Appendix B1

New Alsea Watershed Study

NEW ALSEA WATERSHED STUDY

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January 2016

TABLE OF CONTENTS

NEW ALSEA WATERSHED STUDY
FIELD PROTOCOLS

PURPOSE

This guide is to improve consistency and accuracy of field measurements of precipitation and streamflow and aid in managing data for the New Alsea Watershed Study. This document should be used in conjunction with the National Council for Air and Stream Improvement, Inc. (NCASI) Quality Assurance Project Plan (QAPP) (NCASI 2006). Information provided in this document is intended as guidance only, is subject to revision, and is specific to the hydrometeorological monitoring in the New Alsea Watershed Study.

PRECIPITATION

Rain Gauges

A rain gauge is an instrument designed to measure the amount of rain that reaches the ground surface. Rain gauges can be classified into two main categories: non-recording gauges or recording gauges. A non-recording rain gauge is a storage device that measures cumulative amount of rain. The 8-inch Standard Rain Gauge (SRG), which has been used by the weather offices of US National Weather Service (NWS) for over 100 years, is a non-recording rain gauge. The SRG is a large cylindrical container with a funnel and a measuring tube inside the cylinder and depths can be measured to 0.01inch.

A recording rain gauge automatically records the amount of rainfall reaching the surface as a function of time during the lifespan of a rain event. A tipping-bucket rain gauge and a weighing rain gauge are the most common types of recording gauges. The tipping bucket rain gauge is a cylinder with a funnel that drains into a pair of cups (buckets) that are balanced on a horizontal axis. When a predetermined amount of rainwater (0.1 mm/tip for the Alsea study) collects into one of the buckets, the bucket tips, causing the other bucket to move quickly into position and catch the incoming rain. Water collected by the tipping bucket passes out of the rain gauge, thus no need for emptying. With each tip, an electronic signal is sent to a data logger that records the time of each event. The known amount of rain for each tip and its occurrence time makes it possible to calculate the incremental amounts of rain over time. These measurements can also be used to estimate rainfall intensities and total storm depths.

Currently all rain gauges used in the New Alsea Watershed Study are Texas Electronics, Inc. TR-525M Rainfall Sensors. The TR-525M Rainfall Sensor is a remote tipping bucket style rain gauge that measures rain intensity. This rain gauge has a resolution of 0.1 mm, an accuracy of 1.0% up to 2 in/hr (50 mm/hr) and can operate in temperatures from 32 to 125°F (0 to 50°C) (Texas Electronics 2014).

Equipment (Hale 2007)

1. TR-525M rain gauge
2. Watch to record time
3. Field book to record observations
4. HOBO Shuttle

Note rain gauge name, location, date, time of visit, and initials of field technician in field book.

1. Note any necessary observations that may affect rain gauge performance (i.e., clogging or evidence of tampering or site disturbance)
2. Remove precipitation bucket cover by twisting anticlockwise
3. Use Hobo Shuttle to download data

   a. Connect to data logger
   b. Press download button on shuttle
   c. Toggle through the options (see Shuttle directions)
   d. Make sure "Relaunch" is successful
4. Replace cover
5. Upon return to the office, immediately download Shuttle data.
6. Create a backup file on another server
7. Examine precipitation record in comparison to other precipitation recorder results. The Alsea is relatively small area and precipitation depths, both storm and monthly values, should be fairly similar. There is some orographic lifting (higher precipitation at higher elevations). If there are differences among precipitation recorders, ascertain the problem (mechanical, low battery, electronic failure) and remedy as soon as possible.
8. After data collection and processing, upload to the common database

Data Collection and Processing

Time and frequency of data collection

A rain gauge site should be visited at regular intervals as specified by the project manager. If possible, the rain gauges should be visited about twice a month during periods of little to no rainfall, and at least weekly or after each significant rainfall during periods of rainfall. These visits should coincide with visits to streamflow gauging stations.

Sources of errors in data collection

There are several sources of errors to consider when determining rainfall characteristics: timing error, instrumental error, and sampling error. Timing errors occur among rain gauges and need to be corrected. For example, one gauge may record a 24-hr event on September 15, where a different rain gauge records the same event over a 24-hr period that covers September 14 and September 15. Instrumental error is related to accuracy with which a rain gauge will catch the "true" rainfall amount at a point (Ffolliott, 1990). The most common instrumental error that occurs is wind-induced error. Because most rain gauges are elevated above the ground, wind eddies that form around their openings reduce the amount of rain captured. This problem is known as wind-induced gauge under-catch and is considered the most common and largest source of rainfall-measurement error. Wind effect can be minimized by placing wind-shields around gauges. Rain gauge openings often become clogged with organic matter and other debris. This can be minimized with regular site visits and maintaining a screen covering the precipitation bucket drain hole (not the bucket orifice). Sampling error is a measure of how well the rain gauges in a network represent rainfall characteristics of the entire watershed area. Sampling error can be minimized by increasing the number of rain gauges in and around the study area.

Data processing

Data processing should begin immediately after data from rain gauge have been downloaded and should be completed as soon as possible to ensure that any malfunctions in instrumentation is addressed in a timely manner. The following section explains potential methods for rectifying missing precipitation data. All raw data should be maintained (including missing data). However, processed data are needed to answer other research questions and should be made available on the Alsea database.

Missing data

Missing records in rainfall measurements is not an uncommon problem. This is due to gauge mechanical and electrical failures and is also caused by erroneous recording and publishing of rainfall measurements

(ULL 2013). Missing data can be a problem for calculating water budgets, determining maximum rainfall intensities, and estimating area-average rainfall intensities. Several methods have been developed to estimate annual missing records at a certain station from concurrent measurements at nearby stations. A cumulative plot or double mass analysis is a good initial approximation of missing daily precipitation data. Also, missing daily data can be estimated using various weighting schemes as discussed below. Storm-specific events may be estimated similarly.

Uniform weighting – Uniform weighting is the simplest weighting scheme. The same weight is assigned to each of the available *n* nearby stations:

$$R_g = \frac{1}{n}\sum_{i=1}^{i=n} R_i$$

Where Rg is the estimate of missing rainfall record at a station *g* and R_i, i=1:n are the corresponding measurements available at the *n* nearby stations.

Uniform weighting is recommended if rainfall at each of the *n* nearby stations has similar trends and annual totals (ULL 2013).

Normal-ratio weighting – When annual rainfall shows variation (>10%), weighting factors can be assigned:

$$R_g = \frac{1}{n}\sum_{i=1}^{i=n} \frac{AR_g}{AR_i} R_i$$

Where *AR* represents annual-average rainfall at the missing station *g* and at the *n* nearby stations.

Inverse-distance weighting – For inverse-distance weighting, the weight factor for each site is inversely proportional to the site's distance from the gauge with missing data. The proportionality can be either to the distance or the distance squared (most common):

$$R_g = \frac{1}{\sum_{i=1}^{i=n} \frac{1}{d_i^2}} \sum_{i=1}^{i=n} \left(\frac{1}{d_i^2} R_i\right)$$

The user of these methods is cautioned against over-weighting that may be caused by station clustering. In such situations, only one out of the clustered stations (the closest to the missing station) should be included in the analysis (ULL 2013).

Precipitation records should be uploaded to the database management system in a timely manner. Data should be validated, metadata or field notes included, and forwarded to the database manager, preferably within one week. The relatively short time frame is to encourage data validation processes shortly after data collection rather than waiting until the year-end.

STREAM DISCHARGE

Streamflow measurements are critical to the success of the New Alsea Watershed Study. To date, streamflow data collection methods have significantly relied on electronic data recorders and the previously established stage-discharge relationships. The stage-discharge relationships are only constant for well-maintained, artificial control sections (weir maintenance is required in the Alsea). These maintenance protocols are explained below.

Velocity-Area Method

Streamflow is the best integration of watershed level processes. Yet, streamflow is perhaps the most difficult measurements to make as professional judgment is required each time at every cross-section measurement. As stated earlier, one cannot assume a constant stage-discharge relationship, thus streamflow discharge measurements should be taken repeatedly over time.

The Velocity-Area Method is a commonly used and relatively accurate method for measuring discharge in a stream or an open channel (AEP 2009). For this method, the channel cross-section is divided into subsections, and the width and depth of water at each subsection are measured. No less than 10 subsections are recommended in a stream, but fewer subsections may be used in a small channel with a smooth cross-section and good velocity distribution (AEP 2009). For accurate results, subsections should be spaced so that no subsection has more than 10% of the total discharge. A current (velocity) meter is used to measure velocity of flow by tallying number of revolutions over a specific amount of time at each subsection. Observations are usually made at 0.6 times depth of water if the depth of water is less than 2.5ft or at 0.2 and 0.8 times the depth of water from the water surface if the depth of water is more than 2.5ft. A pygmy meter is used in place of a current meter for shallow water with depth less than 1.5ft. Velocity of flow is determined based on observations and the current meter equation or rating table provided by the manufacturer. The total discharge passing through the cross-section at the time of measurement is computed as the sum of the discharges of each subsection.

Equipment

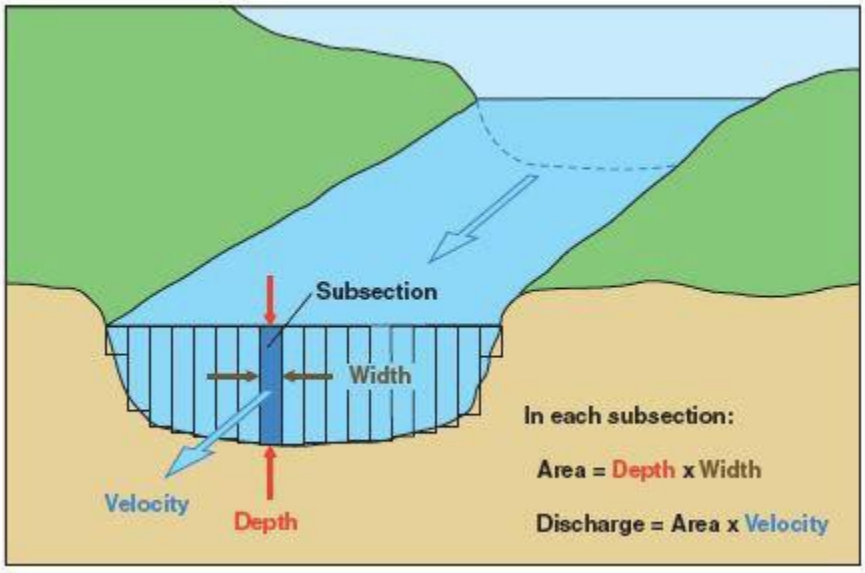
1. A Gurley or similar current meter or Pygmy meter (depending on depth of water)
2. Wading rod
3. Measuring tape
4. Stop watch
5. Current meter/pygmy meter rating equation or table (provided by manufacturer)
6. Select consistent units of measure (i.e., m/s for velocity and m^3/s for discharge). Frequent errors are made when using mixed units such as meters and feet.

Procedure

1. Select a straight reach of stream free of large boulders or any obstructions that create excessive turbulence, eddies, or stagnant conditions.
2. Stretch the measuring tape across the channel cross-section perpendicular to flow.
3. Divide the channel cross-section into different subsections. Marking at least 10 sections is recommended, but fewer sections may be used in a small channel with smooth cross- section and good velocity distribution.
4. Measure distance from a fixed initial point to the first mark and record depth of water.
5. Compute the cross-sectional area for each subsection.
6. Place the Current Meter at a depth 0.6 times the depth of water below the water surface for at least 40 seconds. Make sure that the meter is parallel to the flow and wading rod stands in vertical position. Record the observation point as 0.6. Record the number of revolutions and time taken (seconds). If the depth of water is more than 2.5 ft, make observations at 0.2*depth and 0.8*depth below the water surface and record the point of observation as 0.2 and 0.8, respectively. Note if the current meter used in the measurement gives the direct velocity of flow.

   Be sure to be standing on the downstream side of the measurement to ensure a good velocity reading.

