/26/86	0.08	6/3/86	0.05	6/3/86	0.11
4/27/86	0.02	4/27/86	0.08	6/4/86	0.04	6/4/86	0.10
4/28/86	0.02	4/28/86	0.08	6/5/86	0.04	6/5/86	0.12
4/29/86	0.02	4/29/86	0.08	6/6/86	0.04	6/6/86	0.12
4/30/86	0.02	4/30/86	0.08	6/7/86	0.03	6/7/86	0.12
5/1/86	0.02	5/1/86	0.08	6/8/86	0.03	6/8/86	0.12
5/2/86	0.02	5/2/86	0.07	6/9/86	0.04	6/9/86	0.12
5/3/86	0.02	5/3/86	0.07	6/10/86	0.06	6/10/86	0.12
5/4/86	0.02	5/4/86	0.07	6/11/86	0.05	6/11/86	0.11
5/5/86	0.02	5/5/86	0.06	6/12/86	0.04	6/12/86	0.10
5/6/86	0.02	5/6/86	0.06	6/13/86	0.04	6/13/86	0.10
5/7/86	0.02	5/7/86	0.06	6/14/86	0.03	6/14/86	0.09
5/8/86	0.02	5/8/86	0.06	6/15/86	0.03	6/15/86	0.09
5/9/86	0.02	5/9/86	0.06	6/16/86	0.03	6/16/86	0.08
5/10/86	0.02	5/10/86	0.06	6/17/86	0.03	6/17/86	0.08
5/11/86	0.02	5/11/86	0.06	6/18/86	0.03	6/18/86	0.08
5/12/86	0.01	5/12/86	0.05	6/19/86	0.04	6/19/86	0.09
5/13/86	0.01	5/13/86	0.05	6/20/86	0.03	6/20/86	0.08
5/14/86	0.01	5/14/86	0.05	6/21/86	0.03	6/21/86	0.07

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
6/22/86	0.02	6/22/86	0.06	7/30/86	0.01	7/30/86	0.05
6/23/86	0.02	6/23/86	0.06	7/31/86	0.01	7/31/86	0.05
6/24/86	0.02	6/24/86	0.06	8/1/86	0.01	8/1/86	0.05
6/25/86	0.02	6/25/86	0.05	8/2/86	0.01	8/2/86	0.05
6/26/86	0.02	6/26/86	0.05	8/3/86	0.01	8/3/86	0.05
6/27/86	0.02	6/27/86	0.05	8/4/86	0.01	8/4/86	0.05
6/28/86	0.01	6/28/86	0.05	8/5/86	0.01	8/5/86	0.04
6/29/86	0.01	6/29/86	0.04	8/6/86	0.01	8/6/86	0.03
6/30/86	0.01	6/30/86	0.04	8/7/86	0.01	8/7/86	0.11
7/1/86	0.01	7/1/86	0.04	8/8/86	0.03	8/8/86	0.26
7/2/86	0.01	7/2/86	0.04	8/9/86	0.02	8/9/86	0.31
7/3/86	0.01	7/3/86	0.03	8/10/86	0.02	8/10/86	0.31
7/4/86	0.01	7/4/86	0.03	8/11/86	0.02	8/11/86	0.34
7/5/86	0.01	7/5/86	0.04	8/12/86	0.02	8/12/86	0.28
7/6/86	0.02	7/6/86	0.08	8/13/86	0.02	8/13/86	0.25
7/7/86	0.02	7/7/86	0.06	8/14/86	0.02	8/14/86	0.23
7/8/86	0.02	7/8/86	0.05	8/15/86	0.02	8/15/86	0.23
7/9/86	0.02	7/9/86	0.05	8/16/86	0.02	8/16/86	0.19
7/10/86	0.02	7/10/86	0.05	8/17/86	0.02	8/17/86	0.16
7/11/86	0.02	7/11/86	0.05	8/18/86	0.01	8/18/86	0.14
7/12/86	0.02	7/12/86	0.04	8/19/86	0.01	8/19/86	0.14
7/13/86	0.03	7/13/86	0.06	8/20/86	0.01	8/20/86	0.12
7/14/86	0.02	7/14/86	0.06	8/21/86	0.01	8/21/86	0.12
7/15/86	0.02	7/15/86	0.05	8/22/86	0.01	8/22/86	0.11
7/16/86	0.01	7/16/86	0.05	8/23/86	0.02	8/23/86	0.11
7/17/86	0.01	7/17/86	0.04	8/24/86	0.02	8/24/86	0.14
7/18/86	0.01	7/18/86	0.04	8/25/86	0.01	8/25/86	0.12
7/19/86	0.02	7/19/86	0.07	8/26/86	0.01	8/26/86	0.13
7/20/86	0.05	7/20/86	0.09	8/27/86	0.02	8/27/86	0.15
7/21/86	0.06	7/21/86	0.11	8/28/86	0.01	8/28/86	0.14
7/22/86	0.05	7/22/86	0.10	8/29/86	0.01	8/29/86	0.14
7/23/86	0.03	7/23/86	0.09	8/30/86	0.01	8/30/86	0.12
7/24/86	0.03	7/24/86	0.08	8/31/86	0.01	8/31/86	0.13
7/25/86	0.02	7/25/86	0.08	9/1/86	0.01	9/1/86	0.14
7/26/86	0.02	7/26/86	0.07	9/2/86	0.02	9/2/86	0.14
7/27/86	0.01	7/27/86	0.07	9/3/86	0.01	9/3/86	0.12
7/28/86	0.01	7/28/86	0.06	9/4/86	0.01	9/4/86	0.12
7/29/86	0.01	7/29/86	0.05	9/5/86	0.01	9/5/86	0.12

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
9/6/86	0.01	9/6/86	0.11	10/14/86	0.01	10/14/86	0.05
9/7/86	0.01	9/7/86	0.11	10/15/86	0.01	10/15/86	0.05
9/8/86	0.01	9/8/86	0.10	10/16/86	0.01	10/16/86	0.05
9/9/86	0.01	9/9/86	0.09	10/17/86	0.01	10/17/86	0.04
9/10/86	0.01	9/10/86	0.08	10/18/86	0.01	10/18/86	0.04
9/11/86	0.01	9/11/86	0.08	10/19/86	0.01	10/19/86	0.04
9/12/86	0.01	9/12/86	0.07	10/20/86	0.01	10/20/86	0.05
9/13/86	0.01	9/13/86	0.07	10/21/86	0.02	10/21/86	0.06
9/14/86	0.01	9/14/86	0.06	10/22/86	0.02	10/22/86	0.05
9/15/86	0.00	9/15/86	0.05	10/23/86	0.02	10/23/86	0.06
9/16/86	0.00	9/16/86	0.05	10/24/86	0.02	10/24/86	0.07
9/17/86	0.00	9/17/86	0.05	10/25/86	0.02	10/25/86	0.06
9/18/86	0.00	9/18/86	0.05	10/26/86	0.02	10/26/86	0.05
9/19/86	0.00	9/19/86	0.05	10/27/86	0.02	10/27/86	0.05
9/20/86	0.00	9/20/86	0.04	10/28/86	0.02	10/28/86	0.04
9/21/86	0.00	9/21/86	0.04	10/29/86	0.01	10/29/86	0.04
9/22/86	0.00	9/22/86	0.04	10/30/86	0.01	10/30/86	0.04
9/23/86	0.00	9/23/86	0.04	10/31/86	0.01	10/31/86	0.04
9/24/86	0.00	9/24/86	0.04	11/1/86	0.02	11/1/86	0.05
9/25/86	0.01	9/25/86	0.04	11/2/86	0.02	11/2/86	0.05
9/26/86	0.01	9/26/86	0.04	11/3/86	0.03	11/3/86	0.07
9/27/86	0.01	9/27/86	0.04	11/4/86	0.03	11/4/86	0.06
9/28/86	0.01	9/28/86	0.04	11/5/86	0.02	11/5/86	0.06
9/29/86	0.01	9/29/86	0.04	11/6/86	0.02	11/6/86	0.06
9/30/86	0.01	9/30/86	0.04	11/7/86	0.02	11/7/86	0.06
10/1/86	0.01	10/1/86	0.05	11/8/86	0.02	11/8/86	0.05
10/2/86	0.01	10/2/86	0.04	11/9/86	0.02	11/9/86	0.04
10/3/86	0.01	10/3/86	0.05	11/10/86	0.02	11/10/86	0.06
10/4/86	0.01	10/4/86	0.06	11/11/86	0.02	11/11/86	0.07
10/5/86	0.01	10/5/86	0.05	11/12/86	0.02	11/12/86	0.06
10/6/86	0.01	10/6/86	0.05	11/13/86	0.02	11/13/86	0.06
10/7/86	0.01	10/7/86	0.05	11/14/86	0.02	11/14/86	0.06
10/8/86	0.01	10/8/86	0.05	11/15/86	0.01	11/15/86	0.05
10/9/86	0.01	10/9/86	0.05	11/16/86	0.02	11/16/86	0.03
10/10/86	0.01	10/10/86	0.05	11/17/86	0.02	11/17/86	0.04
10/11/86	0.01	10/11/86	0.06	11/18/86	0.02	11/18/86	0.03
10/12/86	0.01	10/12/86	0.05	11/19/86	0.02	11/19/86	0.03
10/13/86	0.01	10/13/86	0.05	11/20/86	0.02	11/20/86	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
11/21/86	0.02	11/21/86	0.03	12/29/86	0.02	12/29/86	0.04
11/22/86	0.02	11/22/86	0.03	12/30/86	0.02	12/30/86	0.04
11/23/86	0.02	11/23/86	0.03	12/31/86	0.02	12/31/86	0.04
11/24/86	0.02	11/24/86	0.03	1/1/87	0.01	1/1/87	0.04
11/25/86	0.02	11/25/86	0.03	1/2/87	0.01	1/2/87	0.04
11/26/86	0.02	11/26/86	0.03	1/3/87	0.02	1/3/87	0.04
11/27/86	0.02	11/27/86	0.03	1/4/87	0.02	1/4/87	0.04
11/28/86	0.02	11/28/86	0.03	1/5/87	0.02	1/5/87	0.04
11/29/86	0.02	11/29/86	0.03	1/6/87	0.02	1/6/87	0.04
11/30/86	0.02	11/30/86	0.03	1/7/87	0.02	1/7/87	0.04
12/1/86	0.02	12/1/86	0.03	1/8/87	0.02	1/8/87	0.04
12/2/86	0.02	12/2/86	0.03	1/9/87	0.02	1/9/87	0.04
12/3/86	0.02	12/3/86	0.04	1/10/87	0.02	1/10/87	0.04
12/4/86	0.02	12/4/86	0.03	1/11/87	0.02	1/11/87	0.04
12/5/86	0.02	12/5/86	0.04	1/12/87	0.02	1/12/87	0.04
12/6/86	0.02	12/6/86	0.02	1/13/87	0.02	1/13/87	0.04
12/7/86	0.02	12/7/86	0.02	1/14/87	0.02	1/14/87	0.04
12/8/86	0.02	12/8/86	0.03	1/15/87	0.02	1/15/87	0.04
12/9/86	0.02	12/9/86	0.03	1/16/87	0.02	1/16/87	0.04
12/10/86	0.02	12/10/86	0.03	1/17/87	0.02	1/17/87	0.04
12/11/86	0.02	12/11/86	0.03	1/18/87	0.01	1/18/87	0.04
12/12/86	0.02	12/12/86	0.03	1/19/87	0.01	1/19/87	0.04
12/13/86	0.02	12/13/86	0.03	1/20/87	0.01	1/20/87	0.04
12/14/86	0.02	12/14/86	0.03	1/21/87	0.02	1/21/87	0.04
12/15/86	0.02	12/15/86	0.03	1/22/87	0.02	1/22/87	0.04
12/16/86	0.02	12/16/86	0.03	1/23/87	0.02	1/23/87	0.04
12/17/86	0.02	12/17/86	0.03	1/24/87	0.02	1/24/87	0.04
12/18/86	0.02	12/18/86	0.03	1/25/87	0.02	1/25/87	0.04
12/19/86	0.02	12/19/86	0.04	1/26/87	0.02	1/26/87	0.04
12/20/86	0.02	12/20/86	0.04	1/27/87	0.02	1/27/87	0.04
12/21/86	0.02	12/21/86	0.04	1/28/87	0.03	1/28/87	0.04
12/22/86	0.02	12/22/86	0.04	1/29/87	0.03	1/29/87	0.04
12/23/86	0.02	12/23/86	0.04	1/30/87	0.02	1/30/87	0.03
12/24/86	0.02	12/24/86	0.04	1/31/87	0.02	1/31/87	0.03
12/25/86	0.02	12/25/86	0.04	2/1/87	0.02	2/1/87	0.03
12/26/86	0.01	12/26/86	0.04	2/2/87	0.03	2/2/87	0.03
12/27/86	0.01	12/27/86	0.04	2/3/87	0.03	2/3/87	0.03
12/28/86	0.02	12/28/86	0.04	2/4/87	0.03	2/4/87	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
2/5/87	0.02	2/5/87	0.03	3/15/87	0.07	3/15/87	0.15
2/6/87	0.02	2/6/87	0.03	3/16/87	0.07	3/16/87	0.15
2/7/87	0.02	2/7/87	0.02	3/17/87	0.07	3/17/87	0.14
2/8/87	0.02	2/8/87	0.02	3/18/87	0.07	3/18/87	0.14
2/9/87	0.02	2/9/87	0.02	3/19/87	0.09	3/19/87	0.17
2/10/87	0.02	2/10/87	0.02	3/20/87	0.10	3/20/87	0.19
2/11/87	0.02	2/11/87	0.02	3/21/87	0.10	3/21/87	0.20
2/12/87	0.02	2/12/87	0.02	3/22/87	0.09	3/22/87	0.19
2/13/87	0.02	2/13/87	0.02	3/23/87	0.08	3/23/87	0.18
2/14/87	0.02	2/14/87	0.03	3/24/87	0.07	3/24/87	0.15
2/15/87	0.02	2/15/87	0.03	3/25/87	0.06	3/25/87	0.14
2/16/87	0.02	2/16/87	0.03	3/26/87	0.06	3/26/87	0.13
2/17/87	0.02	2/17/87	0.03	3/27/87	0.05	3/27/87	0.09
2/18/87	0.02	2/18/87	0.03	3/28/87	0.05	3/28/87	0.10
2/19/87	0.02	2/19/87	0.03	3/29/87	0.07	3/29/87	0.11
2/20/87	0.02	2/20/87	0.03	3/30/87	0.05	3/30/87	0.11
2/21/87	0.02	2/21/87	0.03	3/31/87	0.04	3/31/87	0.10
2/22/87	0.02	2/22/87	0.03	4/1/87	0.04	4/1/87	0.08
2/23/87	0.02	2/23/87	0.03	4/2/87	0.04	4/2/87	0.08
2/24/87	0.02	2/24/87	0.03	4/3/87	0.04	4/3/87	0.09
2/25/87	0.02	2/25/87	0.03	4/4/87	0.05	4/4/87	0.10
2/26/87	0.02	2/26/87	0.03	4/5/87	0.06	4/5/87	0.11
2/27/87	0.02	2/27/87	0.03	4/6/87	0.06	4/6/87	0.11
2/28/87	0.02	2/28/87	0.03	4/7/87	0.07	4/7/87	0.12
3/1/87	0.02	3/1/87	0.03	4/8/87	0.08	4/8/87	0.14
3/2/87	0.03	3/2/87	0.03	4/9/87	0.09	4/9/87	0.18
3/3/87	0.03	3/3/87	0.03	4/10/87	0.11	4/10/87	0.22
3/4/87	0.04	3/4/87	0.03	4/11/87	0.15	4/11/87	0.28
3/5/87	0.05	3/5/87	0.05	4/12/87	0.18	4/12/87	0.31
3/6/87	0.09	3/6/87	0.14	4/13/87	0.14	4/13/87	0.28
3/7/87	0.12	3/7/87	0.26	4/14/87	0.13	4/14/87	0.27
3/8/87	0.13	3/8/87	0.28	4/15/87	0.16	4/15/87	0.31
3/9/87	0.10	3/9/87	0.27	4/16/87	0.25	4/16/87	0.45
3/10/87	0.08	3/10/87	0.24	4/17/87	0.37	4/17/87	0.65
3/11/87	0.07	3/11/87	0.18	4/18/87	0.54	4/18/87	0.85
3/12/87	0.07	3/12/87	0.16	4/19/87	0.62	4/19/87	0.96
3/13/87	0.07	3/13/87	0.16	4/20/87	0.54	4/20/87	0.96
3/14/87	0.07	3/14/87	0.16	4/21/87	0.37	4/21/87	0.76

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
4/22/87	0.28	4/22/87	0.68	5/30/87	0.24	5/30/87	0.59
4/23/87	0.31	4/23/87	0.71	5/31/87	0.20	5/31/87	0.48
4/24/87	0.40	4/24/87	0.82	6/1/87	0.18	6/1/87	0.45
4/25/87	0.42	4/25/87	0.82	6/2/87	0.15	6/2/87	0.40
4/26/87	0.45	4/26/87	0.85	6/3/87	0.15	6/3/87	0.37
4/27/87	0.51	4/27/87	0.93	6/4/87	0.13	6/4/87	0.34
4/28/87	0.51	4/28/87	0.91	6/5/87	0.10	6/5/87	0.31
4/29/87	0.48	4/29/87	0.93	6/6/87	0.08	6/6/87	0.28
4/30/87	0.48	4/30/87	0.96	6/7/87	0.08	6/7/87	0.25
5/1/87	0.48	5/1/87	0.99	6/8/87	0.12	6/8/87	0.31
5/2/87	0.45	5/2/87	0.96	6/9/87	0.28	6/9/87	0.82
5/3/87	0.48	5/3/87	0.93	6/10/87	0.42	6/10/87	0.82
5/4/87	0.37	5/4/87	0.82	6/11/87	0.28	6/11/87	0.71
5/5/87	0.37	5/5/87	0.82	6/12/87	0.20	6/12/87	0.62
5/6/87	0.48	5/6/87	1.13	6/13/87	0.15	6/13/87	0.57
5/7/87	0.51	5/7/87	1.39	6/14/87	0.14	6/14/87	0.48
5/8/87	0.51	5/8/87	1.39	6/15/87	0.15	6/15/87	0.45
5/9/87	0.45	5/9/87	1.33	6/16/87	0.13	6/16/87	0.45
5/10/87	0.42	5/10/87	1.25	6/17/87	0.10	6/17/87	0.40
5/11/87	0.37	5/11/87	1.16	6/18/87	0.08	6/18/87	0.37
5/12/87	0.34	5/12/87	1.16	6/19/87	0.08	6/19/87	0.34
5/13/87	0.28	5/13/87	1.16	6/20/87	0.07	6/20/87	0.31
5/14/87	0.25	5/14/87	1.16	6/21/87	0.08	6/21/87	0.31
5/15/87	0.22	5/15/87	1.16	6/22/87	0.06	6/22/87	0.27
5/16/87	0.19	5/16/87	1.16	6/23/87	0.06	6/23/87	0.24
5/17/87	0.16	5/17/87	1.08	6/24/87	0.05	6/24/87	0.23
5/18/87	0.15	5/18/87	0.96	6/25/87	0.05	6/25/87	0.21
5/19/87	0.16	5/19/87	0.88	6/26/87	0.05	6/26/87	0.21
5/20/87	0.16	5/20/87	0.76	6/27/87	0.05	6/27/87	0.20
5/21/87	0.24	5/21/87	0.79	6/28/87	0.04	6/28/87	0.18
5/22/87	0.42	5/22/87	0.88	6/29/87	0.12	6/29/87	0.24
5/23/87	0.79	5/23/87	1.42	6/30/87	0.59	6/30/87	0.42
5/24/87	0.65	5/24/87	1.30	7/1/87	0.54	7/1/87	0.51
5/25/87	0.57	5/25/87	1.19	7/2/87	0.40	7/2/87	0.45
5/26/87	0.48	5/26/87	1.05	7/3/87	0.31	7/3/87	0.40
5/27/87	0.42	5/27/87	0.91	7/4/87	0.25	7/4/87	0.37
5/28/87	0.34	5/28/87	0.76	7/5/87	0.22	7/5/87	0.34
5/29/87	0.28	5/29/87	0.68	7/6/87	0.18	7/6/87	0.28