7. Determine velocity at a point using the equations or rating table provided by the manufacturer for the current meter (or pigmy meter) used.
8. If observation depths are 0.2*depth and 0.8*depth, compute the average velocity of flow for each subsection and record by adding both the point velocities (at 0.2*depth and 0.8*depth) and dividing by 2.
9. Compute subsection discharge by multiplying area by average velocity.
10. Repeat step 4 to 10 for other subsections and record accordingly in the subsequent rows.
11. Compute total discharge by adding up all subsection discharges.



Graphic of a stream cross-section. Current-meter discharge measurements are made by determining the discharge in each subsection of a channel cross-section and summing the subsection discharges to obtain a total discharge (Perlman 2015).

Staff Gauges

Staff gauges are used to measure stage in open channels, streams, and rivers (AEP 2009). Water level readings are taken directly off the gauge. Readings can be converted into a water flow rate (i.e., cubic feet per second) using a rating curve or a stage-discharge curve.

Equipment

1. Installed staff gauge
2. All main stream gauges have an inside staff (in the stilling well) and a reference (bench mark) to an outside staff reference. All these stations should have an outside staff installed to measure the same stage as the inside well. This is a QA/QC method.
3. Rating table (stage-discharge/storage relationship). Should be posted in gauge house or carried with the hydrographer.

Procedure

1. Record the stage on the staff gauge.
2. Note the date and time and record.

3. Read the water level in the open channel from the staff gauge and record.
4. Determine the flow rate corresponding to the water level from the rating table/flow equation previously developed and record.
    a. See the appendices (I-XI) for rating tables and flow equations.

This staff gauge reads a stage value of 2.92 feet (Parker 2004).

All stream gauging stations have an outside staff gauge or means to measure the outside stage (i.e., distance to water surface subtracted from a bench mark). It is recommended that a permanent 'outside' staff gauge be installed at FCG, DCG, and NBL. Staff gauges were already installed at NBU and NBH. There is an inside staff gauge (in the stilling well) for the main stations (FCG, DCG, and NBL) that should be read and recorded. This is a method to determine hydraulic connectivity between the stilling well and the stream water level. The outside staff should be located in still waters and kept free of stream debris.

Weirs

A weir is an overflow structure built in an open channel to measure flow rate. Alsea weirs from the USGS era are broad-crested compound weirs. Stage or head measurements, the measured depth of water above the weir notch, are used to determine flow from a rating table or rating curve (OCF 2013).

The broad-crested compound weir at Flynn Creek. Note outside staff gauge in the pool on river right.

Types/locations of weirs on site

There are three broad-crested compound weirs located at the base of each watershed within Alsea DCG, FCG, and NBL. All of these weirs were installed by the USGS in 1958.

Equipment

1. Installed weir
2. Installed staff gauge/pressure transducer
3. Rating table or weir equation
4. Watch to record time

Procedure

Manual measurement (AEP 2009)

1. Note the location.
2. Note the date and time and record.
3. Read water level from the staff gauge and record.
4. Determine the flow rate using the rating table/weir equation and record (see the appendices for all associated look up tables or rating curves)

Downloading continuous data recorder (Hale 2007)

1. Visually assess the weir and Turbidity Threshold Sampler (TTS) boom for any obvious interference and note in field book and on field forms. Typical interferences include, but are not limited to, debris caught in the weir or on the instrumentation, sediment covering the stilling well intake, and/or beaver activity causing backwater effect in the vicinity of the gauge (*quality control step to ensure data accuracy*).
    a. If there is an obvious problem, continue to step 2 without fixing it and then repeat steps 3 and 4 after fixing it, noting specifically changes in stage and/or turbidity that occurred as a result of maintenance.

b. If there is no problem, note and continue to step 2.

2. Enter the gauge house and connect laptop to the Campbell Scientific data logger via the 9-pin connector cable (*provides opportunity to immediately assess data logger real-time display for potential problems and determine the next "awakening" time for measurement; awakenings occur on ten minute intervals and are indicated by illumination of the OBS button in the "Ports and Flags" window*)
   a. Open LoggerNet software
   b. Connect to the correct data logger (from list)
   c. Open "Numeric Window" and "Ports and Flags" window
3. Log the following information in field notebook and on gauge house data sheet (*data collection*)
   a. Field visit records
      i. Date and Time
      ii. Field personnel present
      iii. Current weather conditions
   b. Data retrieval and manual verification measurements
   (*Steps i-ix provide data necessary for quality control used when compiling, correcting, and analyzing data later*)
      i. Stage
         1) TTS (from numeric window)
         2) Reference stage (*verifies accuracy of instrumentation*) - Measure the outside reference "tape-down" with the staff plate located in each gauge house. Tape-down is located as follows:
            a) FCG- on the upstream side of the weir, right of the notch, top of bolt- subtract measured value from 3.27 to get reference stage in feet.
            b) NBL- on the left bank, weir approach wall, top of lowest bolt- subtract measured value from 2.89 to get reference stage in feet.
            c) DCG - on the upstream side of the weir, right of the notch, top of bolt- subtract measured value from 2.78 to get reference stage in feet.
         3) Stevens stage measurement (*backup for data logger*) - at time of reading, mark on scroll: the current position (by rotating the pulley gently), the date, time, initials, and reference stage.
            a) Complete section of field form associated with Stevens recorder
            b) Reset time or stage, if necessary
            c) Wind clock, if necessary
      ii. TTS system battery voltage (new and old battery in the case of a battery change)
      iii. Median turbidity
      iv. Dump #
      v. Next Bottle #
      vi. If probe was wiped or boom was cleared
      vii. If fouling was evident
      viii. Samples attempted and retrieved (from ISCO)
         1) Note if correct volume was collected

2) Note that ISCO was reset after collection, if applicable

ix. Other information pertinent to specific visit

4. If TTS samples have been collected since the previous visit, perform a data dump.
   a. Fill out bottle labels for each sample collected. Provide:
      i. Dump #
      ii. Location ID
      iii. Bottle number (from ISCO carousel)
      iv. Date of retrieval
      v. Total number of bottles retrieved for this visit
      vi. Initials

   See TTS Field Manual for explicit instructions for the following steps:

   b. If collecting a depth integrated sample (*collected intermittently during wet season, especially during storm events, to verify the performance of the auto-sampler against a USGS accepted method for suspended sediment concentration sample acquisition*)
      i. Click and highlight the "DI" button in the "Ports and Flags" window
      ii. Wait for ISCO sample to be triggered at next "awakening" (*awakening is when OBS-3 turbidity probe and other sensors are activated to take a measurement, every 10 minutes under current settings, and indicated by the illumination of the OBS button in the "Ports and Flags" window*).
      iii. Collect depth integrated sample with DH-48
         1) Place bottle in sampler
         2) Beginning on one side of the flow, submerge sampler slowly through the water column and move to the opposite bank perpendicular to flow while continuing to lift and submerge the sampler.
         3) The goal is to completely fill the bottle with one pass across the channel
   c. Immediately following an "awakening", click and highlight the "Dump" button in the "Ports and Flags" window (*performed to download data from data logger and collect samples from ISCO*)
   d. In LoggerNet window, choose "Custom Collection"
   e. Depending on data needs, choose "Collect All" (this data logger with current settings only holds approximately one month's worth of data, so don't expect to access the entire record with this setting) or "Collect All Since Last Collection". Name the file with station initials and dump date (i.e., FCG060125) and save in "newdata" folder.
   f. While file is downloading, Stop ISCO program (press stop), access and cap bottles, remove and label (in sequential order).
   g. Replace retrieved bottles with clean ones and replace cover
   h. Reset ISCO by pressing "Start" then "Enter"
   i. Check downloaded data by using the TTS RawPlot software
      i. Launch program
      ii. Select file number to view
      iii. Plot Stage-Turbidity and look for any obvious problems that may need addressing in the field

j. If battery change is required, after dump (*batteries should be changed when voltage reaches 12 volts or lower*):
   i. Power off ISCO and disconnect computer from data logger
   ii. Quickly switch battery leads
   iii. Power on ISCO and reconnect to computer
   iv. Reset any settings in the numeric window, if necessary (minimum stage, turbidity offset, stage offset, etc.)
   v. Check to make sure "Dump" number and "Next bottle" have been changed to appropriate values (usually current dump number plus one for "Dump" and one for "Next bottle"), manually change, if necessary.

k. Upon return to office, immediately create back up file to be saved on another server.

Flumes

Types/locations of flumes on site

There is an 18 inch-45 degree trapezoidal flume manufactured by Plasti-Fab installed at NBU. This trapezoidal flume has application advantages over other flumes and weirs because the bottom is level, and does not require a free-fall discharge to operate correctly (Plasti-Fab 2015).

The trapezoidal flume at NBU gauging station.

There is a 3-foot H-flume manufactured by Tracom installed at NBH. H-Type flumes provide excellent accuracy for a wide range of flows in open channels where free-falling discharge conditions occur, H-flumes differ from other flumes as they more closely resemble V-notch weirs than flumes due to their exit geometry (Tracom 2015).

Procedure

Manual measurement (AEP 2009)

1. Record the flume location.
2. Note the date and time and record.
3. Read water level from the staff gauges-inside, outside and data logger and record.

4. Determine the flow rate using the rating table/flume equation and record (see the appendices for all associated rating tables).

Downloading continuous data recorder (Hale 2007)

1. Visually assess the weir and TTS boom for any obvious interference and note in field book and on field forms. Typical interferences include, but are not limited to, debris caught in the weir or on the instrumentation, sediment covering the stilling well intake, and/or beaver activity causing backwater effect in the vicinity of the gauge (*quality control step to ensure data accuracy*).
    a. If there is an obvious problem, continue to step 2 without fixing it and then repeat steps 3 and 4 after fixing it, noting specifically changes in stage and/or turbidity that occurred due to maintenance.
    b. If there is no problem, note and continue to step 2.
2. Enter the gauge house and connect laptop to the Campbell Scientific data logger via the 9-pin connector cable (*provides opportunity to immediately assess data logger real-time display for potential problems and determine the next "awakening" time for measurement; awakenings occur on ten minute intervals and are indicated by the illumination of the OBS button in the "Ports and Flags" window*)
    a. Open LoggerNet software
    b. Connect to the correct data logger (from list)
    c. Open "Numeric Window" and "Ports and Flags" window
3. Log the following information in field notebook and on gauge house data sheet (*data collection*)
    a. Field visit records
        i. Date and Time
        ii. Field personnel present
        iii. Current weather conditions
    b. Data retrieval and manual verification measurements
    (*Steps i-ix provide data necessary for quality control used when compiling, correcting, and analyzing data date*)
        i. Stage
            1) TTS (from numeric window)
            2) Reference stage (*verifies accuracy of instrumentation*) - Measure the outside reference "tape-down" with the staff plate located in each gauge house. Tape-down is located as follows:
                a) Flynn Creek- on the upstream side of the weir, right of the notch, top of bolt- Subtract measured value from 3.27 to get reference stage in feet.
                b) Needle Branch- on the left bank, weir approach wall, top of lowest bolt- Subtract measured value from 2.89 to get reference stage in feet.
                c) Deer Creek- on the upstream side of the weir, right of the notch, top of bolt- Subtract measured value from 2.78 to get reference stage in feet.
            3) Stevens stage measurement (*backup for data logger*) - at time of reading, mark on scroll: the current position (by rotating the pulley gently), date, time, technician initials, and reference stage.
                a) Complete section of field form associated with Stevens recorder
                b) Reset time or stage, if necessary

c) Wind clock, if necessary

ii. TTS system battery voltage (new and old battery in the case of a battery change)

iii. Median turbidity

iv. Dump #

v. Next Bottle #

vi. If probe was wiped or boom was cleared

vii. If fouling was evident

viii. Samples attempted and retrieved (from ISCO)

1) Note if correct volume was collected

2) Note that ISCO was reset after collection, if applicable

ix. Other information pertinent to specific visit

4. If TTS samples have been collected since the previous visit, perform a data dump.

a. Fill out bottle labels for each sample collected. Provide:

i. Dump #

ii. Location ID

iii. Bottle number (from ISCO carousel)

iv. Date of retrieval

v. Total number of bottles retrieved for this visit

vi. Initials

See TTS Field Manual for explicit instructions for the following steps:

b. If collecting a depth integrated sample (*collected intermittently during wet season, especially during storm events, to verify performance of the auto-sampler against a USGS accepted method for suspended sediment concentration sample acquisition*)

i. Click and highlight the "DI" button in the "Ports and Flags" window

ii. Wait for ISCO sample to be triggered at next "awakening" (*awakening is when OBS-3 turbidity probe and other sensors are activated to take a measurement, every 10 minutes under current settings and indicated by illumination of the OBS button in the "Ports and Flags" window*).

iii. Collect depth integrated sample with DH-48

1) Place bottle in sampler

2) Beginning on one side of the flow, submerge sampler slowly through the water column and move to the opposite bank perpendicular to flow while continuing to lift and submerge the sampler.