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
7/7/87	0.15	7/7/87	0.26	8/14/87	0.03	8/14/87	0.10
7/8/87	0.14	7/8/87	0.25	8/15/87	0.02	8/15/87	0.08
7/9/87	0.12	7/9/87	0.24	8/16/87	0.01	8/16/87	0.07
7/10/87	0.10	7/10/87	0.21	8/17/87	0.01	8/17/87	0.07
7/11/87	0.08	7/11/87	0.20	8/18/87	0.01	8/18/87	0.05
7/12/87	0.08	7/12/87	0.19	8/19/87	0.01	8/19/87	0.05
7/13/87	0.08	7/13/87	0.19	8/20/87	0.01	8/20/87	0.05
7/14/87	0.07	7/14/87	0.18	8/21/87	0.01	8/21/87	0.05
7/15/87	0.06	7/15/87	0.16	8/22/87	0.04	8/22/87	0.11
7/16/87	0.06	7/16/87	0.15	8/23/87	0.05	8/23/87	0.14
7/17/87	0.05	7/17/87	0.15	8/24/87	0.03	8/24/87	0.11
7/18/87	0.05	7/18/87	0.15	8/25/87	0.04	8/25/87	0.10
7/19/87	0.04	7/19/87	0.13	8/26/87	0.05	8/26/87	0.12
7/20/87	0.04	7/20/87	0.11	8/27/87	0.07	8/27/87	0.16
7/21/87	0.03	7/21/87	0.10	8/28/87	0.10	8/28/87	0.21
7/22/87	0.03	7/22/87	0.10	8/29/87	0.08	8/29/87	0.20
7/23/87	0.03	7/23/87	0.10	8/30/87	0.08	8/30/87	0.20
7/24/87	0.03	7/24/87	0.09	8/31/87	0.07	8/31/87	0.18
7/25/87	0.02	7/25/87	0.09	9/1/87	0.07	9/1/87	0.17
7/26/87	0.02	7/26/87	0.08	9/2/87	0.06	9/2/87	0.15
7/27/87	0.02	7/27/87	0.07	9/3/87	0.05	9/3/87	0.14
7/28/87	0.02	7/28/87	0.08	9/4/87	0.05	9/4/87	0.12
7/29/87	0.02	7/29/87	0.07	9/5/87	0.04	9/5/87	0.11
7/30/87	0.02	7/30/87	0.07	9/6/87	0.04	9/6/87	0.10
7/31/87	0.02	7/31/87	0.06	9/7/87	0.04	9/7/87	0.10
8/1/87	0.02	8/1/87	0.06	9/8/87	0.04	9/8/87	0.10
8/2/87	0.02	8/2/87	0.08	9/9/87	0.03	9/9/87	0.09
8/3/87	0.02	8/3/87	0.07	9/10/87	0.03	9/10/87	0.09
8/4/87	0.02	8/4/87	0.07	9/11/87	0.03	9/11/87	0.09
8/5/87	0.02	8/5/87	0.06	9/12/87	0.03	9/12/87	0.08
8/6/87	0.01	8/6/87	0.06	9/13/87	0.03	9/13/87	0.08
8/7/87	0.02	8/7/87	0.06	9/14/87	0.02	9/14/87	0.07
8/8/87	0.03	8/8/87	0.08	9/15/87	0.02	9/15/87	0.07
8/9/87	0.03	8/9/87	0.12	9/16/87	0.02	9/16/87	0.06
8/10/87	0.03	8/10/87	0.10	9/17/87	0.02	9/17/87	0.07
8/11/87	0.02	8/11/87	0.10	9/18/87	0.02	9/18/87	0.05
8/12/87	0.02	8/12/87	0.10	9/19/87	0.01	9/19/87	0.05
8/13/87	0.03	8/13/87	0.10	9/20/87	0.01	9/20/87	0.04

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
9/21/87	0.01	9/21/87	0.04	10/29/87	0.01	10/29/87	0.03
9/22/87	0.01	9/22/87	0.04	10/30/87	0.01	10/30/87	0.03
9/23/87	0.01	9/23/87	0.04	10/31/87	0.01	10/31/87	0.03
9/24/87	0.01	9/24/87	0.04	11/1/87	0.01	11/1/87	0.03
9/25/87	0.01	9/25/87	0.04	11/2/87	0.01	11/2/87	0.03
9/26/87	0.01	9/26/87	0.04	11/3/87	0.01	11/3/87	0.03
9/27/87	0.01	9/27/87	0.04	11/4/87	0.01	11/4/87	0.03
9/28/87	0.01	9/28/87	0.04	11/5/87	0.01	11/5/87	0.03
9/29/87	0.01	9/29/87	0.04	11/6/87	0.01	11/6/87	0.03
9/30/87	0.01	9/30/87	0.04	11/7/87	0.01	11/7/87	0.03
10/1/87	0.01	10/1/87	0.04	11/8/87	0.01	11/8/87	0.03
10/2/87	0.01	10/2/87	0.04	11/9/87	0.01	11/9/87	0.03
10/3/87	0.01	10/3/87	0.03	11/10/87	0.01	11/10/87	0.03
10/4/87	0.01	10/4/87	0.03	11/11/87	0.01	11/11/87	0.03
10/5/87	0.01	10/5/87	0.03	11/12/87	0.01	11/12/87	0.03
10/6/87	0.01	10/6/87	0.03	11/13/87	0.01	11/13/87	0.03
10/7/87	0.01	10/7/87	0.03	11/14/87	0.01	11/14/87	0.03
10/8/87	0.01	10/8/87	0.03	11/15/87	0.01	11/15/87	0.04
10/9/87	0.02	10/9/87	0.03	11/16/87	0.01	11/16/87	0.03
10/10/87	0.02	10/10/87	0.04	11/17/87	0.01	11/17/87	0.03
10/11/87	0.02	10/11/87	0.04	11/18/87	0.01	11/18/87	0.03
10/12/87	0.02	10/12/87	0.04	11/19/87	0.01	11/19/87	0.03
10/13/87	0.02	10/13/87	0.04	11/20/87	0.01	11/20/87	0.04
10/14/87	0.03	10/14/87	0.08	11/21/87	0.02	11/21/87	0.03
10/15/87	0.02	10/15/87	0.07	11/22/87	0.02	11/22/87	0.03
10/16/87	0.02	10/16/87	0.05	11/23/87	0.01	11/23/87	0.03
10/17/87	0.02	10/17/87	0.04	11/24/87	0.01	11/24/87	
10/18/87	0.02	10/18/87	0.04	11/25/87	0.01	11/25/87	
10/19/87	0.02	10/19/87	0.04	11/26/87	0.01	11/26/87	
10/20/87	0.02	10/20/87	0.04	11/27/87	0.01	11/27/87	
10/21/87	0.01	10/21/87	0.03	11/28/87	0.01	11/28/87	
10/22/87	0.01	10/22/87	0.03	11/29/87	0.01	11/29/87	
10/23/87	0.01	10/23/87	0.03	11/30/87	0.01	11/30/87	
10/24/87	0.01	10/24/87	0.03	12/1/87	0.01	12/1/87	
10/25/87	0.01	10/25/87	0.03	12/2/87	0.01	12/2/87	
10/26/87	0.01	10/26/87	0.03	12/3/87	0.01	12/3/87	
10/27/87	0.01	10/27/87	0.03	12/4/87	0.01	12/4/87	
10/28/87	0.01	10/28/87	0.03	12/5/87	0.01	12/5/87	

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
12/6/87	0.01	12/6/87		1/13/88	0.01	1/13/88	
12/7/87	0.01	12/7/87		1/14/88	0.01	1/14/88	
12/8/87	0.01	12/8/87		1/15/88	0.01	1/15/88	
12/9/87	0.01	12/9/87		1/16/88	0.01	1/16/88	
12/10/87	0.01	12/10/87		1/17/88	0.01	1/17/88	
12/11/87	0.01	12/11/87		1/18/88	0.01	1/18/88	
12/12/87	0.01	12/12/87		1/19/88	0.01	1/19/88	
12/13/87	0.01	12/13/87		1/20/88	0.01	1/20/88	
12/14/87	0.01	12/14/87		1/21/88	0.01	1/21/88	
12/15/87	0.01	12/15/87		1/22/88	0.01	1/22/88	
12/16/87	0.01	12/16/87		1/23/88	0.01	1/23/88	
12/17/87	0.01	12/17/87		1/24/88	0.01	1/24/88	
12/18/87	0.01	12/18/87		1/25/88	0.01	1/25/88	
12/19/87	0.01	12/19/87		1/26/88	0.01	1/26/88	
12/20/87	0.01	12/20/87		1/27/88	0.01	1/27/88	
12/21/87	0.01	12/21/87		1/28/88	0.01	1/28/88	
12/22/87	0.01	12/22/87		1/29/88	0.01	1/29/88	
12/23/87	0.01	12/23/87		1/30/88	0.01	1/30/88	
12/24/87	0.01	12/24/87		1/31/88	0.01	1/31/88	
12/25/87	0.01	12/25/87		2/1/88	0.01	2/1/88	
12/26/87	0.01	12/26/87		2/2/88	0.01	2/2/88	
12/27/87	0.01	12/27/87		2/3/88	0.01	2/3/88	
12/28/87	0.01	12/28/87		2/4/88	0.01	2/4/88	
12/29/87	0.01	12/29/87		2/5/88	0.01	2/5/88	
12/30/87	0.01	12/30/87		2/6/88	0.01	2/6/88	
12/31/87	0.01	12/31/87		2/7/88	0.01	2/7/88	
1/1/88	0.01	1/1/88		2/8/88	0.01	2/8/88	
1/2/88	0.01	1/2/88		2/9/88	0.01	2/9/88	
1/3/88	0.01	1/3/88		2/10/88	0.01	2/10/88	
1/4/88	0.01	1/4/88		2/11/88	0.01	2/11/88	
1/5/88	0.01	1/5/88		2/12/88	0.01	2/12/88	
1/6/88	0.01	1/6/88		2/13/88	0.01	2/13/88	
1/7/88	0.01	1/7/88		2/14/88	0.01	2/14/88	
1/8/88	0.01	1/8/88		2/15/88	0.02	2/15/88	
1/9/88	0.01	1/9/88		2/16/88	0.01	2/16/88	
1/10/88	0.01	1/10/88		2/17/88	0.01	2/17/88	
1/11/88	0.01	1/11/88		2/18/88	0.01	2/18/88	
1/12/88	0.01	1/12/88		2/19/88	0.01	2/19/88	

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
2/20/88	0.01	2/20/88		3/29/88	0.03	3/29/88	
2/21/88	0.01	2/21/88		3/30/88	0.02	3/30/88	
2/22/88	0.01	2/22/88		3/31/88	0.02	3/31/88	
2/23/88	0.01	2/23/88		4/1/88	0.02	4/1/88	
2/24/88	0.01	2/24/88		4/2/88	0.03	4/2/88	
2/25/88	0.02	2/25/88		4/3/88	0.03	4/3/88	
2/26/88	0.01	2/26/88		4/4/88	0.04	4/4/88	
2/27/88	0.01	2/27/88		4/5/88	0.04	4/5/88	
2/28/88	0.01	2/28/88		4/6/88	0.05	4/6/88	
2/29/88	0.01	2/29/88		4/7/88	0.05	4/7/88	
3/1/88	0.01	3/1/88		4/8/88	0.05	4/8/88	
3/2/88	0.02	3/2/88		4/9/88	0.05	4/9/88	
3/3/88	0.02	3/3/88		4/10/88	0.04	4/10/88	
3/4/88	0.02	3/4/88		4/11/88	0.05	4/11/88	
3/5/88	0.02	3/5/88		4/12/88	0.05	4/12/88	
3/6/88	0.02	3/6/88		4/13/88	0.04	4/13/88	
3/7/88	0.02	3/7/88		4/14/88	0.05	4/14/88	
3/8/88	0.02	3/8/88		4/15/88	0.05	4/15/88	
3/9/88	0.02	3/9/88		4/16/88	0.05	4/16/88	
3/10/88	0.02	3/10/88		4/17/88	0.05	4/17/88	
3/11/88	0.02	3/11/88		4/18/88	0.06	4/18/88	
3/12/88	0.01	3/12/88		4/19/88	0.06	4/19/88	
3/13/88	0.02	3/13/88		4/20/88	0.06	4/20/88	
3/14/88	0.02	3/14/88		4/21/88	0.06	4/21/88	
3/15/88	0.02	3/15/88		4/22/88	0.06	4/22/88	
3/16/88	0.01	3/16/88		4/23/88	0.06	4/23/88	
3/17/88	0.01	3/17/88		4/24/88	0.06	4/24/88	
3/18/88	0.01	3/18/88		4/25/88	0.05	4/25/88	
3/19/88	0.02	3/19/88		4/26/88	0.05	4/26/88	
3/20/88	0.02	3/20/88		4/27/88	0.04	4/27/88	
3/21/88	0.02	3/21/88		4/28/88	0.04	4/28/88	
3/22/88	0.02	3/22/88		4/29/88	0.03	4/29/88	
3/23/88	0.02	3/23/88		4/30/88	0.03	4/30/88	
3/24/88	0.02	3/24/88		5/1/88	0.03	5/1/88	
3/25/88	0.02	3/25/88		5/2/88	0.03	5/2/88	
3/26/88	0.03	3/26/88		5/3/88	0.03	5/3/88	
3/27/88	0.03	3/27/88		5/4/88	0.03	5/4/88	
3/28/88	0.03	3/28/88		5/5/88	0.03	5/5/88	

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
5/6/88	0.03	5/6/88		6/13/88	0.01	6/13/88	0.04
5/7/88	0.02	5/7/88		6/14/88	0.01	6/14/88	0.03
5/8/88	0.02	5/8/88		6/15/88	0.01	6/15/88	0.04
5/9/88	0.02	5/9/88		6/16/88	0.01	6/16/88	0.03
5/10/88	0.02	5/10/88		6/17/88	0.00	6/17/88	0.03
5/11/88	0.02	5/11/88		6/18/88	0.00	6/18/88	0.03
5/12/88	0.02	5/12/88		6/19/88	0.00	6/19/88	0.03
5/13/88	0.02	5/13/88		6/20/88	0.00	6/20/88	0.03
5/14/88	0.02	5/14/88		6/21/88	0.00	6/21/88	0.03
5/15/88	0.02	5/15/88		6/22/88	0.01	6/22/88	0.05
5/16/88	0.02	5/16/88		6/23/88	0.01	6/23/88	0.04
5/17/88	0.02	5/17/88		6/24/88	0.01	6/24/88	0.05
5/18/88	0.01	5/18/88		6/25/88	0.01	6/25/88	0.03
5/19/88	0.02	5/19/88		6/26/88	0.01	6/26/88	0.03
5/20/88	0.03	5/20/88		6/27/88	0.01	6/27/88	0.05
5/21/88	0.03	5/21/88		6/28/88	0.01	6/28/88	0.05
5/22/88	0.02	5/22/88		6/29/88	0.01	6/29/88	0.07
5/23/88	0.02	5/23/88		6/30/88	0.01	6/30/88	0.06
5/24/88	0.02	5/24/88		7/1/88	0.01	7/1/88	0.05
5/25/88	0.02	5/25/88		7/2/88	0.01	7/2/88	0.04
5/26/88	0.02	5/26/88		7/3/88	0.00	7/3/88	0.04
5/27/88	0.02	5/27/88	0.07	7/4/88	0.00	7/4/88	0.03
5/28/88	0.02	5/28/88	0.07	7/5/88	0.00	7/5/88	0.03
5/29/88	0.02	5/29/88	0.07	7/6/88	0.00	7/6/88	0.03
5/30/88	0.02	5/30/88	0.06	7/7/88	0.00	7/7/88	0.02
5/31/88	0.02	5/31/88	0.06	7/8/88	0.00	7/8/88	0.02
6/1/88	0.02	6/1/88	0.06	7/9/88	0.00	7/9/88	0.02
6/2/88	0.02	6/2/88	0.05	7/10/88	0.00	7/10/88	0.02
6/3/88	0.01	6/3/88	0.05	7/11/88	0.00	7/11/88	0.02
6/4/88	0.01	6/4/88	0.05	7/12/88	0.00	7/12/88	0.02
6/5/88	0.01	6/5/88	0.04	7/13/88	0.00	7/13/88	0.01
6/6/88	0.01	6/6/88	0.04	7/14/88		7/14/88	0.01
6/7/88	0.01	6/7/88	0.04	7/15/88		7/15/88	0.01
6/8/88	0.01	6/8/88	0.03	7/16/88		7/16/88	0.01
6/9/88	0.01	6/9/88	0.03	7/17/88	0.00	7/17/88	0.02
6/10/88	0.01	6/10/88	0.05	7/18/88	0.00	7/18/88	0.02
6/11/88	0.02	6/11/88	0.06	7/19/88	0.00	7/19/88	0.02
6/12/88	0.01	6/12/88	0.04	7/20/88	0.00	7/20/88	0.02