3) The goal is to completely fill the bottle with one pass across the channel

c. Immediately following an "awakening", click and highlight the "Dump" button in the "Ports and Flags" window (*performed to download data from data logger and collect samples from ISCO*)

d. In LoggerNet window, choose "Custom Collection"

e. Depending on data needs, choose "Collect All" (this data logger with current settings only holds approximately one month's worth of data, so don't expect to access the entire record with this setting) or "Collect All Since Last Collection". Name the file with station initials and dump date (i.e., FCG060125) and save in "newdata" folder.

f. While file is downloading, Stop ISCO program (press stop), access and cap bottles, remove and label (in sequential order).
g. Replace retrieved bottles with clean ones and replace cover
h. Reset ISCO by pressing “Start” then “Enter”
i. Check downloaded data by using the TTS RawPlot software
    i. Launch program
    ii. Select file number to view
    iii. Plot Stage-Turbidity and look for any obvious problems that may need addressing in the field
j. If battery change is required, after dump (*batteries should be changed when voltage reaches 12 volts or lower*):
    i. Power off ISCO and disconnect computer from data logger
    ii. Quickly switch battery leads
    iii. Power on ISCO and reconnect to computer
    iv. Reset any settings in the numeric window, if necessary (minimum stage, turbidity offset, stage offset, etc.)
    v. Check to make sure “Dump” number and “Next bottle” have been changed to appropriate values (usually current dump number plus one for “Dump” and one for “Next bottle”), manually change, if necessary
k. Upon return to office, immediately create back up file to be saved on another server

DATA COLLECTION AND PROCESSING

Time and Frequency of Data Collection

Each gauge site should be visited at regular intervals specified by the watershed manager (generally weekly during wet periods). The control sections with continuous water-level recorders should be visited at least once a week during periods of little to no rainfall, and after each period of stormflow. These visits should coincide with visits to rain gauge locations. Site visits should be scheduled the day after the end of a rainfall event.

Sources of Errors in Data Collection

Sampling errors generally are not considered in measurements of discharge. However, errors in a rating curve should be considered (Ffolliott 1990). Errors in a rating curve can include, but are not limited to, errors in taking measurements that are required for developing a rating curve (i.e., Velocity-Area Method), the statistical variability in the curve itself, and instrument-related errors (especially when a continuous water-level recorder is employed to determine the stage). Regular site visits and proper site maintenance, therefore, are very important.

Data Processing

Processing data collected at a staff gauge, or while completing a cross-section with the Velocity-Area Method, is relatively simple. Observations made are recorded on appropriate forms and then the corresponding flow rate can be determined from the rating table or equation found in the associated appendix.

Processing data obtained from a continuous water-level recorder, such as a pressure transducer, is more detailed. Immediately after data from a continuous water-level recorder have been downloaded, data

processing should begin and should be completed as soon as possible to ensure that any malfunctions in the instrumentation can be addressed in a timely manner.

Data Analysis

Discharge for each control structure should be plotted versus time to observe any obvious problems with the data. In general, the larger the contributing area, the larger the discharge should be. To ensure data quality, two graphical comparisons should be made.

For the New Alsea Study Watersheds, the first graphical comparison made should include DCG, FCG, and NBL. Highest discharge should be for DCG, followed by FCG; NBL should have the lowest discharge of the three control structures. The second graphical comparison made should include NBL, NBU, and NBH. NBL should have the highest discharge, followed by NBU, and NBH should have the lowest discharge of the three stations.

Rating Curve (Stage-Discharge Relationships)

Stream discharge is one of the most difficult variables to measure continuously. The derivation of an empirical relationship between stage (water level) and discharge is fundamental to producing streamflow data. A true stage-discharge curve will hold its shape as the number of discharge measurements increases and will accurately predict streamflow in extrapolated areas, such as those areas that are outside the previously measured range. A stage-discharge curve is developed from a series of stage and streamflow measurements. These measurements are assumed to have homogeneous variance and are independent, neither of which is true. The curve is often fit statistically based on the correlation of determination, although it should be better recognized as a hydraulics-derived function of the channel cross section. Care should be taken to identify the zero flow point for each stream gauging station. Although Alsea includes artificial control sections, previous efforts by USGS continued to identify stage shifts and needed offsets for NBL, DCG, and FCG gauging stations. Similarly, the flumes at NBU and NBH suggest a variable stage-discharge relationship due to debris and sediment accumulation in the flumes or poor hydraulic conductivity between the stilling well and water elevation in the flume.

Site visits are recognized to occur as a function of precipitation/streamflow events or routine maintenance. As part of any visit to any gauging station, field/observations notes should be collected even when data loggers are not downloaded. See the new proposed field notes form in Appendix VI (p. 1.23). The site visit should include station name, date, time, general weather and stream conditions, and name of personnel. *The importance of a current and properly maintained rating curve (stage-discharge relationship) cannot be overstated*. Whenever a site visit is made, the outside stage, inside stage, and recorded/measured stage need to be recorded in field notes. When time is available or when a streamflow event not previously measured is occurring, a discharge measurement can be taken as described above. Once back in the office, calculate the discharge and add to the existing stage rating database. Plot the data point on the rating curve to check for curve consistency. These field notes, streamflow measurements, and data logger downloads need to be kept current and uploaded to the database soon after collection. Changes in the rating curve have been problematic even for these artificial control sections.

WATER QUALITY

Water Quality Monitoring

To evaluate the types and amounts of water quality constituents in water, representative water quality measurements are taken. Water quality samples are collected at each gauging location on a monthly interval (Hale 2007). Physical samples are accompanied by *in situ* water quality measurements made with a Hydrolab Quanta (Hach Company, Loveland, CO) (Hale 2007). Dissolved oxygen (in milligrams per liter and percent saturation), temperature (C˚), pH (standard units), and specific conductivity (µS/cm) will be recorded. Turbidity will be measured using a Hach 2100P Turbidimeter either in the field or in

the lab using a re-suspended sub-sample of the nutrient sample collected in the field (Hale 2007). Laboratory analytical methods and Quality Assurance/Quality Control procedures are outlined in the QAPP (Hale 2007).

Procedure (Hale 2007)

1. Prior to leaving for the field
    a. Make arrangements with NCASI laboratory for sample delivery date and request bottles and labels
    b. The HydroLab should be calibrated according to its instruction manual
    c. The turbidimeter should be calibrated according to its instruction manual
    d. Bottles and labels should be picked up from NCASI laboratory
    e. Buy ice
2. Upon arriving at sample location
    a. Submerge HydroLab Quanta in channel thalweg and allow to equilibrate
    b. Measure reference stage as described in Servicing Stream Gauges outline (3.iv.2) and note in field book
    c. Put on nitrile gloves (new pair at each site)
    d. Label bottle with necessary information, including site ID, date, time, and technician initials
    e. Collect sample from mid-depth in channel thalweg
        i. Be sure to be downstream from bottle to ensure sample quality!
    f. Record site ID, date, time, dissolved oxygen (in milligrams per liter and percent saturation), temperature (C˚), pH (standard units), and specific conductivity (µS/cm) in field book
    g. Either
        i. Measure and record turbidity in the field using cuvette
        ii. Sub-sample each sample in the lab using nitrile gloves and the cuvette in the Turbidimeter case to measure turbidity
    h. Deliver samples to NCASI laboratory within 24 hours of collection:
    720 SW 4th Street
    Corvallis, Oregon 97333

RECOMMENDATIONS

1. A common and readily accessible database needs to be built and maintained. All data need to be uploaded shortly after collection. A common naming/labeling system needs to be implemented. Similarly, field notes, anecdotal observations, and pictures can be included.

2. Standard, non-recording rain gauges (SRG) should be placed in and around the study watersheds for additional precipitation data collection and to validate tipping bucket rain gauges. Alter shields are less important than additional rain gauges.

3. Stream gauging stations all should have ‘outside’ staff gauges (rather than depth to water minus bench mark elevation calculations), including NBH and NBU. The weirs and the flumes are not self-maintaining with respect to organic debris and sediment accumulation in the weir ponds or flume itself. Routine maintenance includes removing said debris. However stage measurements should include ‘before and after’ readings to allow better estimation of stage before debris accumulation. Other than prevention of back-waters impeding the downstream flume discharge, downstream channel maintenance efforts are generally not needed.

4. Gauging stations at NBL, DCG, and FCG (all originally built by the USGS) have inside stage gauges located in their stilling well. These stage readings should be included in routine maintenance of the gauging station. This confirms the stage reading and a responsive hydraulic connection between the stilling well and inlet pipes (stream level). See proposed discharge measurement form in Appendix VI (p. 1.23).

5. More site visits to gauging stations and/or increased recording of stage during site visits. Stage values are rarely corrected or adjusted, but stage shifts are recognized at all streamflow gauging stations. Stage notes can be collected on the proposed discharge form in Appendix VI (p. 1.23).

6. All weirs and flumes are subject to leakage. It is advised that a small amount of fluorescein dye be injected into the upstream channel especially during low flows and to identify structure leakage. Maintenance can include caulking, mortar, or waterproof epoxy.

7. Increased streamflow measurements should be made to build better rating curves for all stations. The rating curve (stage-discharge relationship) should not be considered constant. All stations are subject to channel shape changes which will affect the rating curve. The lower portion of the rating curve is subject to change. Offsets are rarely addressed in the streamflow reduction. Measurement units are often problematic, whereby streamflow may be measured as m/s and then incorrectly converted to ft/s. See proposed discharge measurement form in Appendix VI (p. 1.23). We advise that each discharge measurement be plotted to assess rating curve functionality and consistency. A point to the left of the curve will show backwater conditions. Conversely a point to the right of the curve may show a steeper energy slope as on a rising limb. Each gauging station has a zero-flow stage that needs to be included in the rating curve.

8. A decision on Flynn Creek needs to be made as to its added value for streamflow monitoring. A second pressure transducer was placed in the Flynn Creek weir pond in 2007, to record to stage values. Using two stage values, near the weir and at the head of the weir pond, would allow calculation of a water slope to estimate discharge as a step-backwater. These data or the second pressure transducer have apparently been lost. Better discharge estimates would improve the rating curve. The current rating curve is very poor. We will be hard-pressed to recreate past streamflow values and will have to develop a predictive equation, probably from DSG as precipitation data are inconsistent between stations. Further, storm event precipitation records are also frequently missing.