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
7/21/88	0.00	7/21/88	0.02	8/28/88	0.00	8/28/88	0.02
7/22/88	0.00	7/22/88	0.01	8/29/88	0.00	8/29/88	0.02
7/23/88		7/23/88	0.01	8/30/88	0.00	8/30/88	0.02
7/24/88		7/24/88	0.01	8/31/88	0.00	8/31/88	0.02
7/25/88		7/25/88	0.01	9/1/88	0.01	9/1/88	0.02
7/26/88		7/26/88	0.01	9/2/88	0.02	9/2/88	0.03
7/27/88		7/27/88	0.01	9/3/88	0.01	9/3/88	0.02
7/28/88		7/28/88	0.01	9/4/88	0.00	9/4/88	0.02
7/29/88		7/29/88	0.01	9/5/88	0.00	9/5/88	0.01
7/30/88		7/30/88	0.01	9/6/88	0.00	9/6/88	0.01
7/31/88		7/31/88	0.01	9/7/88	0.00	9/7/88	0.01
8/1/88		8/1/88	0.01	9/8/88	0.00	9/8/88	0.01
8/2/88		8/2/88	0.01	9/9/88		9/9/88	0.01
8/3/88		8/3/88	0.01	9/10/88		9/10/88	0.01
8/4/88	0.00	8/4/88	0.05	9/11/88		9/11/88	0.01
8/5/88	0.16	8/5/88	0.19	9/12/88	0.00	9/12/88	0.01
8/6/88	0.05	8/6/88	0.08	9/13/88	0.00	9/13/88	0.02
8/7/88	0.04	8/7/88	0.06	9/14/88	0.01	9/14/88	0.02
8/8/88	0.03	8/8/88	0.07	9/15/88	0.01	9/15/88	0.02
8/9/88	0.03	8/9/88	0.05	9/16/88	0.01	9/16/88	0.02
8/10/88	0.02	8/10/88	0.05	9/17/88	0.00	9/17/88	0.02
8/11/88	0.02	8/11/88	0.04	9/18/88	0.00	9/18/88	0.01
8/12/88	0.01	8/12/88	0.03	9/19/88	0.00	9/19/88	0.01
8/13/88	0.01	8/13/88	0.03	9/20/88	0.00	9/20/88	0.01
8/14/88	0.01	8/14/88	0.03	9/21/88	0.00	9/21/88	0.01
8/15/88	0.01	8/15/88	0.02	9/22/88	0.00	9/22/88	0.01
8/16/88	0.00	8/16/88	0.02	9/23/88	0.00	9/23/88	0.01
8/17/88	0.01	8/17/88	0.03	9/24/88	0.00	9/24/88	0.01
8/18/88	0.02	8/18/88	0.04	9/25/88	0.00	9/25/88	0.01
8/19/88	0.01	8/19/88	0.03	9/26/88	0.00	9/26/88	0.01
8/20/88	0.01	8/20/88	0.03	9/27/88	0.00	9/27/88	0.01
8/21/88	0.00	8/21/88	0.02	9/28/88	0.00	9/28/88	0.01
8/22/88	0.00	8/22/88	0.02	9/29/88	0.00	9/29/88	0.01
8/23/88	0.00	8/23/88	0.03	9/30/88	0.00		
8/24/88	0.00	8/24/88	0.03	10/1/88	0.00		
8/25/88	0.00	8/25/88	0.02	10/2/88	0.00		
8/26/88	0.00	8/26/88	0.02	10/3/88	0.00		
8/27/88	0.00	8/27/88	0.02	10/4/88	0.00		

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
1/4/95	0.02			2/11/95	0.02		
1/5/95	0.02			2/12/95	0.02		
1/6/95	0.02			2/13/95	0.02		
1/7/95	0.02			2/14/95	0.03		
1/8/95	0.02			2/15/95	0.02		
1/9/95	0.02			2/16/95	0.02		
1/10/95	0.02			2/17/95	0.02		
1/11/95	0.02			2/18/95	0.02		
1/12/95	0.02			2/19/95	0.02		
1/13/95	0.02			2/20/95	0.02		
1/14/95	0.02			2/21/95	0.02		
1/15/95	0.02			2/22/95	0.02	2/22/95	0.02
1/16/95	0.02			2/23/95	0.02	2/23/95	0.02
1/17/95	0.02			2/24/95	0.02	2/24/95	0.02
1/18/95	0.02			2/25/95	0.02	2/25/95	0.02
1/19/95	0.02			2/26/95	0.02	2/26/95	0.02
1/20/95	0.02			2/27/95	0.02	2/27/95	0.02
1/21/95	0.02			2/28/95	0.02	2/28/95	0.02
1/22/95	0.02			3/1/95	0.02	3/1/95	0.01
1/23/95	0.02			3/2/95	0.02	3/2/95	0.01
1/24/95	0.02			3/3/95	0.02	3/3/95	0.01
1/25/95	0.01			3/4/95	0.03	3/4/95	0.01
1/26/95	0.02			3/5/95	0.02	3/5/95	0.02
1/27/95	0.02			3/6/95	0.02	3/6/95	0.02
1/28/95	0.01			3/7/95	0.02	3/7/95	0.02
1/29/95	0.01			3/8/95	0.02	3/8/95	0.02
1/30/95	0.01			3/9/95	0.02	3/9/95	0.02
1/31/95	0.01			3/10/95	0.02	3/10/95	0.03
2/1/95	0.01			3/11/95	0.03	3/11/95	0.04
2/2/95	0.01			3/12/95	0.03	3/12/95	0.04
2/3/95	0.01			3/13/95	0.03	3/13/95	0.03
2/4/95	0.01			3/14/95	0.03	3/14/95	0.03
2/5/95	0.01			3/15/95	0.02	3/15/95	0.03
2/6/95	0.01			3/16/95	0.03	3/16/95	0.04
2/7/95	0.01			3/17/95	0.03	3/17/95	0.05
2/8/95	0.02			3/18/95	0.03	3/18/95	0.05
2/9/95	0.02			3/19/95	0.03	3/19/95	0.05
2/10/95	0.01			3/20/95	0.03	3/20/95	0.04

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
3/21/95	0.02	3/21/95	0.04	4/28/95	0.28	4/28/95	0.42
3/22/95	0.02	3/22/95	0.04	4/29/95	0.48	4/29/95	0.76
3/23/95	0.02	3/23/95	0.04	4/30/95	0.91	4/30/95	0.99
3/24/95	0.02	3/24/95	0.04	5/1/95	0.93	5/1/95	1.39
3/25/95	0.02	3/25/95	0.04	5/2/95	0.59	5/2/95	1.25
3/26/95	0.02	3/26/95	0.04	5/3/95	0.68	5/3/95	1.22
3/27/95	0.02	3/27/95	0.04	5/4/95	0.57	5/4/95	1.10
3/28/95	0.02	3/28/95	0.03	5/5/95	0.74	5/5/95	1.19
3/29/95	0.02	3/29/95	0.04	5/6/95	1.05	5/6/95	1.27
3/30/95	0.02	3/30/95	0.04	5/7/95	0.93	5/7/95	1.27
3/31/95	0.02	3/31/95	0.04	5/8/95	0.71	5/8/95	1.10
4/1/95	0.02	4/1/95	0.04	5/9/95	0.54	5/9/95	0.93
4/2/95	0.02	4/2/95	0.04	5/10/95	0.48	5/10/95	0.82
4/3/95	0.02	4/3/95	0.04	5/11/95	0.48	5/11/95	0.79
4/4/95	0.02	4/4/95	0.04	5/12/95	0.54	5/12/95	0.82
4/5/95	0.02	4/5/95	0.05	5/13/95	0.54	5/13/95	0.82
4/6/95	0.02	4/6/95	0.05	5/14/95	0.48	5/14/95	0.76
4/7/95	0.02	4/7/95	0.05	5/15/95	0.42	5/15/95	0.76
4/8/95	0.02	4/8/95	0.05	5/16/95	0.42	5/16/95	0.76
4/9/95	0.02	4/9/95	0.06	5/17/95	1.61	5/17/95	2.27
4/10/95	0.02	4/10/95	0.05	5/18/95	1.50	5/18/95	2.83
4/11/95	0.02	4/11/95	0.06	5/19/95	1.36	5/19/95	3.26
4/12/95	0.03	4/12/95	0.07	5/20/95	1.19	5/20/95	3.54
4/13/95	0.04	4/13/95	0.09	5/21/95	1.13	5/21/95	3.82
4/14/95	0.04	4/14/95	0.11	5/22/95	1.05	5/22/95	3.40
4/15/95	0.05	4/15/95	0.11	5/23/95	0.79	5/23/95	2.89
4/16/95	0.05	4/16/95	0.12	5/24/95	0.62	5/24/95	2.49
4/17/95	0.05	4/17/95	0.13	5/25/95	0.82	5/25/95	2.12
4/18/95	0.05	4/18/95	0.14	5/26/95	1.19	5/26/95	2.21
4/19/95	0.06	4/19/95	0.12	5/27/95	1.02	5/27/95	1.84
4/20/95	0.08	4/20/95	0.15	5/28/95	0.85	5/28/95	1.70
4/21/95	0.08	4/21/95	0.04	5/29/95	2.83	5/29/95	5.66
4/22/95	0.09	4/22/95	0.12	5/30/95	4.96	5/30/95	10.76
4/23/95	0.09	4/23/95	0.17	5/31/95	3.26	5/31/95	6.51
4/24/95	0.10	4/24/95	0.19	6/1/95	2.55	6/1/95	3.96
4/25/95	0.15	4/25/95	0.21	6/2/95	1.93	6/2/95	3.11
4/26/95	0.20	4/26/95	0.28	6/3/95	1.67	6/3/95	2.69
4/27/95	0.18	4/27/95	0.28	6/4/95	1.50	6/4/95	2.41

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
6/5/95	1.36	6/5/95	2.27	7/13/95	0.08	7/13/95	0.13
6/6/95	1.25	6/6/95	1.98	7/14/95	0.08	7/14/95	0.13
6/7/95	1.13	6/7/95	1.70	7/15/95	0.08	7/15/95	0.13
6/8/95	1.08	6/8/95	1.56	7/16/95	0.08	7/16/95	0.13
6/9/95	1.22	6/9/95	1.39	7/17/95	0.13	7/17/95	0.17
6/10/95	1.13	6/10/95	1.27	7/18/95	0.12	7/18/95	0.23
6/11/95	1.05	6/11/95	1.16	7/19/95	0.10	7/19/95	0.20
6/12/95	0.88	6/12/95	1.05	7/20/95	0.12	7/20/95	0.24
6/13/95	0.74	6/13/95	0.93	7/21/95	0.10	7/21/95	0.23
6/14/95	0.59	6/14/95	0.82	7/22/95	0.09	7/22/95	0.20
6/15/95	0.51	6/15/95	0.71	7/23/95	0.09	7/23/95	0.18
6/16/95	0.45	6/16/95	0.65	7/24/95	0.08	7/24/95	0.16
6/17/95	0.42	6/17/95	0.62	7/25/95	0.07	7/25/95	0.15
6/18/95	0.45	6/18/95	0.71	7/26/95	0.06	7/26/95	0.14
6/19/95	0.34	6/19/95	0.62	7/27/95	0.06	7/27/95	0.12
6/20/95	0.28	6/20/95	0.54	7/28/95	0.05	7/28/95	0.12
6/21/95	0.25	6/21/95	0.45	7/29/95	0.05	7/29/95	0.11
6/22/95	0.23	6/22/95	0.40	7/30/95	0.05	7/30/95	0.09
6/23/95	0.22	6/23/95	0.34	7/31/95	0.05	7/31/95	0.09
6/24/95	0.21	6/24/95	0.34	8/1/95	0.05	8/1/95	0.09
6/25/95	0.20	6/25/95	0.31	8/2/95	0.05	8/2/95	0.08
6/26/95	0.16	6/26/95	0.28	8/3/95	0.04	8/3/95	0.08
6/27/95	0.14	6/27/95	0.27	8/4/95	0.04	8/4/95	0.07
6/28/95	0.14	6/28/95	0.25	8/5/95	0.04	8/5/95	0.07
6/29/95	0.16	6/29/95	0.25	8/6/95	0.04	8/6/95	0.07
6/30/95	0.20	6/30/95	0.25	8/7/95	0.04	8/7/95	0.06
7/1/95	0.24	7/1/95	0.25	8/8/95	0.04	8/8/95	0.06
7/2/95	0.23	7/2/95	0.25	8/9/95	0.04	8/9/95	0.17
7/3/95	0.20	7/3/95	0.24	8/10/95	0.03	8/10/95	0.08
7/4/95	0.20	7/4/95	0.23	8/11/95	0.03	8/11/95	0.07
7/5/95	0.17	7/5/95	0.22	8/12/95	0.04	8/12/95	0.10
7/6/95	0.14	7/6/95	0.20	8/13/95	0.05	8/13/95	0.14
7/7/95	0.13	7/7/95	0.18	8/14/95	0.05	8/14/95	0.16
7/8/95	0.12	7/8/95	0.17	8/15/95	0.05	8/15/95	0.15
7/9/95	0.12	7/9/95	0.16	8/16/95	0.04	8/16/95	0.13
7/10/95	0.10	7/10/95	0.15	8/17/95	0.03	8/17/95	0.10
7/11/95	0.10	7/11/95	0.14	8/18/95	0.03	8/18/95	0.09
7/12/95	0.09	7/12/95	0.14	8/19/95	0.17	8/19/95	0.28

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
8/20/95	0.07	8/20/95	0.18	9/27/95	0.02	9/27/95	0.03
8/21/95	0.05	8/21/95	0.13	9/28/95	0.01	9/28/95	0.03
8/22/95	0.04	8/22/95	0.11	9/29/95	0.02	9/29/95	0.03
8/23/95	0.04	8/23/95	0.10	9/30/95	0.02	9/30/95	0.03
8/24/95	0.03	8/24/95	0.09	10/1/95	0.02	10/1/95	0.03
8/25/95	0.03	8/25/95	0.08	10/2/95	0.02	10/2/95	0.03
8/26/95	0.03	8/26/95	0.11	10/3/95	0.01	10/3/95	0.03
8/27/95	0.03	8/27/95	0.09	10/4/95	0.02	10/4/95	0.03
8/28/95	0.03	8/28/95	0.08	10/5/95	0.02	10/5/95	0.03
8/29/95	0.02	8/29/95	0.07	10/6/95	0.02	10/6/95	0.03
8/30/95	0.02	8/30/95	0.06	10/7/95	0.02	10/7/95	0.03
8/31/95	0.02	8/31/95	0.06	10/8/95	0.02	10/8/95	0.03
9/1/95	0.02	9/1/95	0.05	10/9/95	0.02	10/9/95	0.03
9/2/95	0.01	9/2/95	0.05	10/10/95	0.02	10/10/95	0.03
9/3/95	0.01	9/3/95	0.05	10/11/95	0.02	10/11/95	0.03
9/4/95	0.02	9/4/95	0.04	10/12/95	0.02	10/12/95	0.03
9/5/95	0.01	9/5/95	0.04	10/13/95	0.02	10/13/95	0.02
9/6/95	0.01	9/6/95	0.04	10/14/95	0.02	10/14/95	0.02
9/7/95	0.02	9/7/95	0.04	10/15/95	0.02	10/15/95	0.02
9/8/95	0.03	9/8/95	0.05	10/16/95	0.02	10/16/95	0.02
9/9/95	0.05	9/9/95	0.08	10/17/95	0.02	10/17/95	0.03
9/10/95	0.07	9/10/95	0.13	10/18/95	0.02	10/18/95	0.03
9/11/95	0.05	9/11/95	0.10	10/19/95	0.03	10/19/95	0.03
9/12/95	0.04	9/12/95	0.07	10/20/95	0.03	10/20/95	0.02
9/13/95	0.03	9/13/95	0.06	10/21/95	0.03	10/21/95	0.02
9/14/95	0.02	9/14/95	0.05	10/22/95	0.03	10/22/95	0.02
9/15/95	0.02	9/15/95	0.04	10/23/95	0.03	10/23/95	0.02
9/16/95	0.02	9/16/95	0.04	10/24/95	0.03	10/24/95	0.02
9/17/95	0.02	9/17/95	0.04	10/25/95	0.03	10/25/95	0.02
9/18/95	0.02	9/18/95	0.04	10/26/95	0.03	10/26/95	0.02
9/19/95	0.02	9/19/95	0.04	10/27/95	0.02	10/27/95	0.02
9/20/95	0.02	9/20/95	0.04	10/28/95	0.02	10/28/95	0.02
9/21/95	0.03	9/21/95	0.04	10/29/95	0.02	10/29/95	0.02
9/22/95	0.03	9/22/95	0.04	10/30/95	0.02	10/30/95	0.02
9/23/95	0.03	9/23/95	0.04	10/31/95	0.02	10/31/95	0.02
9/24/95	0.02	9/24/95	0.04	11/1/95	0.02	11/1/95	0.02
9/25/95	0.02	9/25/95	0.04	11/2/95	0.02	11/2/95	0.02
9/26/95	0.02	9/26/95	0.03	11/3/95	0.02	11/3/95	0.02

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
11/4/95	0.02	11/4/95	0.03	12/12/95	0.01	12/12/95	0.03
11/5/95	0.02	11/5/95	0.03	12/13/95	0.01	12/13/95	0.03
11/6/95	0.02	11/6/95	0.03	12/14/95	0.01	12/14/95	0.02
11/7/95	0.02	11/7/95	0.03	12/15/95	0.01	12/15/95	0.02
11/8/95	0.02	11/8/95	0.03	12/16/95	0.01	12/16/95	0.02
11/9/95	0.02	11/9/95	0.03	12/17/95	0.01	12/17/95	0.02
11/10/95	0.02	11/10/95	0.03	12/18/95	0.01	12/18/95	0.02
11/11/95	0.01	11/11/95	0.03	12/19/95	0.01	12/19/95	0.02
11/12/95	0.01	11/12/95	0.02	12/20/95	0.01	12/20/95	0.02
11/13/95	0.02	11/13/95	0.02	12/21/95	0.01	12/21/95	0.02
11/14/95	0.02	11/14/95	0.03	12/22/95	0.01	12/22/95	0.02
11/15/95	0.02	11/15/95	0.03	12/23/95	0.01	12/23/95	0.02
11/16/95	0.01	11/16/95	0.03	12/24/95	0.01	12/24/95	0.02
11/17/95	0.01	11/17/95	0.03	12/25/95	0.01	12/25/95	0.02
11/18/95	0.02	11/18/95	0.03	12/26/95	0.01	12/26/95	0.02
11/19/95	0.02	11/19/95	0.03	12/27/95	0.01	12/27/95	0.02
11/20/95	0.01	11/20/95	0.03	12/28/95	0.01	12/28/95	0.02
11/21/95	0.02	11/21/95	0.03	12/29/95	0.01	12/29/95	0.02
11/22/95	0.02	11/22/95	0.03	12/30/95	0.01	12/30/95	0.02
11/23/95	0.02	11/23/95	0.03	12/31/95	0.01	12/31/95	0.02
11/24/95	0.02	11/24/95	0.03	1/1/96	0.01	1/1/96	0.02
11/25/95	0.01	11/25/95	0.03	1/2/96	0.01	1/2/96	0.02
11/26/95	0.01	11/26/95	0.03	1/3/96	0.01	1/3/96	0.02
11/27/95	0.01	11/27/95	0.03	1/4/96	0.01	1/4/96	0.02
11/28/95	0.01	11/28/95	0.02	1/5/96	0.01	1/5/96	0.02
11/29/95	0.01	11/29/95	0.02	1/6/96	0.01	1/6/96	0.02
11/30/95	0.01	11/30/95	0.03	1/7/96	0.01	1/7/96	0.02
12/1/95	0.01	12/1/95	0.03	1/8/96	0.01	1/8/96	0.02
12/2/95	0.01	12/2/95	0.03	1/9/96	0.01	1/9/96	0.02
12/3/95	0.01	12/3/95	0.03	1/10/96	0.01	1/10/96	0.02
12/4/95	0.01	12/4/95	0.02	1/11/96	0.01	1/11/96	0.02
12/5/95	0.01	12/5/95	0.02	1/12/96	0.01	1/12/96	0.02
12/6/95	0.01	12/6/95	0.02	1/13/96	0.01	1/13/96	0.02
12/7/95	0.01	12/7/95	0.02	1/14/96	0.01	1/14/96	0.02
12/8/95	0.01	12/8/95	0.02	1/15/96	0.01	1/15/96	0.02
12/9/95	0.01	12/9/95	0.01	1/16/96	0.01	1/16/96	0.02
12/10/95	0.01	12/10/95	0.02	1/17/96	0.01	1/17/96	0.03
12/11/95	0.01	12/11/95	0.03	1/18/96	0.01	1/18/96	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
1/19/96	0.01	1/19/96	0.03	2/26/96	0.01	2/26/96	0.02
1/20/96	0.01	1/20/96	0.03	2/27/96	0.01	2/27/96	0.03
1/21/96	0.01	1/21/96	0.03	2/28/96	0.01	2/28/96	0.02
1/22/96	0.01	1/22/96	0.03	2/29/96	0.01	2/29/96	0.02
1/23/96	0.01	1/23/96	0.03	3/1/96	0.01	3/1/96	0.02
1/24/96	0.01	1/24/96	0.03	3/2/96	0.01	3/2/96	0.02
1/25/96	0.01	1/25/96	0.03	3/3/96	0.01	3/3/96	0.02
1/26/96	0.01	1/26/96	0.03	3/4/96	0.01	3/4/96	0.02
1/27/96	0.01	1/27/96	0.03	3/5/96	0.01	3/5/96	0.02
1/28/96	0.01	1/28/96	0.03	3/6/96	0.01	3/6/96	0.02
1/29/96	0.01	1/29/96	0.03	3/7/96	0.01	3/7/96	0.02
1/30/96	0.01	1/30/96	0.03	3/8/96	0.01	3/8/96	0.02
1/31/96	0.01	1/31/96	0.03	3/9/96	0.01	3/9/96	0.02
2/1/96	0.01	2/1/96	0.02	3/10/96	0.01	3/10/96	0.03
2/2/96	0.01	2/2/96	0.02	3/11/96	0.01	3/11/96	0.03
2/3/96	0.01	2/3/96	0.02	3/12/96	0.01	3/12/96	0.03
2/4/96	0.01	2/4/96	0.01	3/13/96	0.01	3/13/96	0.02
2/5/96	0.01	2/5/96	0.02	3/14/96	0.01	3/14/96	0.02
2/6/96	0.01	2/6/96	0.02	3/15/96	0.01	3/15/96	0.02
2/7/96	0.01	2/7/96	0.03	3/16/96	0.01	3/16/96	0.02
2/8/96	0.01	2/8/96	0.03	3/17/96	0.01	3/17/96	0.02
2/9/96	0.01	2/9/96	0.03	3/18/96	0.01	3/18/96	0.02
2/10/96	0.01	2/10/96	0.03	3/19/96	0.01	3/19/96	0.03
2/11/96	0.01	2/11/96	0.03	3/20/96	0.01	3/20/96	0.03
2/12/96	0.01	2/12/96	0.03	3/21/96	0.01	3/21/96	0.03
2/13/96	0.01	2/13/96	0.03	3/22/96	0.01	3/22/96	0.03
2/14/96	0.01	2/14/96	0.03	3/23/96	0.02	3/23/96	0.03
2/15/96	0.01	2/15/96	0.03	3/24/96	0.02	3/24/96	0.03
2/16/96	0.01	2/16/96	0.03	3/25/96	0.01	3/25/96	0.02
2/17/96	0.01	2/17/96	0.03	3/26/96	0.02	3/26/96	0.02
2/18/96	0.01	2/18/96	0.03	3/27/96	0.02	3/27/96	0.02
2/19/96	0.01	2/19/96	0.03	3/28/96	0.01	3/28/96	0.03
2/20/96	0.01	2/20/96	0.03	3/29/96	0.02	3/29/96	0.03
2/21/96	0.01	2/21/96	0.03	3/30/96	0.02	3/30/96	0.03
2/22/96	0.02	2/22/96	0.03	3/31/96	0.02	3/31/96	0.03
2/23/96	0.01	2/23/96	0.03	4/1/96	0.01	4/1/96	0.03
2/24/96	0.01	2/24/96	0.03	4/2/96	0.01	4/2/96	0.03
2/25/96	0.01	2/25/96	0.03	4/3/96	0.02	4/3/96	0.04

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
4/4/96	0.02	4/4/96	0.04	5/12/96	0.01	5/12/96	0.03
4/5/96	0.02	4/5/96	0.04	5/13/96	0.01	5/13/96	0.03
4/6/96	0.02	4/6/96	0.04	5/14/96	0.00	5/14/96	0.02
4/7/96	0.03	4/7/96	0.05	5/15/96	0.00	5/15/96	0.02
4/8/96	0.03	4/8/96	0.05	5/16/96	0.00	5/16/96	0.02
4/9/96	0.03	4/9/96	0.06	5/17/96	0.00	5/17/96	0.02
4/10/96	0.03	4/10/96	0.06	5/18/96	0.00	5/18/96	0.02
4/11/96	0.03	4/11/96	0.06	5/19/96	0.00	5/19/96	0.02
4/12/96	0.03	4/12/96	0.06	5/20/96	0.00	5/20/96	0.02
4/13/96	0.03	4/13/96	0.05	5/21/96	0.00	5/21/96	0.02
4/14/96	0.03	4/14/96	0.05	5/22/96	0.00	5/22/96	0.02
4/15/96	0.02	4/15/96	0.05	5/23/96	0.00	5/23/96	0.01
4/16/96	0.02	4/16/96	0.05	5/24/96	0.00	5/24/96	0.02
4/17/96	0.02	4/17/96	0.05	5/25/96	0.02	5/25/96	0.05
4/18/96	0.02	4/18/96	0.04	5/26/96	0.08	5/26/96	0.16
4/19/96	0.01	4/19/96	0.04	5/27/96	0.05	5/27/96	0.13
4/20/96	0.01	4/20/96	0.04	5/28/96	0.04	5/28/96	0.11
4/21/96	0.01	4/21/96	0.04	5/29/96	0.03	5/29/96	0.09
4/22/96	0.01	4/22/96	0.04	5/30/96	0.03	5/30/96	0.08
4/23/96	0.01	4/23/96	0.04	5/31/96	0.02	5/31/96	0.08
4/24/96	0.01	4/24/96	0.04	6/1/96	0.02	6/1/96	0.08
4/25/96	0.01	4/25/96	0.04	6/2/96	0.02	6/2/96	0.06
4/26/96	0.01	4/26/96	0.04	6/3/96	0.02	6/3/96	0.05
4/27/96	0.01	4/27/96	0.03	6/4/96	0.01	6/4/96	0.05
4/28/96	0.01	4/28/96	0.04	6/5/96	0.01	6/5/96	0.04
4/29/96	0.01	4/29/96	0.04	6/6/96	0.01	6/6/96	0.04
4/30/96	0.01	4/30/96	0.03	6/7/96	0.01	6/7/96	0.03
5/1/96	0.01	5/1/96	0.03	6/8/96	0.01	6/8/96	0.03
5/2/96	0.01	5/2/96	0.03	6/9/96	0.01	6/9/96	0.03
5/3/96	0.01	5/3/96	0.03	6/10/96	0.01	6/10/96	0.03
5/4/96	0.01	5/4/96	0.03	6/11/96	0.01	6/11/96	0.03
5/5/96	0.01	5/5/96	0.03	6/12/96	0.01	6/12/96	0.03
5/6/96	0.00	5/6/96	0.03	6/13/96	0.01	6/13/96	0.03
5/7/96	0.00	5/7/96	0.03	6/14/96	0.01	6/14/96	0.03
5/8/96	0.00	5/8/96	0.03	6/15/96	0.02	6/15/96	0.05
5/9/96	0.00	5/9/96	0.03	6/16/96	0.02	6/16/96	0.06
5/10/96	0.01	5/10/96	0.03	6/17/96	0.01	6/17/96	0.04
5/11/96	0.01	5/11/96	0.03	6/18/96	0.01	6/18/96	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
6/19/96	0.01	6/19/96	0.03	7/27/96	0.02	7/27/96	0.03
6/20/96	0.01	6/20/96	0.03	7/28/96	0.02	7/28/96	0.03
6/21/96	0.01	6/21/96	0.02	7/29/96	0.02	7/29/96	0.03
6/22/96	0.01	6/22/96	0.03	7/30/96	0.02	7/30/96	0.03
6/23/96	0.01	6/23/96	0.02	7/31/96	0.03	7/31/96	0.03
6/24/96	0.00	6/24/96	0.02	8/1/96	0.03	8/1/96	0.03
6/25/96	0.00	6/25/96	0.02	8/2/96	0.02	8/2/96	0.02
6/26/96	0.00	6/26/96	0.02	8/3/96	0.02	8/3/96	0.02
6/27/96	0.00	6/27/96	0.02	8/4/96	0.02	8/4/96	0.02
6/28/96	0.00	6/28/96	0.02	8/5/96	0.01	8/5/96	0.02
6/29/96	0.00	6/29/96	0.02	8/6/96	0.01	8/6/96	0.02
6/30/96	0.00	6/30/96	0.02	8/7/96	0.01	8/7/96	0.01
7/1/96	0.00	7/1/96	0.02	8/8/96	0.01	8/8/96	0.03
7/2/96	0.00	7/2/96	0.02	8/9/96	0.04	8/9/96	0.13
7/3/96	0.00	7/3/96	0.02	8/10/96	0.03	8/10/96	0.06
7/4/96	0.00	7/4/96	0.01	8/11/96	0.02	8/11/96	0.04
7/5/96	0.00	7/5/96	0.01	8/12/96	0.02	8/12/96	0.04
7/6/96	0.00	7/6/96	0.01	8/13/96	0.01	8/13/96	0.03
7/7/96	0.00	7/7/96	0.01	8/14/96	0.01	8/14/96	0.03
7/8/96	0.00	7/8/96	0.01	8/15/96	0.01	8/15/96	0.03
7/9/96	0.12	7/9/96	0.05	8/16/96	0.01	8/16/96	0.03
7/10/96	0.57	7/10/96	0.25	8/17/96	0.01	8/17/96	0.03
7/11/96	0.12	7/11/96	0.09	8/18/96	0.00	8/18/96	0.02
7/12/96	0.08	7/12/96	0.07	8/19/96	0.01	8/19/96	0.03
7/13/96	0.08	7/13/96	0.08	8/20/96	0.01	8/20/96	0.02
7/14/96	0.09	7/14/96	0.08	8/21/96	0.00	8/21/96	0.02
7/15/96	0.07	7/15/96	0.08	8/22/96	0.00	8/22/96	0.02
7/16/96	0.06	7/16/96	0.07	8/23/96	0.08	8/23/96	0.05
7/17/96	0.05	7/17/96	0.06	8/24/96	0.12	8/24/96	0.07
7/18/96	0.05	7/18/96	0.06	8/25/96	0.06	8/25/96	0.04
7/19/96	0.06	7/19/96	0.06	8/26/96	0.05	8/26/96	0.04
7/20/96	0.05	7/20/96	0.05	8/27/96	0.21	8/27/96	0.09
7/21/96	0.04	7/21/96	0.04	8/28/96	0.42	8/28/96	0.16
7/22/96	0.04	7/22/96	0.03	8/29/96	0.31	8/29/96	0.12
7/23/96	0.03	7/23/96	0.03	8/30/96	0.28	8/30/96	0.12
7/24/96	0.03	7/24/96	0.03	8/31/96	0.21	8/31/96	0.09
7/25/96	0.03	7/25/96	0.03	9/1/96	0.16	9/1/96	0.08
7/26/96	0.02	7/26/96	0.03	9/2/96	0.12	9/2/96	0.07

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
9/3/96	0.10	9/3/96	0.05	10/11/96	0.02	10/11/96	0.03
9/4/96	0.08	9/4/96	0.05	10/12/96	0.02	10/12/96	0.03
9/5/96	0.06	9/5/96	0.04	10/13/96	0.02	10/13/96	0.03
9/6/96	0.06	9/6/96	0.04	10/14/96	0.02	10/14/96	0.02
9/7/96	0.05	9/7/96	0.05	10/15/96	0.02	10/15/96	0.02
9/8/96	0.05	9/8/96	0.04	10/16/96	0.02	10/16/96	0.02
9/9/96	0.03	9/9/96	0.03	10/17/96	0.02	10/17/96	0.02
9/10/96	0.03	9/10/96	0.03	10/18/96	0.02	10/18/96	0.02
9/11/96	0.02	9/11/96	0.03	10/19/96	0.02	10/19/96	0.02
9/12/96	0.02	9/12/96	0.03	10/20/96	0.02	10/20/96	0.02
9/13/96	0.03	9/13/96	0.03	10/21/96	0.02	10/21/96	0.03
9/14/96	0.03	9/14/96	0.03	10/22/96	0.02	10/22/96	0.02
9/15/96	0.03	9/15/96	0.04	10/23/96	0.02	10/23/96	0.02
9/16/96	0.02	9/16/96	0.03	10/24/96	0.02	10/24/96	0.02
9/17/96	0.03	9/17/96	0.03	10/25/96	0.02	10/25/96	0.02
9/18/96	0.05	9/18/96	0.03	10/26/96	0.02	10/26/96	0.02
9/19/96	0.05	9/19/96	0.04	10/27/96	0.02	10/27/96	0.03
9/20/96	0.03	9/20/96	0.03	10/28/96	0.02	10/28/96	0.03
9/21/96	0.03	9/21/96	0.03	10/29/96	0.02	10/29/96	0.03
9/22/96	0.02	9/22/96	0.03	10/30/96	0.02	10/30/96	0.03
9/23/96	0.02	9/23/96	0.03	10/31/96	0.02	10/31/96	0.03
9/24/96	0.03	9/24/96	0.04	11/1/96	0.02	11/1/96	0.03
9/25/96	0.03	9/25/96	0.04	11/2/96	0.02	11/2/96	0.02
9/26/96	0.03	9/26/96	0.04	11/3/96	0.02	11/3/96	0.02
9/27/96	0.04	9/27/96	0.04	11/4/96	0.02	11/4/96	0.02
9/28/96	0.05	9/28/96	0.05	11/5/96	0.02	11/5/96	0.02
9/29/96	0.05	9/29/96	0.05	11/6/96	0.02	11/6/96	0.02
9/30/96	0.05	9/30/96	0.06	11/7/96	0.02	11/7/96	0.02
10/1/96	0.04	10/1/96	0.05	11/8/96	0.01	11/8/96	0.02
10/2/96	0.04	10/2/96	0.05	11/9/96	0.02	11/9/96	0.02
10/3/96	0.04	10/3/96	0.05	11/10/96	0.02	11/10/96	0.02
10/4/96	0.04	10/4/96	0.05	11/11/96	0.02	11/11/96	0.02
10/5/96	0.03	10/5/96	0.05	11/12/96	0.02	11/12/96	0.02
10/6/96	0.03	10/6/96	0.04	11/13/96	0.01	11/13/96	0.02
10/7/96	0.03	10/7/96	0.04	11/14/96	0.01	11/14/96	0.02
10/8/96	0.03	10/8/96	0.04	11/15/96	0.01	11/15/96	0.02
10/9/96	0.02	10/9/96	0.03	11/16/96	0.01	11/16/96	0.02
10/10/96	0.02	10/10/96	0.03	11/17/96	0.01	11/17/96	0.02

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
11/18/96	0.01	11/18/96	0.03	12/26/96	0.02	12/26/96	0.03
11/19/96	0.01	11/19/96	0.03	12/27/96	0.02	12/27/96	0.03
11/20/96	0.01	11/20/96	0.03	12/28/96	0.01	12/28/96	0.03
11/21/96	0.01	11/21/96	0.03	12/29/96	0.02	12/29/96	0.03
11/22/96	0.01	11/22/96	0.03	12/30/96	0.02	12/30/96	0.03
11/23/96	0.01	11/23/96	0.03	12/31/96	0.02	12/31/96	0.03
11/24/96	0.02	11/24/96	0.03	1/1/97	0.02	1/1/97	0.03
11/25/96	0.02	11/25/96	0.03	1/2/97	0.02	1/2/97	0.03
11/26/96	0.01	11/26/96	0.03	1/3/97	0.02	1/3/97	0.03
11/27/96	0.01	11/27/96	0.03	1/4/97	0.02	1/4/97	0.03
11/28/96	0.01	11/28/96	0.03	1/5/97	0.02	1/5/97	0.02
11/29/96	0.01	11/29/96	0.03	1/6/97	0.01	1/6/97	0.01
11/30/96	0.01	11/30/96	0.03	1/7/97	0.01	1/7/97	0.02
12/1/96	0.01	12/1/96	0.03	1/8/97	0.01	1/8/97	0.02
12/2/96	0.01	12/2/96	0.03	1/9/97	0.01	1/9/97	0.01
12/3/96	0.01	12/3/96	0.03	1/10/97	0.01	1/10/97	0.01
12/4/96	0.01	12/4/96	0.03	1/11/97	0.01	1/11/97	0.01
12/5/96	0.01	12/5/96	0.03	1/12/97	0.01	1/12/97	0.01
12/6/96	0.01	12/6/96	0.03	1/13/97	0.01	1/13/97	0.01
12/7/96	0.01	12/7/96	0.03	1/14/97	0.01	1/14/97	0.01
12/8/96	0.01	12/8/96	0.03	1/15/97	0.01	1/15/97	0.01
12/9/96	0.01	12/9/96	0.03	1/16/97	0.01	1/16/97	0.01
12/10/96	0.01	12/10/96	0.03	1/17/97	0.01	1/17/97	0.01
12/11/96	0.01	12/11/96	0.03	1/18/97	0.01	1/18/97	0.01
12/12/96	0.01	12/12/96	0.03	1/19/97	0.01	1/19/97	0.01
12/13/96	0.01	12/13/96	0.03	1/20/97	0.01	1/20/97	0.01
12/14/96	0.01	12/14/96	0.03	1/21/97	0.01	1/21/97	0.02
12/15/96	0.01	12/15/96	0.02	1/22/97	0.01	1/22/97	0.02
12/16/96	0.01	12/16/96	0.02	1/23/97	0.01	1/23/97	0.01
12/17/96	0.01	12/17/96	0.02	1/24/97	0.01	1/24/97	0.01
12/18/96	0.01	12/18/96	0.02	1/25/97	0.01	1/25/97	0.01
12/19/96	0.01	12/19/96	0.02	1/26/97	0.01	1/26/97	0.02
12/20/96	0.02	12/20/96	0.02	1/27/97	0.01	1/27/97	0.02
12/21/96	0.02	12/21/96	0.02	1/28/97	0.01	1/28/97	0.02
12/22/96	0.02	12/22/96	0.02	1/29/97	0.01	1/29/97	0.02
12/23/96	0.01	12/23/96	0.03	1/30/97	0.01	1/30/97	0.02
12/24/96	0.01	12/24/96	0.03	1/31/97	0.01	1/31/97	0.02
12/25/96	0.02	12/25/96	0.03	2/1/97	0.01	2/1/97	0.02