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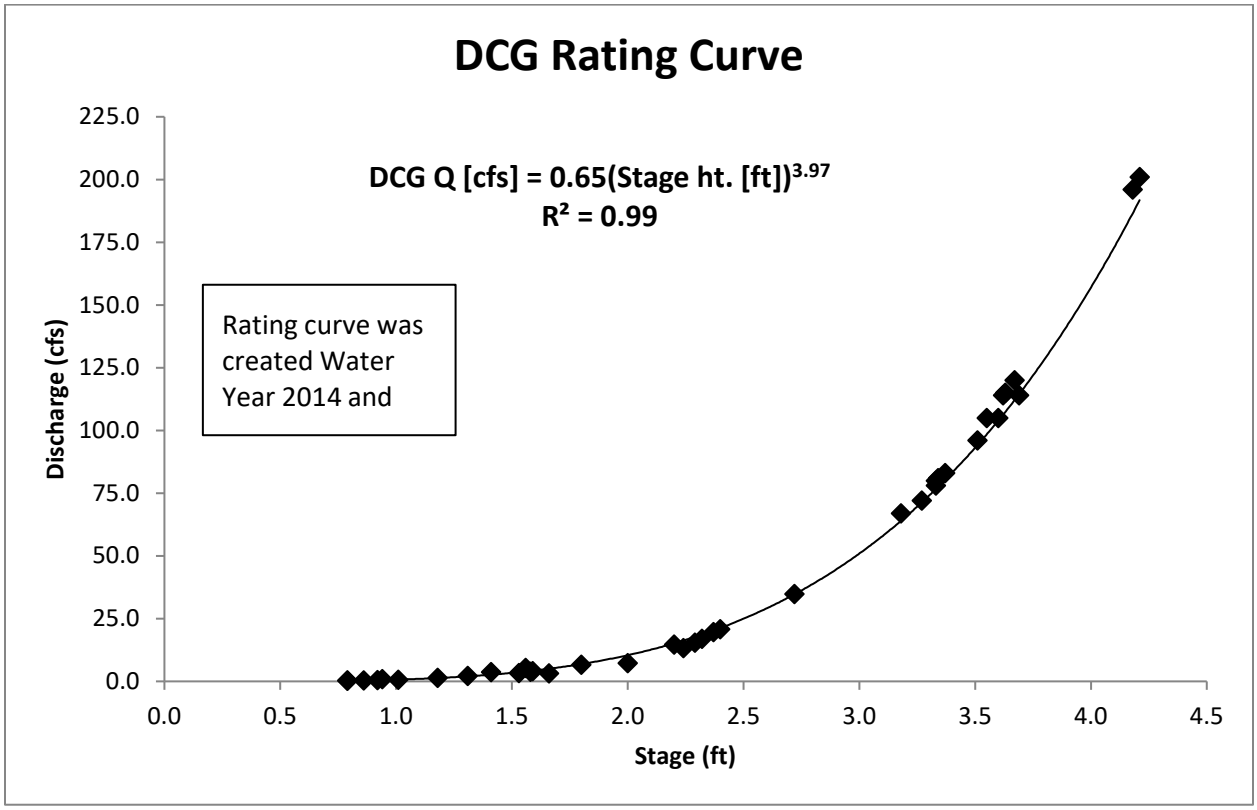
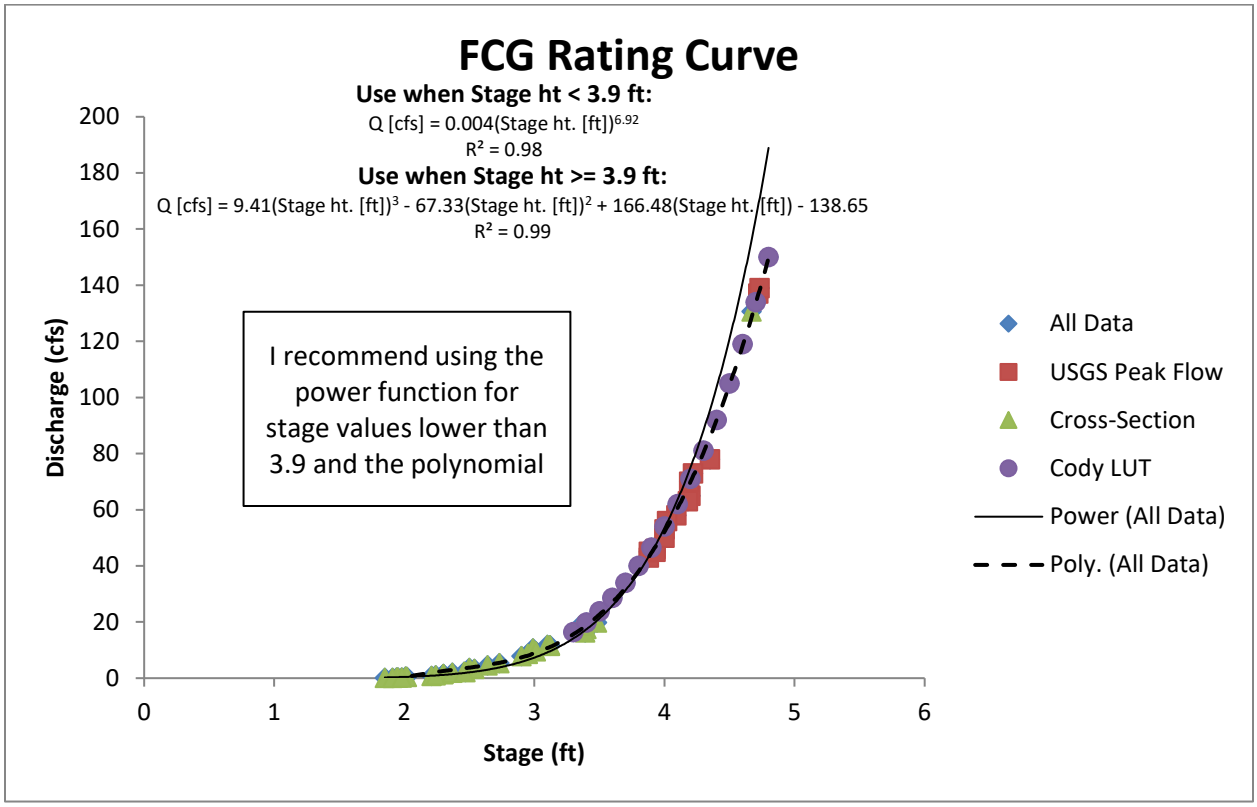
APPENDIX I
Deer Creek (DCG) Rating Curve



APPENDIX II
Flynn Creek (FCG) Rating Curve



APPENDIX III
Needle Branch Lower (NBL) Gauging Station Look Up Table

NBL LUT Broad-crested compound weir							
Stage (h) (ft)	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**
0.99	0.02	1.35	0.47	1.71	2.09	2.07	6.19
1.00	0.02	1.36	0.49	1.72	2.16	2.08	6.36
1.01	0.02	1.37	0.52	1.73	2.23	2.09	6.53
1.02	0.02	1.38	0.54	1.74	2.30	2.10	6.70
1.03	0.03	1.39	0.57	1.75	2.37	2.11	6.93
1.04	0.03	1.40	0.60	1.76	2.44	2.12	7.16
1.05	0.04	1.41	0.63	1.77	2.51	2.13	7.39
1.06	0.04	1.42	0.65	1.78	2.59	2.14	7.62
1.07	0.05	1.43	0.68	1.79	2.67	2.15	7.85
1.08	0.06	1.44	0.71	1.80	2.75	2.16	8.08
1.09	0.07	1.45	0.74	1.81	2.84	2.17	8.31
1.10	0.08	1.46	0.78	1.82	2.93	2.18	8.54
1.11	0.08	1.47	0.81	1.83	3.02	2.19	8.77
1.12	0.09	1.48	0.84	1.84	3.11	2.20	9.00
1.13	0.10	1.49	0.88	1.85	3.20	2.21	9.30
1.14	0.12	1.50	0.92	1.86	3.30	2.22	9.60
1.15	0.13	1.51	0.96	1.87	3.40	2.23	9.90
1.16	0.14	1.52	1.01	1.88	3.50	2.24	10.20
1.17	0.16	1.53	1.06	1.89	3.60	2.25	10.50
1.18	0.17	1.54	1.11	1.90	3.70	2.26	10.80
1.19	0.19	1.55	1.16	1.91	3.83	2.27	11.10
1.20	0.20	1.56	1.21	1.92	3.96	2.28	11.40
1.21	0.21	1.57	1.26	1.93	4.09	2.29	11.70
1.22	0.22	1.58	1.31	1.94	4.22	2.30	12.00
1.23	0.24	1.59	1.36	1.95	4.35	2.31	12.30
1.24	0.26	1.60	1.41	1.96	4.48	2.32	12.60
1.25	0.27	1.61	1.47	1.97	4.61	2.33	12.90
1.26	0.29	1.62	1.53	1.98	4.74	2.34	13.20
1.27	0.31	1.63	1.59	1.99	4.87	2.35	13.50
1.28	0.32	1.64	1.65	2.00	5.00	2.36	13.80
1.29	0.34	1.65	1.71	2.01	5.17	2.37	14.10
1.30	0.36	1.66	1.77	2.02	5.34	2.38	14.40
1.31	0.38	1.67	1.83	2.03	5.51	2.39	14.70
1.32	0.40	1.68	1.89	2.04	5.68	2.4>	$Q = 10.07h^2 - 22.88h + 12.20$
1.33	0.42	1.69	1.95	2.05	5.85		
1.34	0.44	1.70	2.02	2.06	6.02		

APPENDIX IV
Needle Branch Upper (NBU) Gauging Station Look Up Table

NBU LUT 18-inch 45-Degree Trapezoidal Flume															
Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)
<0.25	Q = 2.853 * (h + 0.13558)^2.497	0.51	0.957	0.8	2.416	1.09	4.741	1.38	8.058	1.67	12.476	1.96	18.097	2.25	25.012
		0.52	0.994	0.81	2.481	1.1	4.838	1.39	8.191	1.68	12.649	1.97	18.313	2.26	25.275
		0.53	1.032	0.82	2.547	1.11	4.937	1.4	8.326	1.69	12.824	1.98	18.531	2.27	25.539
0.25	0.264	0.54	1.072	0.83	2.614	1.12	5.036	1.41	8.462	1.7	13	1.99	18.751	2.28	25.805
0.26	0.282	0.55	1.112	0.84	2.682	1.13	5.137	1.42	8.599	1.71	13.178	2	18.972	2.29	26.073
0.27	0.3	0.56	1.153	0.85	2.751	1.14	5.239	1.43	8.738	1.72	13.357	2.01	19.194	2.3	26.342
0.28	0.318	0.57	1.194	0.86	2.822	1.15	5.342	1.44	8.878	1.73	13.537	2.02	19.418	2.31	26.613
0.29	0.338	0.58	1.237	0.87	2.893	1.16	5.447	1.45	9.019	1.74	13.719	2.03	19.644	2.32	26.885
0.3	0.358	0.59	1.281	0.88	2.965	1.17	5.552	1.46	9.162	1.75	13.902	2.04	19.871	2.33	27.16
0.31	0.379	0.6	1.325	0.89	3.039	1.18	5.659	1.47	9.306	1.76	14.087	2.05	20.1	2.34	27.436
0.32	0.401	0.61	1.371	0.9	3.113	1.19	5.767	1.48	9.451	1.77	14.273	2.06	20.331	2.35	27.713
0.33	0.423	0.62	1.417	0.91	3.189	1.2	5.876	1.49	9.598	1.78	14.461	2.07	20.563	2.36	27.992
0.34	0.446	0.63	1.464	0.92	3.266	1.21	5.987	1.5	9.746	1.79	14.65	2.08	20.796	2.37	28.273
0.35	0.47	0.64	1.513	0.93	3.343	1.22	6.098	1.51	9.896	1.8	14.841	2.09	21.031	2.38	28.556
0.36	0.494	0.65	1.562	0.94	3.422	1.23	6.211	1.52	10.047	1.81	15.033	2.1	21.268	2.39	28.84
0.37	0.52	0.66	1.612	0.95	3.502	1.24	6.326	1.53	10.199	1.82	15.227	2.11	21.506	2.4	29.126
0.38	0.546	0.67	1.663	0.96	3.583	1.25	6.441	1.54	10.352	1.83	15.422	2.12	21.746	2.41	29.414
0.39	0.572	0.68	1.715	0.97	3.666	1.26	6.558	1.55	10.507	1.84	15.619	2.13	21.988	2.42	29.703
0.4	0.6	0.69	1.768	0.98	3.749	1.27	6.676	1.56	10.664	1.85	15.817	2.14	22.231	2.43	29.994
0.41	0.628	0.7	1.822	0.99	3.833	1.28	6.795	1.57	10.821	1.86	16.017	2.15	22.476	2.44	30.287
0.42	0.658	0.71	1.877	1	3.919	1.29	6.915	1.58	10.981	1.87	16.218	2.16	22.722	2.45	30.582
0.43	0.688	0.72	1.933	1.01	4.006	1.3	7.037	1.59	11.141	1.88	16.421	2.17	22.97	2.46	30.878
0.44	0.718	0.73	1.99	1.02	4.094	1.31	7.16	1.6	11.303	1.89	16.625	2.18	23.22	2.47	31.176
0.45	0.75	0.74	2.047	1.03	4.183	1.32	7.285	1.61	11.466	1.9	16.83	2.19	23.471	2.48	31.475
0.46	0.782	0.75	2.106	1.04	4.273	1.33	7.41	1.62	11.631	1.91	17.038	2.2	23.724	2.49	31.777
0.47	0.815	0.76	2.166	1.05	4.364	1.34	7.537	1.63	11.797	1.92	17.246	2.21	23.978	2.5	32.08
0.48	0.849	0.77	2.227	1.06	4.457	1.35	7.665	1.64	11.965	1.93	17.457	2.22	24.234		
0.49	0.884	0.78	2.289	1.07	4.55	1.36	7.795	1.65	12.134	1.94	17.668	2.23	24.492		
0.5	0.92	0.79	2.352	1.08	4.645	1.37	7.926	1.66	12.304	1.95	17.882	2.24	24.751		