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
2/2/97	0.01	2/2/97	0.02	3/12/97	0.01	3/12/97	0.03
2/3/97	0.01	2/3/97	0.02	3/13/97	0.01	3/13/97	0.03
2/4/97	0.01	2/4/97	0.02	3/14/97	0.01	3/14/97	0.02
2/5/97	0.01	2/5/97	0.02	3/15/97	0.02	3/15/97	0.02
2/6/97	0.01	2/6/97	0.02	3/16/97	0.02	3/16/97	0.03
2/7/97	0.01	2/7/97	0.02	3/17/97	0.02	3/17/97	0.03
2/8/97	0.01	2/8/97	0.02	3/18/97	0.02	3/18/97	0.03
2/9/97	0.01	2/9/97	0.02	3/19/97	0.02	3/19/97	0.03
2/10/97	0.01	2/10/97	0.02	3/20/97	0.02	3/20/97	0.03
2/11/97	0.01	2/11/97	0.02	3/21/97	0.02	3/21/97	0.04
2/12/97	0.01	2/12/97	0.02	3/22/97	0.02	3/22/97	0.04
2/13/97	0.01	2/13/97	0.02	3/23/97	0.02	3/23/97	0.03
2/14/97	0.01	2/14/97	0.02	3/24/97	0.02	3/24/97	0.04
2/15/97	0.01	2/15/97	0.02	3/25/97	0.02	3/25/97	0.03
2/16/97	0.01	2/16/97	0.02	3/26/97	0.02	3/26/97	0.04
2/17/97	0.01	2/17/97	0.02	3/27/97	0.03	3/27/97	0.04
2/18/97	0.01	2/18/97	0.02	3/28/97	0.03	3/28/97	0.04
2/19/97	0.01	2/19/97	0.02	3/29/97	0.02	3/29/97	0.04
2/20/97	0.01	2/20/97	0.02	3/30/97	0.02	3/30/97	0.04
2/21/97	0.01	2/21/97	0.02	3/31/97	0.03	3/31/97	0.04
2/22/97	0.01	2/22/97	0.02	4/1/97	0.03	4/1/97	0.04
2/23/97	0.01	2/23/97	0.01	4/2/97	0.03	4/2/97	0.04
2/24/97	0.01	2/24/97	0.01	4/3/97	0.03	4/3/97	0.04
2/25/97	0.01	2/25/97	0.01	4/4/97	0.03	4/4/97	0.05
2/26/97	0.01	2/26/97	0.01	4/5/97	0.03	4/5/97	0.05
2/27/97	0.01	2/27/97	0.01	4/6/97	0.03	4/6/97	0.04
2/28/97	0.01	2/28/97	0.01	4/7/97	0.03	4/7/97	0.04
3/1/97	0.01	3/1/97	0.02	4/8/97	0.03	4/8/97	0.04
3/2/97	0.01	3/2/97	0.02	4/9/97	0.03	4/9/97	0.04
3/3/97	0.01	3/3/97	0.02	4/10/97	0.03	4/10/97	0.04
3/4/97	0.01	3/4/97	0.02	4/11/97	0.02	4/11/97	0.03
3/5/97	0.01	3/5/97	0.02	4/12/97	0.03	4/12/97	0.04
3/6/97	0.01	3/6/97	0.02	4/13/97	0.03	4/13/97	0.04
3/7/97	0.01	3/7/97	0.02	4/14/97	0.03	4/14/97	0.04
3/8/97	0.01	3/8/97	0.02	4/15/97	0.03	4/15/97	0.04
3/9/97	0.01	3/9/97	0.02	4/16/97	0.03	4/16/97	0.04
3/10/97	0.01	3/10/97	0.02	4/17/97	0.03	4/17/97	0.05
3/11/97	0.01	3/11/97	0.02	4/18/97	0.03	4/18/97	0.05

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
4/19/97	0.03	4/19/97	0.05	5/27/97	0.54	5/27/97	0.57
4/20/97	0.04	4/20/97	0.05	5/28/97	0.48	5/28/97	0.48
4/21/97	0.05	4/21/97	0.05	5/29/97	0.42	5/29/97	0.42
4/22/97	0.05	4/22/97	0.05	5/30/97	0.42	5/30/97	0.40
4/23/97	0.07	4/23/97	0.05	5/31/97	0.37	5/31/97	0.37
4/24/97	0.19	4/24/97	0.11	6/1/97	0.34	6/1/97	0.31
4/25/97	0.16	4/25/97	0.06	6/2/97	0.31	6/2/97	0.28
4/26/97	0.16	4/26/97	0.11	6/3/97	0.28	6/3/97	0.25
4/27/97	0.23	4/27/97	0.15	6/4/97	0.25	6/4/97	0.23
4/28/97	0.42	4/28/97	0.25	6/5/97	0.24	6/5/97	0.21
4/29/97	0.76	4/29/97	0.54	6/6/97	0.22	6/6/97	0.21
4/30/97	0.93	4/30/97	1.10	6/7/97	0.37	6/7/97	0.51
5/1/97	0.71	5/1/97	0.91	6/8/97	0.34	6/8/97	0.65
5/2/97	0.62	5/2/97	0.71	6/9/97	3.71	6/9/97	4.25
5/3/97	0.48	5/3/97	0.54	6/10/97	7.22	6/10/97	15.57
5/4/97	0.54	5/4/97	0.74	6/11/97	1.42	6/11/97	5.66
5/5/97	0.91	5/5/97	1.53	6/12/97	1.02	6/12/97	3.68
5/6/97	1.22	5/6/97	1.13	6/13/97	1.13	6/13/97	2.63
5/7/97	1.13	5/7/97	0.82	6/14/97	1.39	6/14/97	2.18
5/8/97	1.08	5/8/97	0.68	6/15/97	1.19	6/15/97	1.84
5/9/97	0.91	5/9/97	0.62	6/16/97	1.10	6/16/97	1.67
5/10/97	0.82	5/10/97	0.57	6/17/97	1.16	6/17/97	1.42
5/11/97	0.76	5/11/97	0.54	6/18/97	1.08	6/18/97	1.27
5/12/97	0.71	5/12/97	0.51	6/19/97	0.71	6/19/97	1.27
5/13/97	0.65	5/13/97	0.79	6/20/97	0.65	6/20/97	1.08
5/14/97	0.59	5/14/97	1.25	6/21/97	0.57	6/21/97	0.99
5/15/97	0.57	5/15/97	1.16	6/22/97	0.51	6/22/97	0.88
5/16/97	0.54	5/16/97	1.05	6/23/97	0.45	6/23/97	0.76
5/17/97	0.51	5/17/97	0.96	6/24/97	0.40	6/24/97	0.71
5/18/97	0.48	5/18/97	0.91	6/25/97	0.34	6/25/97	0.62
5/19/97	0.51	5/19/97	0.88	6/26/97	0.31	6/26/97	0.54
5/20/97	0.45	5/20/97	0.79	6/27/97	0.31	6/27/97	0.48
5/21/97	0.45	5/21/97	0.68	6/28/97	0.28	6/28/97	0.45
5/22/97	0.71	5/22/97	0.82	6/29/97	0.26	6/29/97	0.42
5/23/97	0.99	5/23/97	0.93	6/30/97	0.23	6/30/97	0.40
5/24/97	0.85	5/24/97	0.85	7/1/97	0.21	7/1/97	0.37
5/25/97	0.71	5/25/97	0.76	7/2/97	0.19	7/2/97	0.40
5/26/97	0.57	5/26/97	0.68	7/3/97	0.18	7/3/97	0.34

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
7/4/97	0.16	7/4/97	0.37	8/11/97	0.20	8/11/97	0.65
7/5/97	0.15	7/5/97	0.34	8/12/97	0.18	8/12/97	0.57
7/6/97	0.14	7/6/97	0.34	8/13/97	0.16	8/13/97	0.51
7/7/97	0.12	7/7/97	0.34	8/14/97	0.13	8/14/97	0.45
7/8/97	0.10	7/8/97	0.34	8/15/97	0.11	8/15/97	0.40
7/9/97	0.09	7/9/97	0.28	8/16/97	0.09	8/16/97	0.34
7/10/97	0.08	7/10/97	0.16	8/17/97	0.07	8/17/97	0.31
7/11/97	0.08	7/11/97	0.20	8/18/97	0.06	8/18/97	0.31
7/12/97	0.08	7/12/97	0.22	8/19/97	0.06	8/19/97	0.28
7/13/97	0.07	7/13/97	0.20	8/20/97	0.13	8/20/97	0.25
7/14/97	0.07	7/14/97	0.20	8/21/97	0.20	8/21/97	0.23
7/15/97	0.06	7/15/97	0.18	8/22/97	0.18	8/22/97	0.20
7/16/97	0.06	7/16/97	0.17	8/23/97	0.17	8/23/97	0.19
7/17/97	0.05	7/17/97	0.16	8/24/97	0.15	8/24/97	0.17
7/18/97	0.05	7/18/97	0.15	8/25/97	0.14	8/25/97	0.16
7/19/97	0.05	7/19/97	0.17	8/26/97	0.15	8/26/97	0.21
7/20/97	0.08	7/20/97	0.19	8/27/97	0.16	8/27/97	0.24
7/21/97	0.07	7/21/97	0.20	8/28/97	0.14	8/28/97	0.19
7/22/97	0.06	7/22/97	0.19	8/29/97	0.13	8/29/97	0.18
7/23/97	0.05	7/23/97	0.17	8/30/97	0.12	8/30/97	0.17
7/24/97	0.05	7/24/97	0.16	8/31/97	0.11	8/31/97	0.17
7/25/97	0.04	7/25/97	0.15	9/1/97	0.10	9/1/97	0.16
7/26/97	0.04	7/26/97	0.14	9/2/97	0.09	9/2/97	0.14
7/27/97	0.04	7/27/97	0.14	9/3/97	0.09	9/3/97	0.14
7/28/97	0.10	7/28/97	0.14	9/4/97	0.09	9/4/97	0.13
7/29/97	0.12	7/29/97	0.16	9/5/97	0.08	9/5/97	0.13
7/30/97	0.18	7/30/97	0.82	9/6/97	0.08	9/6/97	0.12
7/31/97	0.14	7/31/97	0.57	9/7/97	0.07	9/7/97	0.10
8/1/97	0.14	8/1/97	0.59	9/8/97	0.07	9/8/97	0.10
8/2/97	0.13	8/2/97	0.59	9/9/97	0.07	9/9/97	0.10
8/3/97	0.12	8/3/97	0.54	9/10/97	0.07	9/10/97	0.09
8/4/97	0.13	8/4/97	0.48	9/11/97	0.07	9/11/97	0.09
8/5/97	0.28	8/5/97	0.71	9/12/97	0.06	9/12/97	0.08
8/6/97	0.23	8/6/97	0.91	9/13/97	0.06	9/13/97	0.08
8/7/97	0.28	8/7/97	0.93	9/14/97	0.06	9/14/97	0.08
8/8/97	0.28	8/8/97	0.82	9/15/97	0.06	9/15/97	0.07
8/9/97	0.20	8/9/97	0.71	9/16/97	0.06	9/16/97	0.07
8/10/97	0.19	8/10/97	0.71	9/17/97	0.06	9/17/97	0.06

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
9/18/97	0.05	9/18/97	0.06	10/26/97	0.03	10/26/97	0.07
9/19/97	0.05	9/19/97	0.06	10/27/97	0.04	10/27/97	0.06
9/20/97	0.05	9/20/97	0.08	10/28/97	0.04	10/28/97	0.07
9/21/97	0.05	9/21/97	0.08	10/29/97	0.04	10/29/97	0.07
9/22/97	0.05	9/22/97	0.07	10/30/97	0.03	10/30/97	0.07
9/23/97	0.04	9/23/97	0.08	10/31/97	0.03	10/31/97	0.08
9/24/97	0.05	9/24/97	0.09	11/1/97	0.03	11/1/97	0.08
9/25/97	0.04	9/25/97	0.08	11/2/97	0.03	11/2/97	0.07
9/26/97	0.05	9/26/97	0.07	11/3/97	0.03	11/3/97	0.06
9/27/97	0.05	9/27/97	0.07	11/4/97	0.02	11/4/97	0.06
9/28/97	0.05	9/28/97	0.06	11/5/97	0.03	11/5/97	0.06
9/29/97	0.05	9/29/97	0.06	11/6/97	0.02	11/6/97	0.05
9/30/97	0.05	9/30/97	0.05	11/7/97	0.02	11/7/97	0.05
10/1/97	0.05	10/1/97	0.06	11/8/97	0.02	11/8/97	0.05
10/2/97	0.03	10/2/97	0.05	11/9/97	0.02	11/9/97	0.05
10/3/97	0.03	10/3/97	0.05	11/10/97	0.02	11/10/97	0.05
10/4/97	0.02	10/4/97	0.05	11/11/97	0.02	11/11/97	0.05
10/5/97	0.02	10/5/97	0.05	11/12/97	0.02	11/12/97	0.05
10/6/97	0.02	10/6/97	0.04	11/13/97	0.02	11/13/97	0.05
10/7/97	0.02	10/7/97	0.05	11/14/97	0.02	11/14/97	0.05
10/8/97	0.03	10/8/97	0.05	11/15/97	0.02	11/15/97	0.05
10/9/97	0.03	10/9/97	0.05	11/16/97	0.02	11/16/97	0.05
10/10/97	0.03	10/10/97	0.04	11/17/97	0.02	11/17/97	0.05
10/11/97	0.02	10/11/97	0.05	11/18/97	0.02	11/18/97	0.05
10/12/97	0.02	10/12/97	0.05	11/19/97	0.02	11/19/97	0.05
10/13/97	0.03	10/13/97	0.05	11/20/97	0.02	11/20/97	0.05
10/14/97	0.02	10/14/97	0.05	11/21/97	0.02	11/21/97	0.05
10/15/97	0.02	10/15/97	0.05	11/22/97	0.02	11/22/97	0.05
10/16/97	0.02	10/16/97	0.05	11/23/97	0.02	11/23/97	0.05
10/17/97	0.02	10/17/97	0.05	11/24/97	0.02	11/24/97	0.05
10/18/97	0.02	10/18/97	0.04	11/25/97	0.02	11/25/97	0.05
10/19/97	0.02	10/19/97	0.04	11/26/97	0.02	11/26/97	0.05
10/20/97	0.02	10/20/97	0.04	11/27/97	0.02	11/27/97	0.05
10/21/97	0.02	10/21/97	0.05	11/28/97	0.03	11/28/97	0.05
10/22/97	0.02	10/22/97	0.04	11/29/97	0.03	11/29/97	0.05
10/23/97	0.02	10/23/97	0.04	11/30/97	0.02	11/30/97	0.05
10/24/97	0.02	10/24/97	0.05	12/1/97	0.02	12/1/97	0.04
10/25/97	0.03	10/25/97	0.07	12/2/97	0.02	12/2/97	0.05

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
12/3/97	0.02	12/3/97	0.05	1/10/98	0.02	1/10/98	0.04
12/4/97	0.02	12/4/97	0.05	1/11/98	0.02	1/11/98	0.04
12/5/97	0.02	12/5/97	0.05	1/12/98	0.02	1/12/98	0.04
12/6/97	0.02	12/6/97	0.04	1/13/98	0.02	1/13/98	0.04
12/7/97	0.02	12/7/97	0.04	1/14/98	0.02	1/14/98	0.04
12/8/97	0.02	12/8/97	0.05	1/15/98	0.02	1/15/98	0.03
12/9/97	0.02	12/9/97	0.05	1/16/98	0.02	1/16/98	0.04
12/10/97	0.02	12/10/97	0.05	1/17/98	0.02	1/17/98	0.04
12/11/97	0.02	12/11/97	0.05	1/18/98	0.02	1/18/98	0.03
12/12/97	0.02	12/12/97	0.04	1/19/98	0.02	1/19/98	0.04
12/13/97	0.02	12/13/97	0.05	1/20/98	0.02	1/20/98	0.04
12/14/97	0.02	12/14/97	0.05	1/21/98	0.02	1/21/98	0.03
12/15/97	0.02	12/15/97	0.04	1/22/98	0.02	1/22/98	0.03
12/16/97	0.02	12/16/97	0.05	1/23/98	0.02	1/23/98	0.03
12/17/97	0.02	12/17/97	0.04	1/24/98	0.02	1/24/98	0.03
12/18/97	0.02	12/18/97	0.04	1/25/98	0.02	1/25/98	0.03
12/19/97	0.02	12/19/97	0.04	1/26/98	0.02	1/26/98	0.03
12/20/97	0.02	12/20/97	0.04	1/27/98	0.02	1/27/98	0.03
12/21/97	0.02	12/21/97	0.03	1/28/98	0.02	1/28/98	0.03
12/22/97	0.02	12/22/97	0.03	1/29/98	0.02	1/29/98	0.03
12/23/97	0.02	12/23/97	0.03	1/30/98	0.02	1/30/98	0.03
12/24/97	0.02	12/24/97	0.03	1/31/98	0.02	1/31/98	0.03
12/25/97	0.02	12/25/97	0.03	2/1/98	0.02	2/1/98	0.03
12/26/97	0.02	12/26/97	0.03	2/2/98	0.02	2/2/98	0.03
12/27/97	0.02	12/27/97	0.03	2/3/98	0.02	2/3/98	0.03
12/28/97	0.02	12/28/97	0.03	2/4/98	0.02	2/4/98	0.03
12/29/97	0.02	12/29/97	0.03	2/5/98	0.02	2/5/98	0.03
12/30/97	0.02	12/30/97	0.03	2/6/98	0.02	2/6/98	0.03
12/31/97	0.02	12/31/97	0.03	2/7/98	0.02	2/7/98	0.03
1/1/98	0.02	1/1/98	0.03	2/8/98	0.02	2/8/98	0.03
1/2/98	0.02	1/2/98	0.03	2/9/98	0.02	2/9/98	0.03
1/3/98	0.02	1/3/98	0.03	2/10/98	0.02	2/10/98	0.03
1/4/98	0.02	1/4/98	0.03	2/11/98	0.02	2/11/98	0.03
1/5/98	0.02	1/5/98	0.03	2/12/98	0.02	2/12/98	0.03
1/6/98	0.02	1/6/98	0.03	2/13/98	0.02	2/13/98	0.03
1/7/98	0.02	1/7/98	0.03	2/14/98	0.02	2/14/98	0.03
1/8/98	0.02	1/8/98	0.03	2/15/98	0.02	2/15/98	0.04
1/9/98	0.02	1/9/98	0.04	2/16/98	0.02	2/16/98	0.03