APPENDIX V
Needle Branch H-Flume (NBH) Gauging Station Look Up Table

Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)
0.01		0.39	0.383	0.77	1.48	1.15	3.46	1.53	6.48	1.91	10.7	2.29	16.2	2.67	23.3
0.02	0.0021	0.4	0.402	0.78	1.52	1.16	3.53	1.54	6.58	1.92	10.8	2.3	16.4	2.68	23.5
0.03	0.0045	0.41	0.421	0.79	1.56	1.17	3.6	1.55	6.67	1.93	10.9	2.31	16.6	2.69	23.7
0.04	0.0073	0.42	0.441	0.8	1.6	1.18	3.66	1.56	6.77	1.94	11.0	2.32	16.7	2.7	23.9
0.05	0.0105	0.43	0.462	0.81	1.65	1.19	3.73	1.57	6.87	1.95	11.2	2.33	16.9	2.71	24.1
0.06	0.0143	0.44	0.483	0.82	1.69	1.2	3.8	1.58	6.96	1.96	11.3	2.34	17.1	2.72	24.3
0.07	0.0186	0.45	0.504	0.83	1.73	1.21	3.87	1.59	7.06	1.97	11.4	2.35	17.2	2.73	24.5
0.08	0.0234	0.46	0.526	0.84	1.78	1.22	3.94	1.6	7.16	1.98	11.6	2.36	17.4	2.74	24.7
0.09	0.0288	0.47	0.549	0.85	1.82	1.23	4.01	1.61	7.26	1.99	11.7	2.37	17.6	2.75	24.9
0.1	0.0347	0.48	0.572	0.86	1.86	1.24	4.08	1.62	7.36	2.0	11.9	2.38	17.8	2.76	25.2
0.11	0.0407	0.49	0.596	0.87	1.91	1.25	4.15	1.63	7.47	2.01	12.0	2.39	17.9	2.77	25.4
0.12	0.0471	0.5	0.62	0.88	1.96	1.26	4.23	1.64	7.57	2.02	12.1	2.4	18.1	2.78	25.6
0.13	0.0538	0.51	0.644	0.89	2.0	1.27	4.3	1.65	7.67	2.03	12.3	2.41	18.3	2.79	25.8
0.14	0.061	0.52	0.669	0.9	2.05	1.28	4.37	1.66	7.78	2.04	12.4	2.42	18.5	2.8	26.0
0.15	0.0686	0.53	0.695	0.91	2.1	1.29	4.45	1.67	7.88	2.05	12.6	2.43	18.7	2.81	26.2
0.16	0.0766	0.54	0.721	0.92	2.15	1.3	4.53	1.68	7.99	2.06	12.7	2.44	18.8	2.82	26.5
0.17	0.0851	0.55	0.748	0.93	2.2	1.31	4.6	1.69	8.1	2.07	12.8	2.45	19.0	2.83	26.7
0.18	0.0939	0.56	0.775	0.94	2.25	1.32	4.68	1.7	8.2	2.08	13.0	2.46	19.2	2.84	26.9
0.19	0.1032	0.57	0.803	0.95	2.3	1.33	4.76	1.71	8.31	2.09	13.1	2.47	19.4	2.85	27.1
0.2	0.113	0.58	0.832	0.96	2.35	1.34	4.84	1.72	8.42	2.1	13.3	2.48	19.6	2.86	27.4
0.21	0.123	0.59	0.861	0.97	2.41	1.35	4.92	1.73	8.53	2.11	13.4	2.49	19.8	2.87	27.6
0.22	0.134	0.6	0.89	0.98	2.46	1.36	5.0	1.74	8.64	2.12	13.6	2.5	19.9	2.88	27.6
0.23	0.145	0.61	0.92	0.99	2.51	1.37	5.08	1.75	8.75	2.13	13.7	2.51	20.1	2.89	28.0
0.24	0.156	0.62	0.951	1.0	2.57	1.38	5.16	1.76	8.87	2.14	13.9	2.52	20.3	2.9	28.3
0.25	0.168	0.63	0.982	1.01	2.62	1.39	5.24	1.77	8.98	2.15	14.0	2.53	20.5	2.91	28.5
0.26	0.18	0.64	1.014	1.02	2.68	1.4	5.33	1.78	9.1	2.16	14.2	2.54	20.7	2.92	28.7
0.27	0.193	0.65	1.047	1.03	2.73	1.41	5.41	1.79	9.21	2.17	14.3	2.55	20.9	2.93	28.9
0.28	0.207	0.66	1.08	1.04	2.79	1.42	5.5	1.8	9.33	2.18	14.5	2.56	21.1	2.94	29.2
0.29	0.22	0.67	1.113	1.05	2.85	1.43	5.58	1.81	9.45	2.19	14.6	2.57	21.3	2.95	29.4
0.3	0.234	0.68	1.147	1.06	2.91	1.44	5.67	1.82	9.56	2.2	14.8	2.58	21.5	2.96	29.7
0.31	0.249	0.69	1.182	1.07	2.97	1.45	5.76	1.83	9.68	2.21	14.9	2.59	21.7	2.97	29.9
0.32	0.264	0.7	1.22	1.08	3.03	1.46	5.84	1.84	9.8	2.22	15.1	2.6	21.9	2.98	30.1
0.33	0.28	0.71	1.25	1.09	3.09	1.47	5.93	1.85	9.92	2.23	15.3	2.61	22.1	2.99	30.4
0.34	0.296	0.72	1.29	1.1	3.15	1.48	6.02	1.86	10.05	2.24	15.4	2.62	22.3		
0.35	0.312	0.73	1.33	1.11	3.21	1.49	6.11	1.87	10.17	2.25	15.6	2.63	22.5		
0.36	0.329	0.74	1.36	1.12	3.27	1.5	6.2	1.88	10.29	2.26	15.7	2.64	22.7		
0.37	0.347	0.75	1.4	1.13	3.34	1.51	6.3	1.89	10.41	2.27	15.9	2.65	22.9		
0.38	0.365	0.76	1.44	1.14	3.4	1.52	6.39	1.9	10.5	2.28	16.1	2.66	23.1		

APPENDIX VI
Discharge Measurement and Site Inspection Form
(Modified from USGS-WSP 2175)

Site Name_____
Date_____ Observers _____

Debris on notch or in flume (circle) yes no

If no debris	If debris	After debris removal
Outside stage_____	Outside stage_____	Outside stage_____
Inside stage_____	Inside stage_____	Inside stage_____
Recorded stage_____	Recorded stage_____	Recorded stage_____
		Stage adjustment to logger_____

Discharge Measurement Summary
Measurement Start Time _____ Measurement End Time _____
Width _____ Area _____ Velocity _____ Gage-height _____ Discharge _____

Method _____ Number of sections _____ Gage-height change _____ in _____ hours

Meter Type (circle) mechanical, optical, electro-magnetic, hydroacoustic
Meter Make/Model _____ Serial Number _____
For mechanical meters only: Spin Test before meas _____; after meas _____
Rating used_____
For optical, electro-magnetic, and hydroacoustic meters only: Firmware _____ Software _____
Diagnostic test (circle) Pass, Fail
Measurement rated (circle) excellent (2%), good (5%), fair (8%), poor (>8%)

Control condition: _____
_____
_____

Discharge Measurement - Mid-section Method

(measure distance from initial point and calculate width to the nearest 0.1 foot; measure depth to the nearest 0.01 foot)
(observation depth below WS is usually 0.6, unless section is too shallow)

Units used (circle) feet meters

Distance	Width (W)	Depth (D)	Observation depth	Revolutions	Time (sec)	Velocity	Area (WxD)	Section discharge
Total width	Total width						Total area	Total Q

FLYNN CREEK
STREAMFLOW WATER YEARS 2009-2015

SUMMARY

This report summarizes the methods and compilation of the streamflow data for Flynn Creek (FCG) (Flynn Creek Gauging station, watershed area 500 acres) for water years 2009-2015. See the Excel file titled, FCG_Final_WY2009-2015, for all data. All of Flynn Creek (FCG) streamflow data were predicted with Deer Creek (DCG) streamflow data. Given the amount of prediction and confidence in the actual streamflow measurements, the streamflow data are rated as fair (per Rantz et al. 1982). Streamflow records (FCG_Final_WY2009-2015) include daily, monthly and annual values. Streamflow values can be used for relative comparisons between the different years and different gauging locations. The streamflow data cannot be used as a control to estimate annual water yields as affected by timber harvesting. A series of recommendations have been made to improve streamflow measurement and water yield quantification.

RECOMMENDATIONS

1. A common and readily accessible database needs to be built and maintained. All data need to be uploaded shortly after collection. A common naming/labeling system needs to be implemented. Similarly, field notes, anecdotal observations, and pictures can be included.

2. Standard non-recording rain gauges (SRG) should be placed in and around the study watersheds for additional precipitation data collection and to validate tipping bucket rain gauges. Alter shields are less important than additional rain gauges.

3. Stream gauging stations all should have ‘outside’ staff gauges (rather than depth to water minus bench mark elevation calculations), including NBH and NBU. The weirs and the flumes are not self-maintaining with respect to organic debris and sediment accumulation in the weir ponds or flume itself. Routine maintenance will include removing said debris; however stage measurements should include ‘before and after’ readings to allow better estimation of stage before debris accumulation. Other than prevention of back-waters impeding the downstream flume discharge, downstream channel maintenance efforts are generally not needed.

4. Gauging stations at NBL, DCG, and FCG (all originally built by the USGS) have inside stage gauges located in their stilling well. These stage readings should be included in the routine maintenance of the gauging station. This confirms the stage reading and a responsive hydraulic connection between the stilling well and inlet pipes (stream level). See proposed discharge measurement form in Appendix VI (p. 1.23).

5. More frequent site visits to gauging stations and/or increased recording of stage during site visits. Stage values are rarely corrected or adjusted, but stage shifts are recognized at all streamflow gauging stations. Stage notes can be collected on the proposed discharge form in Appendix VI (p. 1.23).

6. More frequent discharge measurements should be made to build better rating curves for all stations. The rating curve (stage-discharge relationship) should not be considered constant. All stations are subject to channel shape changes which will affect the rating curve, specifically, the lower portion of the rating curve is subject to change. Offsets are rarely addressed in the streamflow reduction. We advise that each discharge measurement be plotted to assess rating curve functionality and consistency. A point to the left of the curve will show backwater conditions, conversely a point to the right of the curve may show a steeper energy slope - as on a rising limb. Each gauging station has a zero-flow stage that needs to be included in the rating curve. Units are often problematic, whereby

streamflow may be measured as m/s and then incorrectly converted to ft/s. See proposed discharge measurement form in Appendix VI (p. 1.23).

7. A decision on Flynn Creek needs to be made as to its added value for streamflow monitoring. A second pressure transducer was placed in the Flynn Creek weir pond in 2007, to record to stage values; using two stage values, near the weir and at the head of the weir pond would allow calculation of a water slope to estimate discharge as a step-backwater. These data or the second pressure transducer have apparently been lost. Better discharge estimates would improve the rating curve. The current rating curve is very poor. We will be hard-pressed to recreate past streamflow values and will have to develop a predictive equation, probably from Deer Creek as precipitation data are inconsistent between stations and storm event precipitation records are also frequently missing.

METHODOLOGY

1. All streamflow data at FCG were predicted using DCG mean daily streamflow values.

Equation 1: DCG vs FCG Relationship

$$FCG\ Q[cfs] = 0.67(DCG\ Q[cfs])$$

$$R^2 = 0.98$$

LITERATURE CITED

Rantz, S.E. et al. 1982. *Measurement and Computation of Streamflow* (two volumes). USGS Water Supply Paper 2175. Washington DC: US Geological Survey.

SUMMARY TABLES

Summary tables of mean daily streamflow values have been compiled for each water year. Along the base of the table, monthly and annual statistics can be found for that water year.

Key
Observed Q value was predicted with DCG

Flynn Creek, Alsea Watershed Study												
Water Year 2009												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.28	0.35	1.82	24.80	1.88	3.71	4.13	1.82	1.48	0.69	0.35	0.26
2	0.29	0.68	2.51	75.37	1.82	5.32	13.11	2.24	1.40	0.65	0.35	0.26
3	0.39	0.94	2.16	26.62	1.82	4.40	17.94	2.11	1.37	0.63	0.36	0.25
4	1.38	2.79	2.11	16.35	1.74	4.01	12.41	3.77	1.45	0.59	0.35	0.25
5	0.66	2.24	2.03	17.41	1.69	4.99	8.18	4.61	1.43	0.57	0.35	0.33
6	0.79	5.21	1.95	25.45	1.95	5.12	4.99	9.23	1.38	0.56	0.35	0.36
7	0.82	6.67	1.95	30.06	1.69	4.77	4.15	13.76	1.26	0.56	0.37	0.31
8	0.64	5.38	1.95	45.76	1.74	4.07	3.77	7.98	1.17	0.55	0.37	0.30
9	0.68	5.50	1.82	29.90	1.82	3.75	3.53	5.02	1.13	0.54	0.37	0.29
10	0.72	5.34	1.74	17.45	1.88	3.49	3.23	3.97	1.07	0.52	0.36	0.27
11	0.62	6.78	1.69	12.37	2.11	3.26	2.97	3.41	1.01	0.52	0.34	0.26
12	0.57	24.97	2.16	9.54	2.16	3.09	3.50	3.61	0.95	0.59	0.36	0.26
13	0.53	53.76	2.74	7.60	2.24	2.92	3.82	3.73	1.13	0.59	0.35	0.25
14	0.50	18.72	2.96	6.35	2.16	3.54	3.73	8.50	0.97	0.53	0.35	0.25
15	0.47	9.20	3.17	5.58	2.16	11.54	3.76	8.58	0.89	0.49	0.34	0.26
16	0.47	5.36	3.32	4.68	2.11	17.39	3.64	6.23	0.84	0.47	0.34	0.30
17	0.45	4.03	3.52	4.03	1.95	10.00	3.57	4.87	0.77	0.45	0.32	0.30
18	0.43	3.27	4.41	3.51	1.88	6.16	3.21	3.91	0.74	0.44	0.30	0.28
19	0.41	2.89	4.32	3.11	1.82	4.45	2.94	3.48	1.14	0.43	0.29	0.28
20	0.46	2.88	5.11	2.79	1.74	4.00	2.70	3.05	0.97	0.43	0.29	0.28
21	0.46	2.58	14.89	2.58	1.69	3.58	2.57	2.73	0.95	0.42	0.29	0.26
22	0.42	2.47	29.68	2.40	2.28	4.04	2.32	2.55	0.85	0.42	0.28	0.24
23	0.40	2.51	21.23	2.03	2.47	3.56	2.24	2.37	0.80	0.41	0.29	0.24
24	0.38	2.32	13.32	1.88	2.36	3.73	2.11	2.22	0.81	0.40	0.29	0.24
25	0.37	2.24	11.23	2.03	3.46	6.38	2.03	2.15	0.83	0.39	0.29	0.24
26	0.35	2.16	9.85	1.74	7.17	10.68	1.95	2.02	0.74	0.38	0.28	0.23
27	0.35	2.03	22.18	2.11	6.08	7.59	1.88	1.88	0.71	0.38	0.27	0.23
28	0.34	1.95	63.35	2.16	4.12	5.65	1.82	1.79	0.69	0.37	0.32	0.23
29	0.34	1.88	34.41	2.03		6.88	2.16	1.69	0.68	0.36	0.31	0.29
30	0.34	1.82	20.63	1.95		6.29	1.95	1.61	0.71	0.36	0.28	0.31
31	0.35		12.64	1.95		4.74		1.54		0.35	0.27	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.28	0.35	1.69	1.74	1.69	2.92	1.82	1.54	0.68	0.35	0.27	0.23
Max Q (cfs)	1.38	53.76	63.35	75.37	7.17	17.39	17.94	13.76	1.48	0.69	0.37	0.36
Mean Monthly Q (cfs)	0.51	6.30	9.90	12.63	2.43	5.58	4.34	4.08	1.01	0.48	0.32	0.27
Cumulative Q (cfs)	15.66	188.94	306.90	391.63	68.03	173.10	130.32	126.42	30.31	15.01	10.05	8.13
Annual Water Yield (in)		69.72				**Mean Annual Q (cfs)**			4.01			

Flynn Creek, Alsea Watershed Study												
Water Year 2010												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.27	1.00	4.57	16.85	3.48	8.49	15.10	7.89	1.58	1.39	0.72	1.05
2	0.26	0.81	3.65	13.84	3.39	6.80	13.49	6.44	7.16	1.48	0.70	0.58
3	0.33	0.65	3.14	9.70	3.54	6.09	14.48	8.64	11.00	1.28	0.70	0.46
4	0.35	0.52	2.78	7.97	3.51	5.21	16.20	9.31	11.47	1.19	0.67	0.41
5	0.30	0.49	2.58	9.22	3.38	4.55	14.58	8.34	9.62	1.11	0.65	0.39
6	0.28	0.98	2.41	14.67	3.36	4.05	15.36	6.99	6.81	1.06	0.65	0.37
7	0.26	2.58	2.28	12.12	3.43	3.74	14.00	6.01	5.80	1.00	0.64	0.41
8	0.25	5.01	2.29	9.36	3.29	3.27	12.89	5.16	4.84	0.96	0.65	0.40
9	0.24	4.64	2.29	7.93	3.19	2.90	11.23	4.47	5.80	0.96	0.63	0.42
10	0.24	4.30	2.27	6.80	3.25	3.06	9.79	4.00	9.83	0.94	0.64	0.39
11	0.23	3.61	2.22	5.99	4.25	4.32	8.47	3.47	9.07	0.91	0.62	0.37
12	0.23	4.64	2.20	7.71	6.39	18.56	7.28	3.11	7.00	0.88	0.60	0.36
13	0.25	4.53	2.18	10.72	6.96	16.95	6.13	2.80	5.46	0.86	0.54	0.35
14	0.46	3.61	2.11	12.02	7.54	12.29	5.27	2.55	4.35	0.84	0.42	0.35
15	0.34	2.74	9.97	11.95	6.97	9.21	4.77	2.34	3.66	0.82	0.41	0.43
16	0.31	1.99	16.06	15.63	6.98	7.26	4.15	2.14	3.24	0.80	0.41	0.56
17	0.53	5.98	10.96	12.46	6.30	5.90	3.67	1.94	2.86	0.84	0.41	0.57
18	0.52	6.30	8.29	11.39	5.72	4.88	3.32	1.85	2.45	0.84	0.41	0.81
19	0.43	4.94	6.45	10.14	4.97	4.17	3.07	1.84	2.27	0.82	0.41	1.11
20	0.39	5.23	5.98	8.07	4.27	3.67	3.12	2.02	2.13	0.81	0.39	1.24
21	0.45	5.17	12.72	6.82	3.72	4.08	2.76	3.43	1.89	0.79	0.38	0.84
22	0.43	5.13	15.07	5.72	3.33	3.86	2.48	4.68	1.67	0.78	0.38	0.69
23	0.86	4.42	11.27	4.60	3.53	3.49	2.28	4.73	1.51	0.76	0.36	0.63
24	0.83	3.68	8.85	4.09	4.92	3.33	2.43	4.27	1.39	0.73	0.35	0.60
25	0.59	2.78	7.19	4.03	4.72	5.41	2.12	4.27	1.26	0.72	0.35	0.57
26	1.45	3.25	5.86	3.53	7.33	15.12	2.87	4.07	1.15	0.73	0.34	0.61
27	1.75	6.23	4.85	3.27	11.47	13.27	10.31	3.80	1.06	0.72	0.34	0.65
28	1.23	5.56	4.07	2.95	10.82	11.63	12.23	3.52	1.01	0.73	0.34	1.02
29	1.39	4.15	3.25	2.78		19.06	11.68	3.23	0.94	0.70	0.33	1.02
30	1.65	3.01	3.46	2.74		27.93	9.64	2.91	0.87	0.71	0.51	1.02
31	2.24		8.25	2.52		21.48		2.84		0.72	0.43	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.23	0.49	2.11	2.52	3.19	2.90	2.12	1.84	0.87	0.70	0.33	0.35
Max Q (cfs)	2.24	6.30	16.06	16.85	11.47	27.93	16.20	9.31	11.47	1.48	0.72	1.24
Mean Monthly Q (cfs)	0.62	3.60	5.79	8.31	5.14	8.52	8.17	4.29	4.30	0.90	0.50	0.62
Cumulative Q (cfs)	19.35	107.97	179.50	257.57	144.02	264.01	245.15	133.04	129.13	27.90	15.37	18.69
Annual Water Yield (in)		73.39				**Mean Annual Q (cfs)**			4.22			