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
2/17/98	0.02	2/17/98	0.03	3/27/98	0.28	3/27/98	0.42
2/18/98	0.02	2/18/98	0.03	3/28/98	0.25	3/28/98	0.45
2/19/98	0.02	2/19/98	0.03	3/29/98	0.21	3/29/98	0.40
2/20/98	0.02	2/20/98	0.03	3/30/98	0.18	3/30/98	0.34
2/21/98	0.02	2/21/98	0.02	3/31/98	0.15	3/31/98	0.31
2/22/98	0.02	2/22/98	0.02	4/1/98	0.13	4/1/98	0.25
2/23/98	0.02	2/23/98	0.03	4/2/98	0.12	4/2/98	0.24
2/24/98	0.03	2/24/98	0.03	4/3/98	0.12	4/3/98	0.22
2/25/98	0.03	2/25/98	0.04	4/4/98	0.13	4/4/98	0.22
2/26/98	0.02	2/26/98	0.03	4/5/98	0.14	4/5/98	0.25
2/27/98	0.02	2/27/98	0.04	4/6/98	0.14	4/6/98	0.28
2/28/98	0.02	2/28/98	0.04	4/7/98	0.13	4/7/98	0.27
3/1/98	0.02	3/1/98	0.04	4/8/98	0.12	4/8/98	0.26
3/2/98	0.02	3/2/98	0.03	4/9/98	0.11	4/9/98	0.23
3/3/98	0.02	3/3/98	0.04	4/10/98	0.11	4/10/98	0.22
3/4/98	0.02	3/4/98	0.03	4/11/98	0.11	4/11/98	0.25
3/5/98	0.02	3/5/98	0.04	4/12/98	0.13	4/12/98	0.31
3/6/98	0.02	3/6/98	0.03	4/13/98	0.14	4/13/98	0.34
3/7/98	0.02	3/7/98	0.03	4/14/98	0.14	4/14/98	0.34
3/8/98	0.02	3/8/98	0.03	4/15/98	0.14	4/15/98	0.34
3/9/98	0.02	3/9/98	0.03	4/16/98	0.13	4/16/98	0.34
3/10/98	0.02	3/10/98	0.03	4/17/98	0.13	4/17/98	0.42
3/11/98	0.02	3/11/98	0.03	4/18/98	0.12	4/18/98	0.25
3/12/98	0.02	3/12/98	0.02	4/19/98	0.12	4/19/98	0.24
3/13/98	0.02	3/13/98	0.02	4/20/98	0.15	4/20/98	0.24
3/14/98	0.02	3/14/98	0.02	4/21/98	0.16	4/21/98	0.24
3/15/98	0.03	3/15/98	0.03	4/22/98	0.18	4/22/98	0.26
3/16/98	0.03	3/16/98	0.03	4/23/98	0.25	4/23/98	0.42
3/17/98	0.03	3/17/98	0.02	4/24/98	0.34	4/24/98	0.62
3/18/98	0.02	3/18/98	0.02	4/25/98	0.37	4/25/98	0.74
3/19/98	0.03	3/19/98	0.02	4/26/98	0.34	4/26/98	0.71
3/20/98	0.04	3/20/98	0.02	4/27/98	0.34	4/27/98	0.62
3/21/98	0.04	3/21/98	0.03	4/28/98	0.37	4/28/98	0.59
3/22/98	0.05	3/22/98	0.02	4/29/98	0.37	4/29/98	0.65
3/23/98	0.08	3/23/98	0.04	4/30/98	0.37	4/30/98	0.65
3/24/98	0.14	3/24/98	0.06	5/1/98	0.34	5/1/98	0.62
3/25/98	0.19	3/25/98	0.28	5/2/98	0.34	5/2/98	0.62
3/26/98	0.19	3/26/98	0.37	5/3/98	0.34	5/3/98	0.65

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
5/4/98	0.34	5/4/98	0.71	6/11/98	0.01	6/11/98	0.12
5/5/98	0.37	5/5/98	0.79	6/12/98	0.01	6/12/98	0.10
5/6/98	0.37	5/6/98	0.79	6/13/98	0.01	6/13/98	0.10
5/7/98	0.34	5/7/98	0.76	6/14/98	0.01	6/14/98	0.09
5/8/98	0.34	5/8/98	0.74	6/15/98	0.01	6/15/98	0.10
5/9/98	0.31	5/9/98	0.71	6/16/98	0.01	6/16/98	0.09
5/10/98	0.28	5/10/98	0.68	6/17/98	0.01	6/17/98	0.09
5/11/98	0.31	5/11/98	0.76	6/18/98	0.01	6/18/98	0.08
5/12/98	0.31	5/12/98	0.82	6/19/98	0.00	6/19/98	0.08
5/13/98	0.28	5/13/98	0.85	6/20/98	0.00	6/20/98	0.07
5/14/98	0.28	5/14/98	0.88	6/21/98	0.00	6/21/98	0.07
5/15/98	0.26	5/15/98	0.79	6/22/98	0.00	6/22/98	0.07
5/16/98	0.23	5/16/98	0.71	6/23/98	0.01	6/23/98	0.06
5/17/98	0.20	5/17/98	0.65	6/24/98	0.02	6/24/98	0.05
5/18/98	0.17	5/18/98	0.62	6/25/98	0.01	6/25/98	0.05
5/19/98	0.16	5/19/98	0.62	6/26/98	0.01	6/26/98	0.05
5/20/98	0.14	5/20/98	0.59	6/27/98	0.01	6/27/98	0.04
5/21/98	0.12	5/21/98	0.59	6/28/98	0.01	6/28/98	0.04
5/22/98	0.11	5/22/98	0.57	6/29/98	0.01	6/29/98	0.04
5/23/98	0.09	5/23/98	0.54	6/30/98	0.13	6/30/98	0.27
5/24/98	0.09	5/24/98	0.51	7/1/98	0.05	7/1/98	0.14
5/25/98	0.08	5/25/98	0.45	7/2/98	0.03	7/2/98	0.10
5/26/98	0.07	5/26/98	0.40	7/3/98	0.03	7/3/98	0.09
5/27/98	0.05	5/27/98	0.37	7/4/98	0.03	7/4/98	0.08
5/28/98	0.05	5/28/98	0.31	7/5/98	0.02	7/5/98	0.07
5/29/98	0.04	5/29/98	0.31	7/6/98	0.02	7/6/98	0.08
5/30/98	0.03	5/30/98	0.28	7/7/98	0.02	7/7/98	0.08
5/31/98	0.03	5/31/98	0.26	7/8/98	0.02	7/8/98	0.07
6/1/98	0.02	6/1/98	0.24	7/9/98	0.03	7/9/98	0.08
6/2/98	0.02	6/2/98	0.22	7/10/98	0.04	7/10/98	0.12
6/3/98	0.02	6/3/98	0.20	7/11/98	0.03	7/11/98	0.12
6/4/98	0.02	6/4/98	0.19	7/12/98	0.02	7/12/98	0.09
6/5/98	0.03	6/5/98	0.20	7/13/98	0.02	7/13/98	0.08
6/6/98	0.02	6/6/98	0.18	7/14/98	0.02	7/14/98	0.07
6/7/98	0.02	6/7/98	0.16	7/15/98	0.01	7/15/98	0.06
6/8/98	0.02	6/8/98	0.15	7/16/98	0.01	7/16/98	0.06
6/9/98	0.01	6/9/98	0.14	7/17/98	0.01	7/17/98	0.05
6/10/98	0.01	6/10/98	0.12	7/18/98	0.01	7/18/98	0.05

RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)	RC Years	RC mean daily discharge (m^3/s)	ULFC Years	ULFC mean daily discharge (m^3/s)
7/19/98	0.01	7/19/98	0.04	8/26/98	0.02	8/26/98	0.13
7/20/98	0.01	7/20/98	0.04	8/27/98	0.02	8/27/98	0.12
7/21/98	0.01	7/21/98	0.03	8/28/98	0.02	8/28/98	0.11
7/22/98	0.01	7/22/98	0.05	8/29/98	0.01	8/29/98	0.10
7/23/98	0.02	7/23/98	0.05	8/30/98	0.01	8/30/98	0.09
7/24/98	0.01	7/24/98	0.05	8/31/98	0.01	8/31/98	0.08
7/25/98	0.01	7/25/98	0.05	9/1/98	0.02	9/1/98	0.11
7/26/98	0.01	7/26/98	0.05	9/2/98	0.01	9/2/98	0.10
7/27/98	0.01	7/27/98	0.04	9/3/98	0.01	9/3/98	0.08
7/28/98	0.01	7/28/98	0.05	9/4/98	0.01	9/4/98	0.07
7/29/98	0.05	7/29/98	0.11	9/5/98	0.01	9/5/98	0.07
7/30/98	0.07	7/30/98	0.17	9/6/98	0.01	9/6/98	0.06
7/31/98	0.15	7/31/98	0.31	9/7/98	0.01	9/7/98	0.05
8/1/98	0.08	8/1/98	0.23	9/8/98	0.01	9/8/98	0.05
8/2/98	0.06	8/2/98	0.18	9/9/98	0.01	9/9/98	0.05
8/3/98	0.06	8/3/98	0.16	9/10/98	0.01	9/10/98	0.04
8/4/98	0.07	8/4/98	0.16	9/11/98	0.01	9/11/98	0.04
8/5/98	0.08	8/5/98	0.18	9/12/98	0.01	9/12/98	0.04
8/6/98	0.07	8/6/98	0.16	9/13/98	0.01	9/13/98	0.05
8/7/98	0.06	8/7/98	0.14	9/14/98	0.01	9/14/98	0.04
8/8/98	0.05	8/8/98	0.12	9/15/98	0.01	9/15/98	0.04
8/9/98	0.09	8/9/98	0.14	9/16/98	0.01	9/16/98	0.04
8/10/98	0.11	8/10/98	0.21	9/17/98	0.01	9/17/98	0.03
8/11/98	0.08	8/11/98	0.21	9/18/98	0.00	9/18/98	0.03
8/12/98	0.06	8/12/98	0.19	9/19/98	0.00	9/19/98	0.03
8/13/98	0.05	8/13/98	0.17	9/20/98	0.00	9/20/98	0.03
8/14/98	0.04	8/14/98	0.16	9/21/98	0.00	9/21/98	0.03
8/15/98	0.04	8/15/98	0.18	9/22/98	0.01	9/22/98	0.03
8/16/98	0.04	8/16/98	0.18	9/23/98	0.01	9/23/98	0.03
8/17/98	0.03	8/17/98	0.17	9/24/98	0.00	9/24/98	0.03
8/18/98	0.04	8/18/98	0.16	9/25/98	0.00	9/25/98	0.02
8/19/98	0.03	8/19/98	0.17	9/26/98	0.00	9/26/98	0.02
8/20/98	0.03	8/20/98	0.15	9/27/98	0.00	9/27/98	0.02
8/21/98	0.02	8/21/98	0.14	9/28/98	0.00	9/28/98	0.02
8/22/98	0.02	8/22/98	0.14	9/29/98	0.00	9/29/98	0.02
8/23/98	0.02	8/23/98	0.12				
8/24/98	0.02	8/24/98	0.12				
8/25/98	0.02	8/25/98	0.14				

A.3 - Drag Coefficient modification

Initial applications of the Yager (2012) flow and stress partitioning equations resulted in a cross over between the total shear stress (τ_t) and mobile shear stress (τ_m) at relative flow depths > 6 (Figure 9). This is unrealistic and called for a refit to the original immobile drag coefficient equation ($C_I = 157(h/P_u)^{-1.6}$). Modifications to both the exponent and coefficient of this equation were needed in order to achieve this (Figure 18). Our goal in this modification was to maintain, as best we could, the power law relationship established by Yager (2012) for relative flow depths > 6, before the cross over, but modify the relationship after the cross over so that there was no longer a cross over in the partitioned shear stresses. This was achieved by forcing the lower bounds of the (C_I) relationship through elevated points asymptotically approaching ≅ 6.5. This modification results in the modified drag coefficient equation (Equation 10) applied in this study. This modified relationship is not rigorously tested nor calibrated empirically, but without thorough evaluation, the modification at least allows for an approximation of channel bed flow resistance due to large immobile steps.

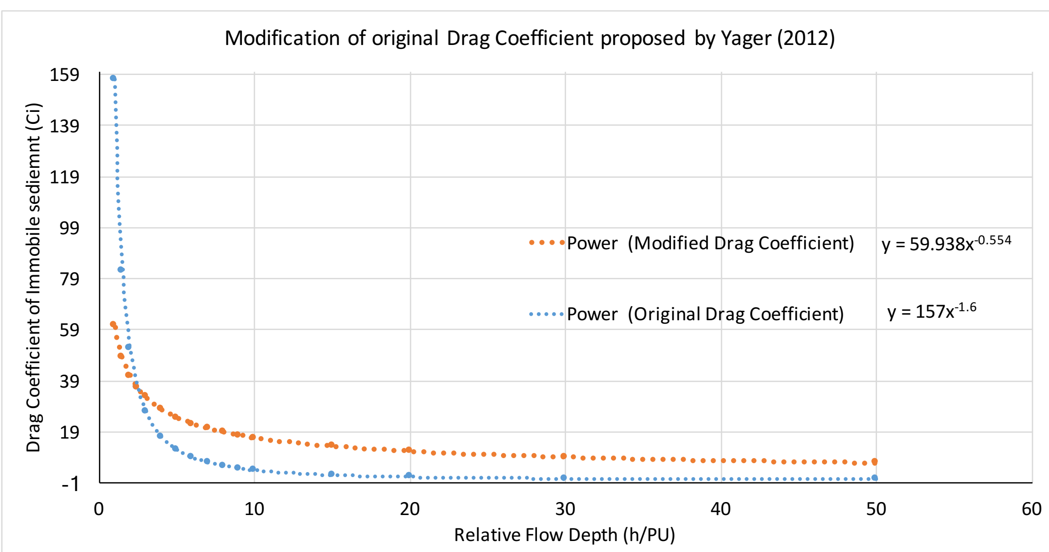

Figure 1. Plot of original Yager (2012) and modified drag coefficient equations. This relationship was modified in order to prevent a collapse in stress partitioning at relative flow depths >6.

A.4 - Graphical Function Parker (1990)

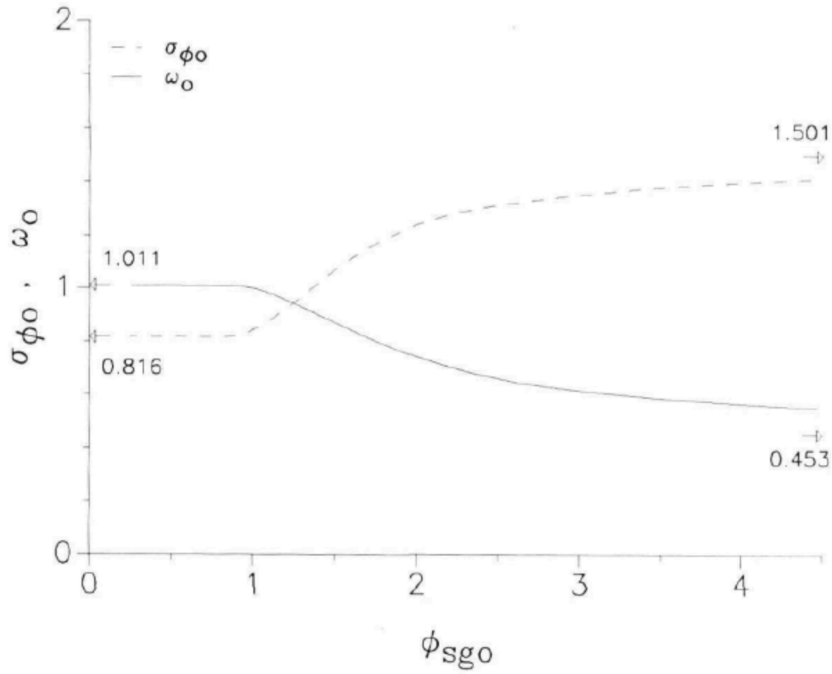

Figure 2. Graphical functions used in the modified bedload sediment transport equation of Parker (1990).

A.5 - Grain Size Distribution Data (49- meter Scientific reach)

grain size (mm)	mobile sediment counts	immobile steps counts	Total streambed surface counts	fraction of each grainsize class in mobile sediment (f_{mi})	Fraction of each grainsize class in total streambed Distribution (f_{Ti})
4096	0	0	0	0.000	0.000
2896.3	0	0	0	0.000	0.000
2048	0	0	0	0.000	0.000
1448.2	2	0	2	0.003	0.002
1024	4	7	11	0.006	0.013
724.1	8	12	20	0.011	0.024
512	14	20	34	0.020	0.040
362	27	47	74	0.038	0.088
256	60	40	100	0.085	0.118
181	73	13	86	0.104	0.102
128	73	3	76	0.104	0.090
90.5	71	0	71	0.101	0.084
64	46	0	46	0.065	0.054
45.3	27	0	27	0.038	0.032
32	27	0	27	0.038	0.032
22.6	20	0	20	0.028	0.024
16	21	0	21	0.030	0.025
11.3	27	0	27	0.038	0.032
8	50	0	50	0.071	0.059
5.7	32	0	32	0.046	0.038
4	66	0	66	0.094	0.078
2.8	30	0	30	0.043	0.036
2	25	0	25	0.036	0.030
Totals	703	142	845	1.000	1.000

A.6 - Cross sections, longitudinal surveys, and survey notes

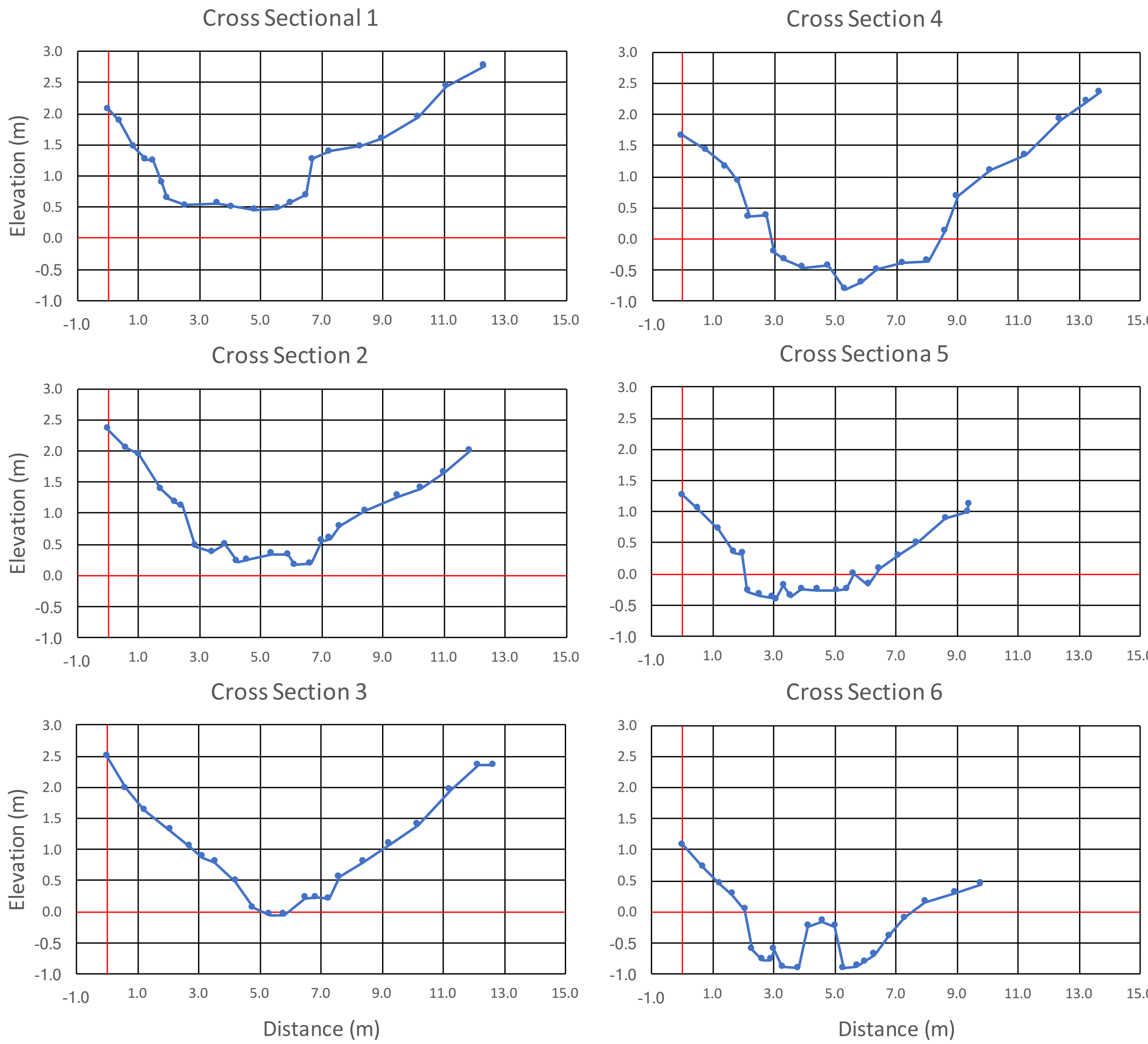

Figure 3. Plots of 6 detailed cross-sections collected in June 2018 within the 49-meter scientific reach. Cross sections move down-stream from 1-6. These cross sections are plotted with a consistent elevation reference.