Flynn Creek, Alsea Watershed Study												
Water Year 2011												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	1.02	1.25	24.32	7.94	2.36	12.58	8.55	8.02	2.40	0.88	0.47	0.31
2	1.02	2.34	18.54	6.11	2.20	12.01	8.36	6.46	2.44	0.83	0.45	0.28
3	1.02	1.73	13.14	4.95	2.05	11.35	7.73	5.27	2.28	0.82	0.41	0.27
4	1.02	1.33	10.23	3.86	1.96	15.19	7.31	4.38	2.11	0.78	0.41	0.27
5	1.02	2.07	8.26	3.05	1.93	17.68	7.98	3.75	1.95	0.75	0.40	0.27
6	1.02	2.12	6.90	2.52	1.86	14.69	9.13	3.45	1.87	0.72	0.41	0.26
7	1.02	4.23	5.87	2.25	2.16	12.29	9.34	3.54	1.84	0.71	0.41	0.26
8	1.09	4.49	6.19	2.24	2.29	11.72	8.14	3.49	1.71	0.69	0.39	0.26
9	1.21	4.70	7.63	2.22	2.23	11.80	6.67	3.09	1.61	0.69	0.38	0.26
10	1.40	7.47	13.70	2.05	2.49	17.25	5.60	2.89	1.53	0.67	0.38	0.25
11	1.21	6.47	18.51	1.93	2.36	16.72	6.12	3.04	1.46	0.66	0.37	0.25
12	1.15	4.85	16.60	2.51	2.36	13.74	5.37	2.84	1.47	0.68	0.37	0.26
13	1.09	3.71	17.87	8.06	2.87	12.66	5.25	2.66	1.54	0.70	0.37	0.26
14	1.02	3.13	26.81	11.62	3.83	13.69	6.02	2.58	1.41	0.64	0.35	0.26
15	1.02	3.00	17.87	15.02	10.21	14.76	9.15	2.57	1.34	0.62	0.35	0.25
16	1.02	3.22	11.49	47.98	8.94	19.15	14.77	2.49	1.28	0.81	0.34	0.25
17	1.02	3.65	8.30	29.21	5.87	22.64	11.52	2.48	1.21	0.68	0.34	0.24
18	1.02	12.90	7.66	17.26	5.36	17.87	8.78	2.39	1.25	0.63	0.33	0.24
19	1.02	10.41	8.30	14.53	4.66	14.02	6.88	2.26	1.21	0.62	0.33	0.25
20	1.02	9.78	12.77	11.52	4.09	11.55	5.59	2.13	1.17	0.59	0.32	0.25
21	1.02	8.27	12.13	9.14	3.83	10.42	4.66	2.02	1.11	0.57	0.32	0.25
22	1.02	7.40	8.30	7.40	3.83	9.09	3.92	1.91	1.06	0.56	0.32	0.24
23	1.09	7.18	6.26	6.04	4.09	8.13	3.33	1.81	1.02	0.53	0.32	0.24
24	5.17	6.23	5.17	4.98	4.21	7.53	3.10	1.71	0.98	0.52	0.32	0.24
25	9.58	5.13	4.53	4.14	3.83	6.67	5.31	1.94	0.95	0.51	0.31	0.30
26	5.04	5.01	5.49	3.48	3.57	6.71	6.66	1.85	0.92	0.50	0.30	0.27
27	2.75	5.84	9.58	2.98	3.70	9.19	6.82	2.40	0.93	0.49	0.30	0.42
28	2.17	6.22	28.09	2.63	20.43	11.64	6.57	2.65	0.97	0.48	0.29	0.33
29	1.92	5.87	30.64	2.40		12.70	7.84	2.59	0.92	0.48	0.30	0.29
30	1.72	8.41	15.96	2.11		17.31	7.92	2.57	0.96	0.48	0.29	0.27
31	1.98		12.79	1.91		16.73		2.56		0.47	0.31	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	1.02	1.25	4.53	1.91	1.86	6.67	3.10	1.71	0.92	0.47	0.29	0.24
Max Q (cfs)	9.58	12.90	30.64	47.98	20.43	22.64	14.77	8.02	2.44	0.88	0.47	0.42
Mean Monthly Q (cfs)	1.77	5.28	12.90	7.87	4.27	13.21	7.15	3.03	1.43	0.64	0.35	0.27
Cumulative Q (cfs)	54.90	158.40	399.90	244.03	119.60	409.48	214.38	93.79	42.87	19.76	10.98	8.03
Annual Water Yield (in)		84.55				**Mean Annual Q (cfs)**			4.87			

Flynn Creek, Alsea Watershed Study												
Water Year 2012												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.30	0.48	3.71	10.88	7.71	8.56	22.51	6.00	1.68	1.59	1.24	0.34
2	0.33	0.49	3.13	7.70	6.33	9.34	16.15	6.44	1.73	1.47	1.24	0.34
3	0.48	0.92	2.72	6.00	5.44	8.12	10.72	13.76	1.57	1.74	1.24	0.33
4	0.47	0.78	2.36	5.45	4.71	7.25	9.48	19.74	1.84	1.46	1.24	0.33
5	0.78	0.79	2.12	5.51	4.05	7.73	8.81	14.78	2.15	1.35	1.17	0.33
6	0.46	0.91	1.90	4.96	3.53	8.79	8.07	10.86	1.89	1.27	1.17	0.32
7	0.42	0.79	1.74	4.27	3.10	7.83	6.95	8.39	2.38	1.20	0.50	0.32
8	0.38	0.72	1.60	3.60	3.18	6.57	5.87	6.80	2.80	1.16	0.49	0.32
9	0.40	0.66	1.51	3.10	2.96	5.46	4.98	5.68	3.17	1.10	0.48	0.32
10	0.80	0.60	1.51	2.72	2.73	4.98	4.26	4.83	2.81	1.06	0.47	0.33
11	1.36	0.63	1.51	2.41	2.56	6.29	3.74	4.17	2.55	1.02	0.46	0.31
12	0.84	0.80	1.51	2.17	2.52	8.25	3.39	3.63	2.22	0.98	0.45	0.30
13	0.61	1.14	1.52	1.97	2.56	12.00	3.22	3.21	2.22	0.95	0.44	0.30
14	0.51	1.02	1.53	1.98	2.72	13.56	2.75	2.86	2.02	0.91	0.43	0.29
15	0.46	0.98	1.42	1.93	2.78	32.75	2.51	2.60	1.96	0.93	0.43	0.29
16	0.42	1.69	1.33	1.83	2.83	23.73	4.75	2.36	1.89	0.93	0.42	0.28
17	0.38	6.79	1.31	4.84	3.09	18.80	5.37	2.17	1.83	0.90	0.41	0.28
18	0.36	6.72	1.28	58.24	3.76	15.13	5.00	2.02	1.89	0.87	0.41	0.28
19	0.35	5.78	1.22	85.20	4.01	11.48	5.17	1.88	1.98	0.84	0.41	0.28
20	0.34	4.51	1.18	35.61	4.54	10.56	7.11	1.79	1.85	0.86	0.40	0.28
21	0.33	4.09	1.14	27.94	6.75	13.84	7.05	2.14	1.75	0.79	0.40	0.29
22	0.33	8.43	1.10	18.46	16.53	12.07	5.82	2.09	1.87	0.75	0.39	0.28
23	0.32	15.84	1.06	13.05	14.21	10.75	4.74	2.02	2.25	0.72	0.38	0.28
24	0.31	14.61	1.01	14.47	9.45	9.72	3.94	3.21	2.15	0.70	0.37	0.27
25	0.30	10.77	1.07	19.45	7.66	8.80	3.71	2.94	2.21	0.68	0.37	0.26
26	0.30	7.90	1.09	13.87	6.87	7.76	3.94	2.64	2.14	0.67	0.37	0.26
27	0.29	6.61	1.70	10.70	6.25	6.88	3.94	2.43	1.95	0.68	0.38	0.26
28	0.32	6.16	18.18	8.66	5.90	6.47	3.80	2.28	1.82	1.31	0.37	0.26
29	0.40	5.48	29.33	8.44	6.61	20.56	3.54	2.08	1.71	1.31	0.36	0.25
30	0.55	4.86	63.68	10.30		60.20	4.06	1.92	1.66	1.31	0.36	0.25
31	0.63		25.04	9.04		36.22		1.79		1.24	0.36	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.29	0.48	1.01	1.83	2.52	4.98	2.51	1.79	1.57	0.67	0.36	0.25
Max Q (cfs)	1.36	15.84	63.68	85.20	16.53	60.20	22.51	19.74	3.17	1.74	1.24	0.34
Mean Monthly Q (cfs)	0.47	4.06	5.82	13.06	5.36	13.56	6.18	4.82	2.06	1.06	0.57	0.29
Cumulative Q (cfs)	14.52	121.93	180.53	404.73	155.35	420.44	185.37	149.51	61.93	32.72	17.62	8.83
Annual Water Yield (in)		83.47				**Mean Annual Q (cfs)**			4.79			

Flynn Creek, Alsea Watershed Study												
Water Year 2013												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.25	15.01	11.25	4.94	10.74	13.32	2.12	1.86	6.67	0.71	0.38	0.77
2	0.25	13.40	22.21	4.19	8.40	11.33	2.00	1.75	5.15	0.67	0.40	0.75
3	0.24	8.63	19.40	3.64	6.78	8.83	1.89	1.64	4.10	0.64	0.40	0.72
4	0.23	6.25	25.74	3.30	5.68	7.16	2.01	1.56	3.41	0.61	0.38	0.71
5	0.24	4.92	31.62	2.85	5.10	6.33	2.29	1.47	2.91	0.59	0.38	1.31
6	0.23	3.95	18.52	2.58	4.91	5.96	3.36	1.39	2.57	0.58	0.34	1.91
7	0.23	3.19	13.98	3.25	5.01	5.36	6.68	1.32	2.29	0.57	0.32	1.12
8	0.23	2.89	11.90	4.00	4.56	4.93	8.79	1.27	2.09	0.55	0.32	0.95
9	0.24	2.47	10.52	7.51	4.26	4.48	7.23	1.22	1.93	0.53	0.32	0.88
10	0.24	2.17	9.10	10.08	3.93	4.06	6.17	1.17	1.79	0.51	0.33	0.82
11	0.25	2.02	8.85	9.18	3.60	3.69	5.26	1.13	1.71	0.49	0.33	0.79
12	0.44	4.41	10.33	7.71	3.61	3.35	4.69	1.08	1.60	0.48	0.32	0.76
13	0.68	5.13	10.62	6.21	3.58	3.06	4.33	1.08	1.84	0.47	0.30	0.77
14	0.51	4.47	9.46	5.09	3.55	2.83	4.10	1.02	1.53	0.46	0.30	0.76
15	3.33	3.71	9.40	4.25	3.41	2.67	3.85	1.02	1.40	0.45	0.33	0.78
16	5.29	3.12	12.63	3.61	3.23	2.74	3.59	0.99	1.31	0.45	0.32	0.82
17	1.86	3.24	17.44	3.12	3.01	2.60	3.34	0.94	1.24	0.44	0.31	0.77
18	1.18	9.50	13.83	2.76	2.87	2.38	3.08	0.93	1.19	0.43	0.30	0.73
19	1.32	25.57	11.88	2.47	2.90	2.40	3.61	0.93	1.15	0.42	0.29	0.72
20	1.41	25.13	30.81	2.24	2.74	5.24	4.26	0.85	1.17	0.42	0.28	0.78
21	1.47	16.75	25.42	2.05	3.19	6.22	4.63	1.63	1.07	0.41	0.28	0.83
22	1.56	12.42	20.32	1.91	5.40	5.93	4.31	3.10	0.99	0.40	0.28	1.46
23	1.53	10.18	18.04	2.07	10.86	5.19	3.79	5.94	0.98	0.39	0.28	2.14
24	1.48	11.73	16.71	1.88	10.00	4.61	3.33	6.99	1.04	0.38	0.28	2.50
25	1.32	10.24	15.17	2.01	9.35	4.03	2.94	6.22	1.13	0.37	0.28	3.57
26	1.17	8.10	15.93	2.50	8.45	3.57	2.64	4.99	1.25	0.36	0.30	2.44
27	2.09	6.51	17.76	4.10	7.61	3.18	2.38	7.82	1.01	0.36	0.35	2.09
28	10.20	5.40	14.43	8.75	9.53	2.95	2.24	11.41	0.89	0.36	0.31	12.69
29	20.76	5.04	11.31	14.01		2.68	2.29	11.64	0.80	0.36	0.37	41.42
30	12.34	5.01	9.11	12.65		2.46	2.01	11.25	0.75	0.36	0.40	59.80
31	10.85		7.56	10.57		2.27		8.91		0.36	0.33	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.23	2.02	7.56	1.88	2.74	2.27	1.89	0.85	0.75	0.36	0.28	0.71
Max Q (cfs)	20.76	25.57	31.62	14.01	10.86	13.32	8.79	11.64	6.67	0.71	0.40	59.80
Mean Monthly Q (cfs)	2.69	8.02	15.52	5.02	5.58	4.70	3.77	3.37	1.90	0.47	0.33	4.89
Cumulative Q (cfs)	83.40	240.56	481.26	155.49	156.27	145.82	113.22	104.51	56.96	14.59	10.13	146.56
Annual Water Yield (in)		81.34				**Mean Annual Q (cfs)**			4.68			