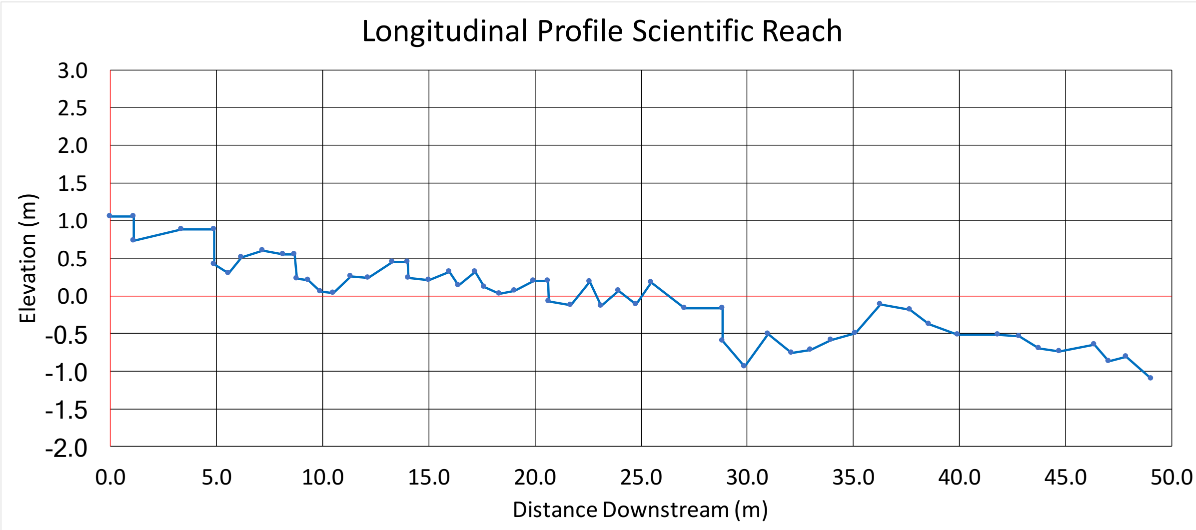

Figure 4. Longitudinal profile from upstream (left) to Downstream (Right). The locations of (6) immobile steps are recognized with abrupt vertical drops in elevation.

Table 4. Field notes for cross sectional and longitudinal surveys with in the 49-meter scientific reach.

PT#	N	E	Z	Notes
0	0	0	0	Monument (0) Benchmark in stream
1	-3.933	1.574	1.095	Monument (1) Benchmark Left bank
2	-0.016	-6.703	1.381	Monument (2) right Bank
3	29.218	15.204	1.049	Top of step 1 (Upstream)
4	28.191	14.807	0.728	bottom of step (1)
5	26.437	13.373	0.886	Top of step (2)
6	25.138	12.548	0.414	bottom of step (2)
7	24.675	12.057	0.297	Bottom of step (2) near red rock
8	24.386	11.514	0.507	pool of step 2
9	23.839	10.69	0.6	pool of step 2
10	23.061	10.142	0.553	top of step (3)
11	22.422	10.056	0.227	bottom of step 3
12	21.942	9.841	0.211	pool of step (3)
13	21.346	9.8	0.052	pool of step (3)
14	20.77	9.586	0.037	pool of step (3)
15	20.135	9.103	0.257	pool of step (3)
16	19.344	8.794	0.24	pool of step (3)
17	18.243	8.622	0.451	top of step (4)
18	17.547	8.337	0.241	Bottom of step 4
19	16.931	7.597	0.207	pool of step (4)

20	16.135	7.017	0.316	pool of step (4)
21	15.74	6.827	0.137	pool of step (4)
22	15.044	6.505	0.321	Top of boulder
23	14.653	6.354	0.114	pool of step (4)
24	14.024	5.974	0.03	pool of step (4)
25	13.399	5.628	0.067	pool of step (4)
26	12.591	5.253	0.196	top of step (5)
27	11.941	4.994	-0.07	Bottom of step (5)
28	11.301	4.17	-0.128	pool of step (5)
29	10.559	3.655	0.188	top of boulder
30	10.07	3.46	-0.134	pool of step (5)
31	9.253	3.377	0.067	pool of step (5)
32	8.636	2.808	-0.119	pool of step (5)
33	8.068	2.419	0.172	pool of step (5)
34	6.806	1.425	-0.167	Top of step (6) - 1st step upstream of mon 000
35	5.031	1.299	-0.598	bottom of step (6)
36	4	1.403	-0.94	pool of step (6)
37	3.61	0.369	-0.507	pool of step (6)
38	2.749	-0.296	-0.762	pool of step (6)
39	2.056	-0.884	-0.715	pool of step (6)
40	1.401	-1.607	-0.587	pool of step (6)
41	0.504	-2.314	-0.496	end of pool for step 6 - start of cascade
42	-0.448	-3.014	-0.113	cascade of step 6
43	-1.621	-3.771	-0.185	cascade of step 6
44	-2.493	-3.936	-0.378	cascade of step 6
45	-3.829	-4.197	-0.52	cascade of step 6
46	-5.551	-4.968	-0.52	cascade of step 6
47	-6.354	-5.549	-0.539	cascade of step 6
48	-7.218	-5.926	-0.698	cascade of step 6
49	-7.811	-6.672	-0.737	cascade of step 6
50	-9.414	-7.11	-0.647	cascade of step 6
51	-10.056	-7.303	-0.872	cascade of step 6
52	-10.762	-7.687	-0.813	cascade of step 6
53	-11.948	-7.659	-1.105	cascade of step 6 (end of reach just upstream of last (x)
54	28.91	14.555	1.468	Tie in 1, furthest upstream
55	25.462	14.664	1.552	Tie in 2
56	23.346	8.375	1.644	Tie in 3, Red Rock
57	19.244	10.508	1.246	Tie in 4

58	17.86	8.51	0.801	Tie in 5
59	12.655	4.783	0.433	Tie in 6
60	7.766	4.302	0.539	Tie in 7
61	2.907	-2.539	0.091	Tie in 8; almost directly across stream from mon (000)
62	-3.12	-3.815	-0.108	Tie in 9; 1st downstream of Mon (000)
63	-12.62	-7.839	-0.165	Tie in 10; Furthest down stream
64	-1.318	-1.495	-0.051	pt next to mon (000) to see if offset is needed
65	-3.937	1.575	1.113	2nd time reading mon (001) was 1.13 (4cm (vertical) off from first time)
66	-0.016	-6.707	1.394	2nd time Mon (002)
67	27.06	8.662	2.074	Cross section 1- (furthest upstream) right bank pin
68	26.894	9.002	1.886	right bank
69	26.47	9.202	1.468	right bank
70	26.32	9.58	1.259	right bank
71	26.256	9.798	1.256	Right Edge of bank
72	26.088	10.045	0.891	
73	26.003	10.197	0.645	Right edge of water
74	25.609	10.638	0.527	in stream
75	24.69	11.132	0.554	in stream
76	24.313	11.447	0.508	in stream
77	23.767	11.92	0.452	in stream
78	23.182	12.402	0.478	in stream
79	22.924	12.75	0.571	in stream
80	22.608	13.147	0.69	Left edge of water
81	22.463	13.278	1.277	left edge of Bank
82	22.038	13.667	1.394	left bank
83	21.162	14.182	1.483	left bank
84	20.638	14.676	1.605	left bank
85	19.843	15.498	1.941	left bank
86	19.154	16.134	2.439	left bank
87	18.63	17.264	2.768	Left bank pin (end)
88	17.358	1.736	2.345	Cross section 2- right bank pin
89	17.037	2.232	2.046	right bank
90	16.922	2.644	1.947	right bank
91	16.812	3.347	1.384	right bank
92	16.626	3.806	1.172	right bank
93	16.605	4.014	1.117	Right edge of Bank
94	16.457	4.434	0.468	
95	16.235	4.939	0.369	

96	15.98	5.258	0.493	Top of Boulder
97	15.745	5.573	0.216	Right edge of water
98	15.591	5.895	0.249	
99	15.094	6.47	0.342	top of boulder
100	14.775	6.926	0.331	top of boulder
101	14.757	7.132	0.166	
102	14.575	7.624	0.19	Left edge of water
103	14.307	7.863	0.548	top of boulder
104	14.161	8.107	0.587	
105	13.977	8.344	0.784	Left edge of bank
106	13.476	9.04	1.036	left bank
107	13.089	10.03	1.274	left bank
108	12.715	10.685	1.394	left bank
109	12.432	11.411	1.654	left bank
110	12.055	12.142	2.005	left bank pin (end)
111	14.128	-0.182	2.497	Cross section (3) Right bank pin
112	13.986	0.412	1.979	right bank
113	13.755	0.973	1.635	right bank
114	13.382	1.732	1.311	right bank
115	13.136	2.329	1.039	right bank
116	12.995	2.714	0.876	right bank
117	12.856	3.112	0.797	Right edge of bank (top of boulder)
118	12.556	3.696	0.48	Top of Boulder
119	12.228	4.174	0.06	Right edge of water
120	11.885	4.606	-0.05	
121	11.581	4.943	-0.056	
122	11.139	5.488	0.214	
123	10.872	5.722	0.23	
124	10.617	6.059	0.207	left edge of water
125	10.359	6.278	0.551	left edge of channel (bank)
126	9.899	6.914	0.793	left bank
127	9.352	7.568	1.08	left bank
128	8.861	8.362	1.397	left bank
129	8.258	9.217	1.951	left bank
130	8.028	10.117	2.355	left bank
131	7.717	10.498	2.358	left bank pin (end)
132	5.536	-4.789	1.655	Cross section 4 right bank pin
133	5.250	-4.047	1.416	
134	4.975	-3.475	1.156	

135	4.816	-3.116	0.925	Right edge of channel
136	4.503	-2.952	0.356	
137	4.187	-2.46	0.378	Top of boulder
138	4.033	-2.28	-0.211	on top of rocks
139	3.811	-1.994	-0.34	Right edge of water
140	3.526	-1.483	-0.461	in stream
141	3.245	-0.702	-0.434	in stream
142	3.135	-0.154	-0.813	in stream
143	2.839	0.285	-0.702	in stream
144	2.459	0.635	-0.495	in stream
145	1.910	1.274	-0.392	in stream
146	1.323	1.834	-0.36	left edge of water
147	1.006	2.324	0.129	
148	0.761	2.619	0.685	left edge of bank
149	0.448	3.658	1.095	
150	0.246	4.808	1.349	
151	0.000	5.913	1.917	
152	-0.259	6.721	2.201	
153	-0.532	7.091	2.361	left bank pin (end)
154	0.058	-6.704	1.259	Cross section 5 (monuments) Right bank pin
155	-0.229	-6.27	1.042	
156	-0.536	-5.682	0.713	
157	-0.853	-5.299	0.339	
158	-0.977	-5.039	0.316	right edge of bank
159	-0.995	-4.867	-0.279	right edge of water
160	-1.170	-4.551	-0.347	
161	-1.398	-4.17	-0.383	
162	-1.473	-4.089	-0.42	
163	-1.612	-3.875	-0.187	top of boulder
164	-1.752	-3.697	-0.367	
165	-1.886	-3.359	-0.251	top of boulder
166	-2.162	-2.938	-0.265	top of boulder
167	-2.369	-2.336	-0.272	top of boulder
168	-2.527	-2.039	-0.251	top of boulder
169	-2.664	-1.869	-0.006	top of boulder
170	-2.767	-1.381	-0.178	
171	-2.926	-1.076	0.081	Left edge of bank
172	-3.241	-0.555	0.29	
173	-3.592	-0.073	0.483	

174	-3.843	0.855	0.881	
175	-3.900	1.586	0.985	
176	-3.934	1.575	1.114	left bank pin (end) Mon (001)
177	-10.111	-11.524	1.072	Cross section 6 (furthest downstream) (right bank pin)
178	-10.308	-10.886	0.727	
179	-10.542	-10.375	0.445	
180	-10.742	-10.023	0.278	
181	-10.987	-9.684	0.036	right edge of bank
182	-11.124	-9.496	-0.608	
183	-11.353	-9.266	-0.775	right edge of water
184	-11.465	-9.014	-0.775	
185	-11.539	-8.948	-0.613	Top of boulder
186	-11.708	-8.722	-0.889	
187	-11.970	-8.269	-0.909	
188	-12.273	-8.178	-0.238	top of boulder
189	-12.409	-7.729	-0.154	top of boulder
190	-12.668	-7.404	-0.232	top of boulder
191	-12.833	-7.191	-0.909	
192	-12.902	-6.743	-0.878	
193	-13.018	-6.513	-0.807	left edge of water
194	-13.224	-6.296	-0.696	
195	-13.498	-5.876	-0.387	
196	-13.513	-5.38	-0.104	left edge of bank
197	-13.797	-4.78	0.159	
198	-14.292	-3.931	0.305	
199	-14.475	-3.099	0.441	left bank pin (end)

Table 5. Field notes for immobile-Step morphometric surveys within the 49-meter scientific reach.

PT#	N	E	Z	Notes
0	0	0	0	Mon (000)
1	-3.97	1.576	1.124	Mon (001) left bank
2	-0.014	-6.719	1.404	Mon (002) right bank
3	30.104	14.412	1.165	U paired upstream Downstream measurements (step 1)
4	29.555	13.647	0.908	D
5	29.718	14.784	1.115	U
6	29.106	14.062	0.87	D
7	29.416	15.018	1.098	U
8	28.545	14.138	0.867	D
9	28.877	15.383	1.046	U
10	28.311	14.818	0.804	D
11	28.809	15.641	1.046	U
12	28.062	15.264	0.877	D
13	26.657	16.294	1.008	U
14	27.734	15.681	0.866	D
15	28.15	16.71	1.089	U left bank
16	27.556	16.256	0.959	D left bank
17	26.753	10.966	0.678	U Step 2 (right bank)
18	26.1	10.581	0.612	D Step 2 (right bank)
19	26.545	11.409	0.678	U
20	25.869	11.131	0.554	D
21	26.762	11.942	0.623	U
22	25.154	11.432	0.608	D
23	26.493	12.745	0.798	U
24	25.248	12.16	0.476	D
25	26.466	13.147	0.848	U
26	25.299	12.983	0.408	D
27	26.395	13.539	0.847	U
28	25.277	13.23	0.411	D
29	26.114	14.273	1.043	U
30	25.526	13.991	0.622	D
31	25.631	15.018	1.225	U
32	24.917	14.322	0.465	D
33	25.511	15.243	1.322	U Right bank
34	24.633	14.512	0.605	D Right bank
35	24.077	8.816	0.921	U Step 3 (right bank)

36	22.315	8.165	0.455	D
37	23.137	9.341	0.706	U
38	22.353	8.947	0.337	D
39	22.975	10.003	0.649	U
40	22.24	9.643	0.363	D
41	22.887	10.291	0.615	U
42	22.486	10.107	0.323	D
43	23.049	11.074	0.401	U
44	22.287	10.336	0.374	D
45	22.127	11.088	0.5	U
46	21.785	10.27	0.232	D
47	21.195	10.692	0.606	U
48	21.299	10.305	0.196	D
49	20.861	10.598	0.549	U
50	20.879	10.097	0.324	D
51	20.27	10.79	0.729	U
52	20.278	10	0.269	D
53	19.297	10.951	0.808	U left bank
54	19.436	9.998	0.502	D left bank
55	21.36	7.139	0.568	U step 4 right bank
56	17.781	6.383	0.43	D step 4 right bank
57	20.933	7.62	0.359	U
58	17.704	6.662	0.414	D
59	19.904	7.737	0.297	U
60	17.899	7.083	0.244	D
61	19.651	8.61	0.285	U
62	17.877	7.497	0.207	D
63	18.864	8.929	0.434	U
64	17.255	7.831	0.307	D
65	17.995	9.415	0.496	U
66	17.279	8.807	0.303	D
67	17.786	9.844	0.583	U left bank
68	16.604	8.886	0.272	D left bank
69	14.445	4.805	0.321	U step 5 (right bank)
70	13.181	4.156	0.12	D
71	14.262	5.084	0.315	U
72	13.068	4.33	0.078	D
73	13.588	5.419	0.123	U
74	13.053	4.567	0.093	D

75	12.924	4.853	0.236	U
76	12.178	4.5	0.075	D
77	12.646	5.255	0.214	U
78	12.219	4.903	0.063	D
79	12.479	5.595	0.182	U
80	11.911	5.081	-0.029	D
81	12.084	6.061	0.269	U
82	11.83	5.361	-0.03	D
83	11.596	6.112	0.406	U Left bank
84	11.077	5.022	-0.035	D left bank
85	7.553	-0.113	0.92	U Step 6 right bank
86	6.994	-0.427	-0.334	D
87	7.455	0.243	-0.158	U
88	6.562	-0.127	-0.373	D
89	7.001	0.508	-0.282	U
90	6.371	0.159	-0.38	D
91	6.956	0.961	-0.123	U
92	6.346	0.752	-0.391	D
93	6.628	1.272	-0.067	U
94	5.594	0.782	-0.377	D
95	6.475	1.793	0.08	U
96	4.922	0.927	-0.577	D
97	6.274	2.46	0.117	U
98	4.72	2.033	-0.734	D
99	5.996	3.105	0.193	U left bank
100	4.83	2.613	-0.576	D left bank

A.7 - Paylor cross section and high-water mark surveys (2013)

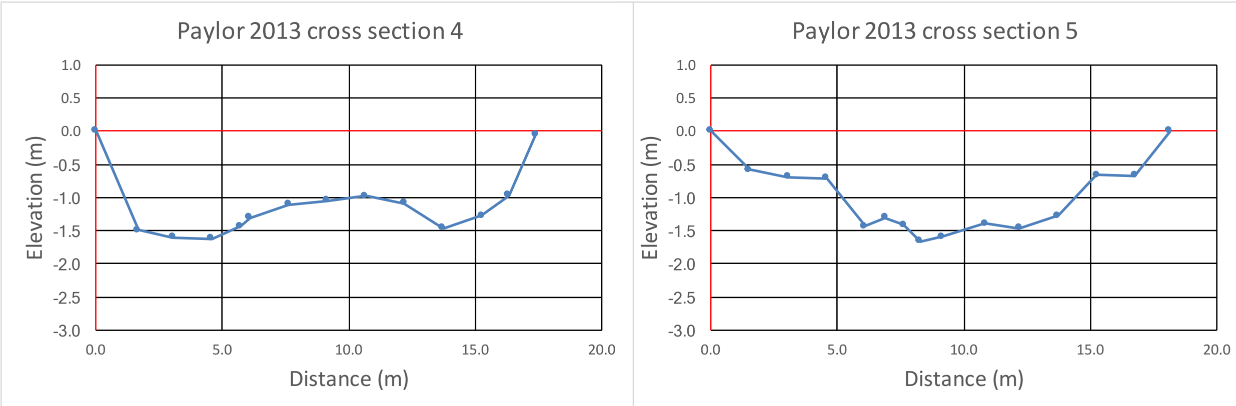

Figure 5. Cross sectional surveys from high water marks near 49- meter scientific reach. High water marks range from 1.62-1.66 m.

A.8 - Field Data for 4002 Geology class

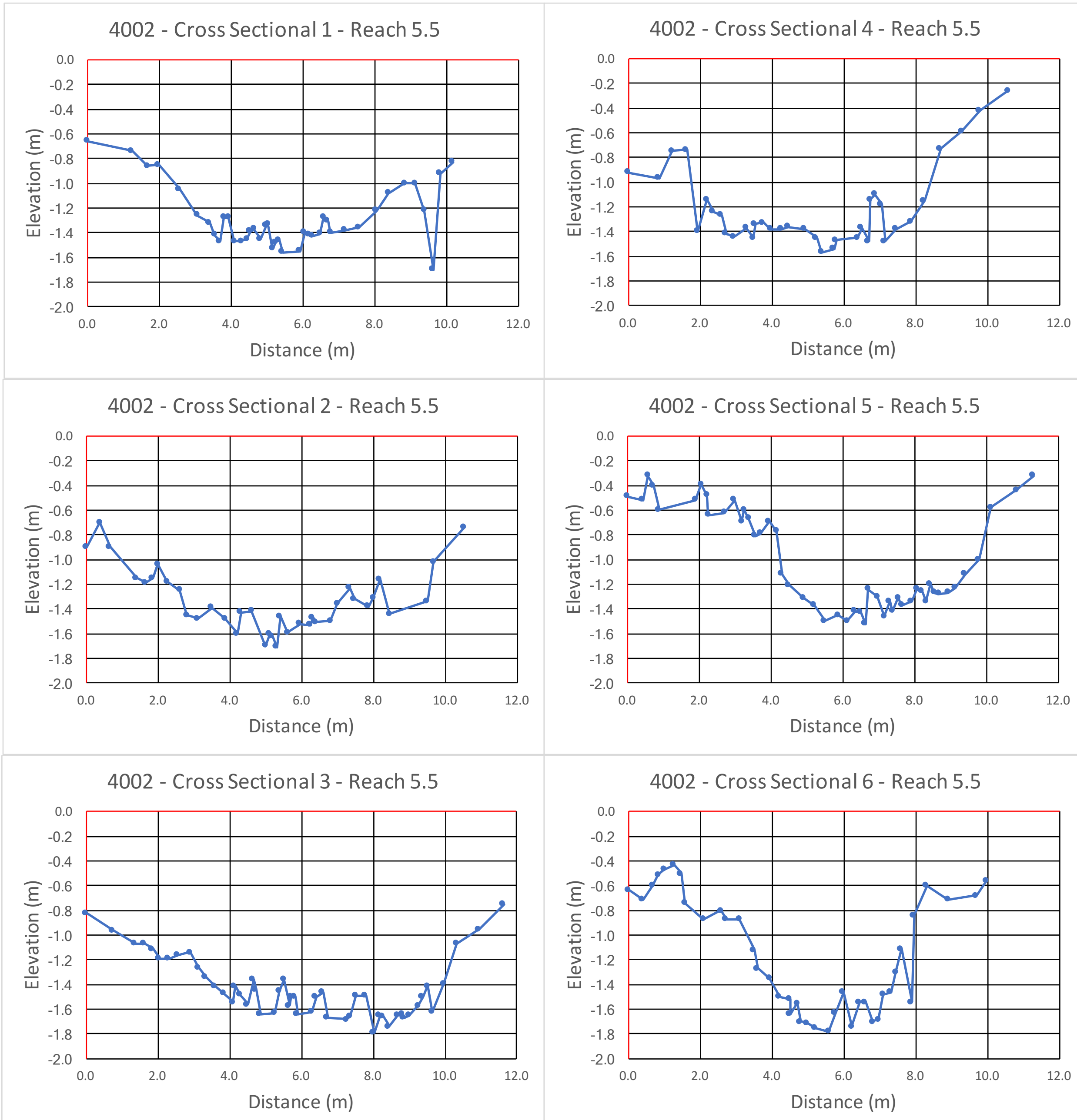

Figure 6. Cross sectional surveys for reach 5.5 collected in June – 2018.

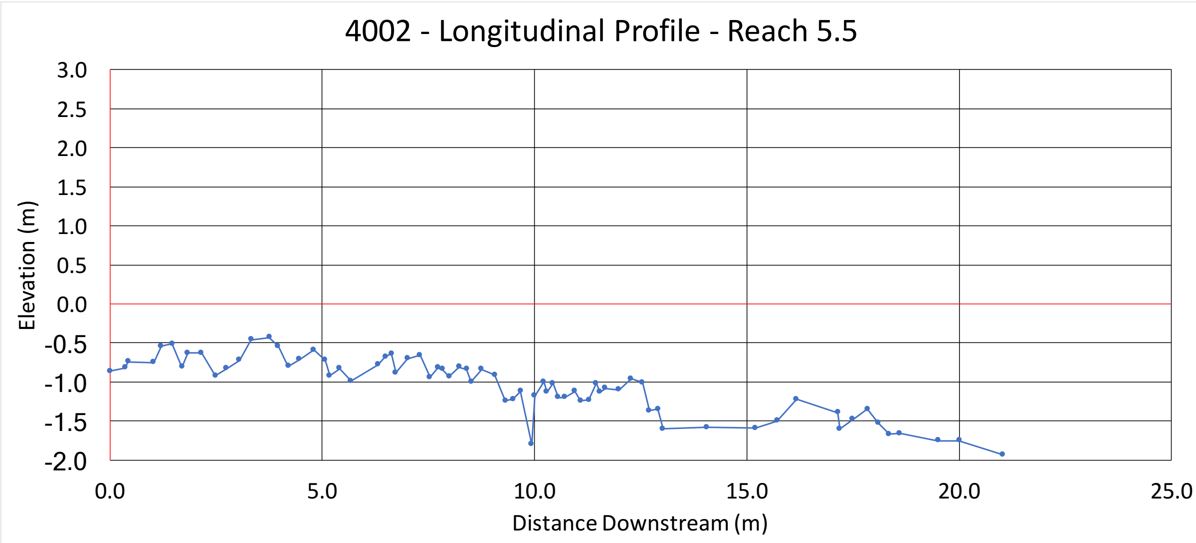

Figure 7. Longitudinal profile for reach 5.5 collected in June – 2018

Table 6. Total grain size distribution data for reach 5.5

Grain size class (mm)	Total Counts
4096	0
2896.3	0
2048	0
1448.2	0
1024	0
724.1	0
512	6
362	12
256	16
181	18
128	29
90.5	21
64	31
45.3	7
32	6
22.6	8
16	7
11.3	6
8	12
5.7	9
4	1
2.8	2
2	3
Totals	194

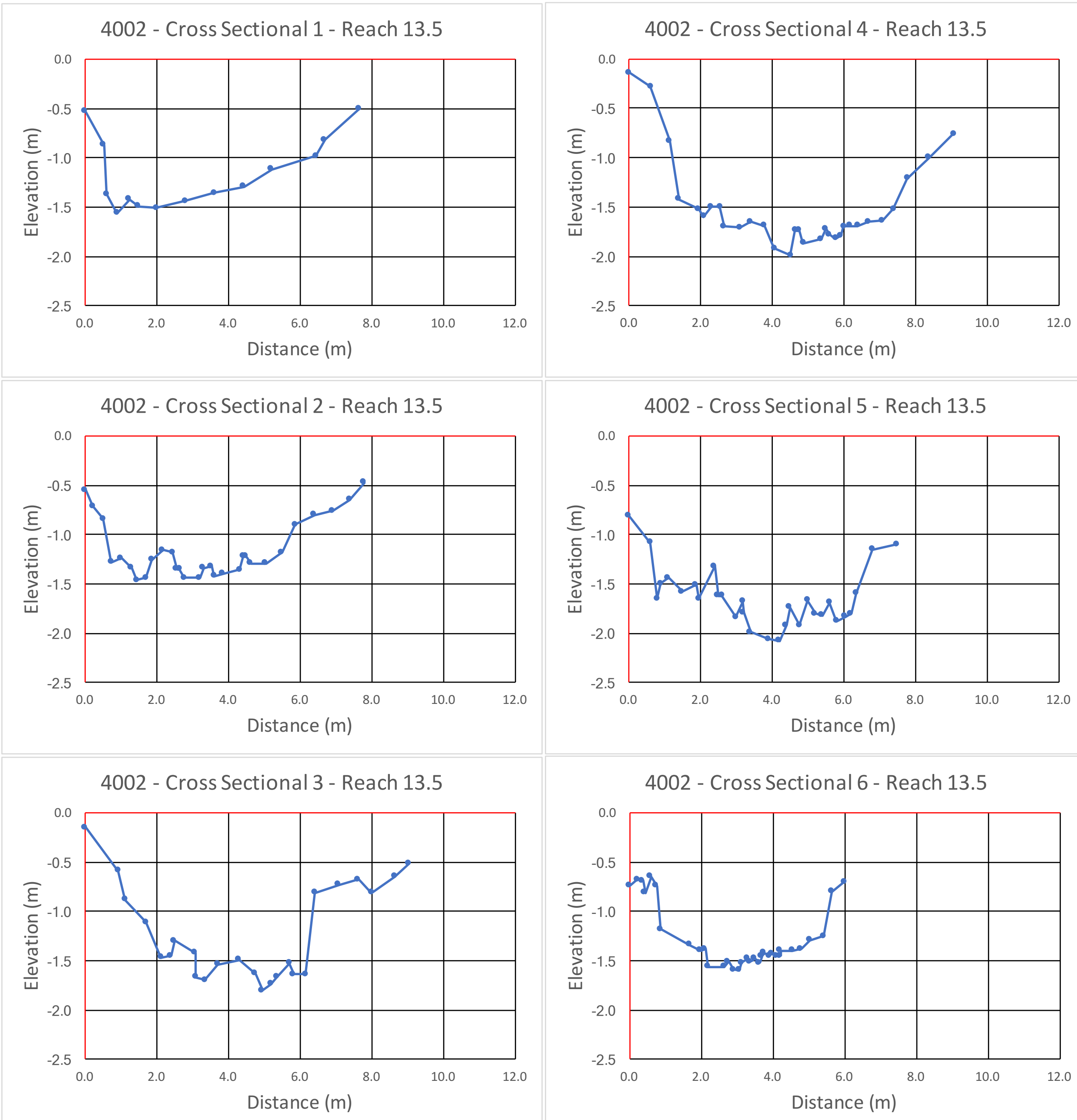

Figure 8. Cross sectional surveys for reach 13.5 collected in June – 2018.

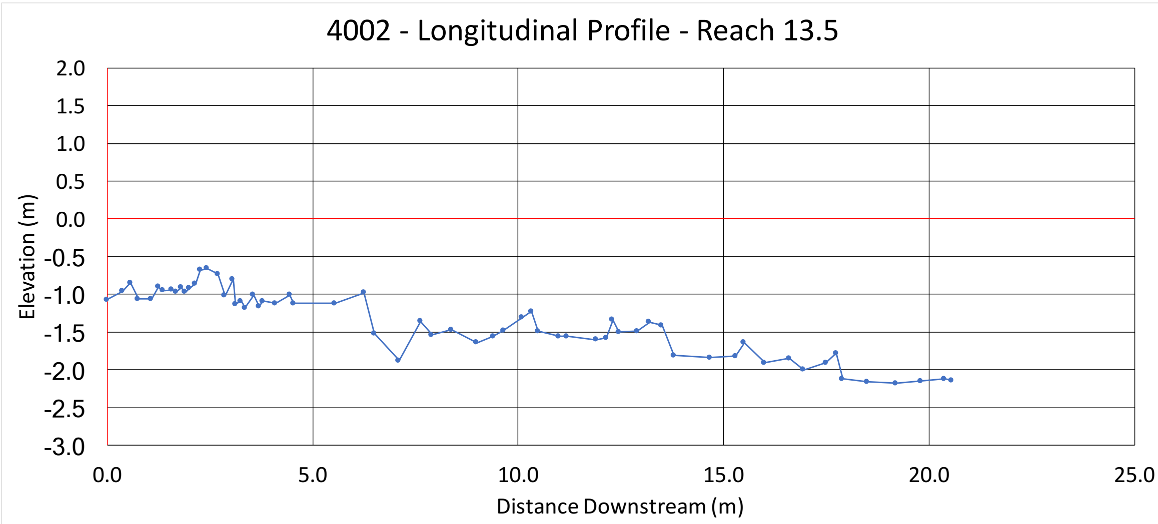

Figure 9. Longitudinal profile for reach 13.5 collected in June – 2018

Table 7. grain size distribution data for reach 13.5

Grain size class	Cascade Counts	Pool Counts	Immobile Step Counts	Total Counts
4096	0	0	0	0
2896.3	0	0	0	0
2048	0	0	0	0
1448.2	0	0	0	0
1024	1	0	0	1
724.1	4	2	3	9
512	9	4	15	28
362	13	18	23	54
256	15	30	15	60
181	10	24	1	35
128	11	30	0	41
90.5	2	28	0	30
64	2	27	0	29
45.3	1	17	0	18
32	3	8	0	11
22.6	1	11	0	12
16	1	3	0	4
11.3	3	5	0	8
8	2	17	0	19
5.7	10	26	0	36
4	3	19	0	22
2.8	7	13	0	20
2	3	11	0	14
Totals	101	293	57	451

8. Works Cited

Bathurst, J. C., W. H. Graf, and H. H. Cao (1987), Bed load discharge equations for steep mountain rivers, in Sediment Transport in Gravel-Bed Rivers, edited by C. R. Thorne, J. C. Bathurst, and R. D. Hey, pp. 453–477, John Wiley, N. Y.

Chin, A., and E. Wohl (2005), Toward a theory for step pool in stream channels, Prog. Phys. Geogr., 29, 275– 296.

Curran, J. H., and Wohl, E. E. (2003), Large woody debris and flow resistance in step-pool channels, Cascade Range, Washington. Geomorphology 51, 141-157. Google Scholar, Crossref, ISI

Egashira, S., and K. Ashida (1991), Flow resistance and sediment transportation in streams with step-pool bed morphology, in Fluvial Hydraulics of Mountain Regions, edited by A. Armanini and G. Silvio, pp. 45–58, Springer, Berlin.

Ferguson, R. I. (2007), Flow resistance equations for gravel- and boulder-bed streams, Water Resour. Res., 43, W05427, doi:10.1029/2006WR005422.

Kimbrough, Robert A., and Robert R. Holmes Jr. (2015). Flooding in the South Platte River and Fountain Creek Basins in eastern Colorado, Setember 9–18, 2013. No. 2015-5119. US Geological Survey: 3.

MacFarlane, W. A., and Wohl, E. (2003), Influence of step composition on step geometry and flow resistance in step-pool streams of the Washington Cascades. Water Resources Research 39, ESG 3-11 to 3-13. Google Scholar, Crossref, ISI

Milhous, R. T., (1973), Sediment transport in a gravel-bottomed stream, Ph.D. thesis, Dept. of Civil Enginering, Oregon State University, U.S.A., 232 p.

Nitsche, M., D. Rickenmann, J. M. Turowski, A. Badoux, and J. W. Kirchner (2011), Evaluation of bedload transport predictions using flow resistance equations to account for macro-roughness in steep mountain streams, Water Resour. Res., 47, W08513, doi:10.1029/2011WR010645.

Pagliara, S., and P. Chiavaccini (2006), Flow resistance of rock chutes with protruding boulders, J. Hydraul. Eng., 132(6), 545–552.

Parker, G. (1990), Surface-based bedload transport relation for gravel rivers, J. Hydraul. Res., 28(4), 417–436.

Rathburn, S., Bennett, G., Wohl, E., Briles, C., McElroy, B., and Sutfin, N., (2017), The fate of sediment, wood and organic carbon eroded during an extreme flood, Colorado Front Range, USA. Geology http://dx.doi.org/10.1130/G38935.1.

Ryan S.E, Porth L.S, and Troendle C.A. (2005), Coarse sediment transport in mountain streams in Colorado and Wyoming, USA. Earth Surface Processes and Landforms 30: 269–288.

Rickenmann, D., and A. Recking (2011), Evaluation of flow resistance in gravel-bed rivers through a large field data set, Water Resources. Res.,47, W07538, doi:10.1029/2010WR009793.

Rowley, P., Himmelreich, J., Kupfer, D., and Siddoway, C. (2003), OF-02-05 Geologic Map of the Cheyenne Mountain Quadrangle, El Paso County, Colorado. Geologic. Denver, CO: Colorado Geological Survey, Department of Natural Resources. Open File Report.

Schneider, J. M., D. Rickenmann, J. M. Turowski, B. Schmid, and J. W. Kirchner (2016), Bed load transport in a very steep mountain stream (Riedbach, Switzerland): Measurement and prediction, Water Resour. Res., 52, 9522–9541, doi:10.1002/2016WR019308.

Wilcock, P. R., and J. C. Crowe (2003), Surface-based transport model for mixed-size sediment, J. Hydraul. Eng., 129(2), 120–128, doi:10.1061/(ASCE)0733-9429(2003)129:2(120).

Wilcox, A. C., J. M. Nelson, and E. E. Wohl (2006), Flow resistance dynamics in step-pool channels: 2. Partitioning between grain, spill, and woody debris resistance, Water Resour. Res., 42, W05419, doi:10.1029/ 2005WR004278.

Wolman, G. M. (1954), A method of sampling coarse river-bed material, Eos Trans. AGU, 35(6), 951–956.

Yager, E. M. (2006), Prediction of sediment transport in steep, rough streams, Ph.D. dissertation, Univ. of California, Berkeley.

Yager, E. M., W. E. Dietrich, J. W. Kirchner, and B. W. McArdell (2012), Prediction of sediment transport in step-pool channels, Water Resources. Res., 48, W01541, doi:10.1029/2011WR010829.

Zimmermann, A., M. Church, and M. A. Hassan (2008), Identification of steps and pools from stream longitudinal profile data, Geomorphology,102, 395–406, doi:10.1016/j.geomorph.2008.04.009.

9. Vita

James Emerson Smith IV earned his Bachelor's of Science degree from Louisiana State University (LSU) in May 2015. As an undergraduate, James was heavily involved in various research projects, completing an undergraduate thesis under Dr. Sam Bentley (Fall 2015), and working as a hydrologist intern with the United States Geological Survey (USGS) in Boulder, Colorado (Summer 2014). Post-graduation, James took time to evaluate his career path as a geologist. In August 2017, James enrolled in a Master's of Science degree program within the LSU Geology and Geophysics Department under Dr. Carol Wicks and Dr. Kory Konsoer. James plans to graduate from LSU with a Master's of Science degree in December 2018. Upon graduation, James looks to continue his commitment to science and research as a hydrologist with the USGS or closely affiliated federal agency.