Flynn Creek, Alsea Watershed Study												
Water Year 2014												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	14.29	0.72	1.26	1.69	4.30	4.82	6.01	3.71	1.21	0.92	0.21	0.13
2	9.97	1.12	13.01	1.58	3.66	5.32	4.90	3.20	1.15	0.83	0.20	0.12
3	6.88	1.45	7.77	1.53	3.22	9.37	4.33	3.12	1.11	0.78	0.19	0.12
4	4.93	1.42	4.92	1.42	2.84	10.60	3.92	3.30	1.06	0.73	0.19	0.11
5	3.68	1.88	3.63	1.35	2.54	21.39	3.85	3.28	1.01	0.69	0.18	0.11
6	2.88	2.21	2.89	1.29	2.40	30.85	4.99	2.94	0.96	0.65	0.17	0.10
7	2.60	3.36	2.32	1.36	2.29	23.09	5.51	2.74	0.93	0.63	0.16	0.10
8	2.43	4.22	1.94	2.20	2.84	18.32	4.94	3.77	0.90	0.60	0.16	0.10
9	2.22	3.58	1.71	4.28	6.55	27.65	4.31	8.68	0.87	0.58	0.16	0.10
10	1.98	2.98	1.54	4.69	7.87	24.19	3.72	11.40	0.83	0.56	0.15	0.10
11	1.83	2.52	1.40	7.05	15.71	17.65	3.26	9.59	0.81	0.54	0.15	0.10
12	1.79	2.41	1.38	9.80	38.17	14.08	2.91	6.81	0.84	0.53	0.15	0.09
13	1.65	2.05	1.40	12.63	27.42	11.41	2.63	5.09	1.34	0.53	0.15	0.09
14	1.52	1.93	1.25	9.45	24.32	9.59	2.42	4.11	0.96	0.51	0.15	0.09
15	1.42	1.91	1.17	6.70	21.01	7.80	2.24	3.42	0.88	0.49	0.15	0.09
16	1.33	2.67	1.11	5.07	19.51	7.02	2.08	2.97	0.82	0.47	0.14	0.10
17	1.25	2.88	1.06	4.03	17.63	7.41	2.31	2.66	0.83	0.45	0.14	0.10
18	1.18	3.70	1.02	3.35	18.08	6.52	2.07	2.63	0.76	0.44	0.13	0.10
19	1.12	9.73	0.97	2.89	19.34	6.06	1.91	2.99	0.72	0.43	0.13	0.10
20	1.06	10.23	1.06	2.58	16.88	5.42	1.76	2.38	0.72	0.40	0.13	0.10
21	1.01	6.92	1.69	2.35	15.28	4.83	1.72	2.15	0.68	0.35	0.12	0.10
22	0.96	4.98	1.76	2.17	12.25	4.32	2.01	1.99	0.65	0.32	0.12	0.10
23	0.92	3.84	1.81	2.01	9.86	3.90	4.09	1.89	0.63	0.39	0.12	0.13
24	0.89	3.10	1.82	1.87	8.10	3.57	19.89	1.79	0.61	0.38	0.12	0.31
25	0.86	2.61	1.74	1.75	6.66	3.41	14.40	1.67	0.62	0.31	0.12	0.16
26	0.83	2.30	1.57	1.65	5.55	4.26	9.08	1.62	0.66	0.28	0.11	0.13
27	0.84	2.06	1.42	1.59	4.83	6.64	7.88	1.51	1.38	0.26	0.11	0.12
28	0.80	1.86	1.28	1.78	4.19	13.86	6.50	1.59	1.40	0.25	0.11	0.11
29	0.77	1.70	1.19	5.15		19.30	5.32	1.44	1.19	0.24	0.11	0.12
30	0.74	1.58	1.10	6.45		13.41	4.43	1.34	1.03	0.23	0.16	0.14
31	0.74		1.02	5.24		10.06		1.27		0.22	0.15	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.74	0.72	0.97	1.29	2.29	3.41	1.72	1.27	0.61	0.22	0.11	0.09
Max Q (cfs)	14.29	10.23	13.01	12.63	38.17	30.85	19.89	11.40	1.40	0.92	0.21	0.31
Mean Monthly Q (cfs)	2.43	3.13	2.23	3.77	11.55	11.49	4.85	3.45	0.92	0.48	0.15	0.12
Cumulative Q (cfs)	75.37	93.93	69.20	116.96	323.28	356.14	145.39	107.03	27.52	15.01	4.54	3.48
Annual Water Yield (in)		63.69				**Mean Annual Q (cfs)**			3.67			

Flynn Creek, Alsea Watershed Study												
Water Year 2015												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.13	3.69	9.65	6.88	2.55	2.08	2.15	0.69	0.77	0.82	0.86	0.87
2	0.12	3.17	7.58	6.04	2.78	2.02	2.20	0.65	0.77	0.82	0.86	0.87
3	0.11	3.10	6.19	5.17	2.54	1.88	2.21	0.62	0.77	0.83	0.87	0.86
4	0.11	3.29	6.99	4.75	2.37	1.80	1.96	0.56	0.77	0.82	0.86	0.84
5	0.11	3.42	7.12	4.22	2.84	1.73	1.80	0.51	0.77	0.83	0.85	0.83
6	0.10	3.48	8.53	3.86	14.58	1.66	1.64	0.50	0.77	0.83	0.85	0.83
7	0.08	3.18	8.79	3.59	19.07	1.59	1.47	0.47	0.78	0.83	0.85	0.84
8	0.07	2.89	7.50	3.32	16.83	1.53	1.78	0.44	0.78	0.84	0.86	0.84
9	0.06	2.62	6.65	3.08	24.00	1.48	2.20	0.42	0.79	0.84	0.86	0.85
10	0.06	2.30	8.91	2.93	44.43	1.29	2.05	0.39	0.79	0.84	0.87	0.85
11	0.06	2.02	14.34	2.75	19.44	1.10	2.54	0.34	0.78	0.85	0.87	0.85
12	0.05	1.82	16.60	3.04	13.37	1.08	2.18	0.60	0.78	0.85	0.88	0.86
13	0.06	9.56	12.80	2.75	10.62	1.01	2.59	0.50	0.77	0.85	0.88	0.86
14	0.14	18.56	9.77	2.65	8.73	3.46	4.39	0.40	0.77	0.85	0.88	0.85
15	0.25	11.55	7.85	3.08	7.34	10.29	4.70	0.37	0.77	0.85	0.88	0.83
16	0.12	7.96	6.44	8.67	6.18	8.60	4.07	0.36	0.78	0.85	0.87	0.83
17	0.09	6.12	5.55	15.98	5.21	5.97	3.06	0.33	0.77	0.84	0.86	0.84
18	0.30	5.02	5.12	24.47	4.43	4.33	2.52	0.31	0.78	0.84	0.86	0.84
19	0.19	3.91	7.98	15.04	3.85	3.27	1.95	0.29	0.79	0.85	0.87	0.83
20	0.14	3.12	43.19	10.95	3.44	2.72	1.68	0.27	0.79	0.86	0.88	0.83
21	0.14	4.40	66.21	8.68	3.12	2.40	1.49	0.30	0.79	0.86	0.87	0.84
22	2.61	11.35	32.47	7.14	2.85	2.06	1.32	0.26	0.79	0.85	0.86	0.83
23	6.46	9.08	19.91	6.08	2.63	3.19	1.25	0.26	0.79	0.85	0.86	0.81
24	5.28	7.16	16.03	5.18	2.46	5.01	1.17	0.24	0.79	0.84	0.85	0.82
25	4.16	6.96	14.32	4.51	2.31	5.02	1.21	0.39	0.80	0.85	0.84	0.83
26	5.14	7.26	12.19	4.04	2.22	4.32	1.08	0.76	0.80	0.85	0.84	0.83
27	3.89	6.54	10.76	3.65	2.76	3.73	1.00	0.76	0.81	0.84	0.85	0.81
28	3.39	11.29	10.10	3.29	2.26	3.09	0.89	0.77	0.81	0.84	0.86	0.80
29	4.42	19.13	9.41	3.02		2.61	0.79	0.77	0.82	0.85	0.87	0.79
30	4.22	12.95	8.33	2.81		2.35	0.73	0.77	0.82	0.85	0.88	0.79
31	4.30		7.61	2.62		2.60		0.77		0.86	0.88	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.05	1.82	5.12	2.62	2.22	1.01	0.73	0.24	0.77	0.82	0.84	0.79
Max Q (cfs)	6.46	19.13	66.21	24.47	44.43	10.29	4.70	0.77	0.82	0.86	0.88	0.87
Mean Monthly Q (cfs)	1.50	6.56	13.38	5.94	8.40	3.07	2.00	0.49	0.79	0.84	0.86	0.83
Cumulative Q (cfs)	46.39	196.91	414.87	184.24	235.22	95.25	60.07	15.07	23.55	26.14	26.77	25.04
Annual Water Yield (in)		64.24				**Mean Annual Q (cfs)**			3.70			

DEER CREEK
STREAMFLOW WATER YEARS 1992-2015

SUMMARY

This report summarizes the methods and compilation of the streamflow data for Deer Creek (DCG) (Deer Creek Gauging station, watershed area 750 acres) for water years 1992-2015. See the Excel file titled, DCG_Final_WY1992-2015, for all data. Given the amount of prediction and confidence in the actual streamflow measurements, the streamflow data are rated as fair (per Rantz et al. 1982). Streamflow values can be used for relative comparisons between the different years and different gauging locations. The data cannot be used to estimate stationarity of annual water yields or serve a control watershed without qualification. Recommendations are made to improve streamflow measurement and water yield quantification.

Stage data were collected every 10 minutes by a pressure transducer located in the weir stilling pond. These data are recorded on a logger and physically downloaded at various intervals, and all files are shared at the water year end. As noted from the field notes, there are a few stage corrections that are changes in the stage as related to debris removal or sedimentation in the pond. Thus the higher recorded stage measurement overestimates streamflow.

A rating curve (stage-discharge relationship) was developed for the station using historical high flows as measured by the US Geological Survey (USGS) in the original study, coupled with more recent lower streamflow measurements. Regression analysis between stage and discharge showed a very good fit based on the coefficient of determination. (Stream discharge measurements should continue to be collected to confirm equation stability.)

Stage data were used to calculate daily, monthly, and annual streamflow. These runoff values (measured as depth) were compared to on-site precipitation values. Precipitation recorders are located throughout the watershed; however data quality is generally poor due to missing records or equipment failure. The nearest available long-term precipitation data for the Alsea Fish Hatchery (AFH) (NOAA 350145) were downloaded. AFH measures precipitation to the tenth of a millimeter (0.1 mm/tip). These data were confirmed by monthly PRISM data (on-file at Oregon State University). Water yield efficiency was calculated—runoff depth divided by precipitation depth. In general, there was good agreement for water yields (runoff/precipitation). When missing, streamflow estimates were made by linear prediction with East Fork Lobster Creek (EFLC) (USGS 14306340 East Fork Lobster Creek near Alsea, OR), unless extended periods of record were missing or storm events occurred. Streamflow estimation was based on hydrograph comparisons (Rantz et al. 1982) for short periods of record. Streamflow predictions were for a daily time step, since finer resolution would be too speculative. Streamflow records (DCG_Final_WY1992-2015) include 10 minute, daily, monthly and annual values.

RECOMMENDATIONS

1. A common and readily accessible database needs to be built and maintained. All data need to be uploaded shortly after collection. A common naming/labeling system needs to be implemented. Similarly, field notes, anecdotal observations, and pictures can be included.

2. Standard non-recording rain gauges (SRG) should be placed in and around the study watersheds for additional precipitation data collection and to validate tipping bucket rain gauges. Alter shields are less important than additional rain gauges.

3. Stream gauging stations all should have ‘outside’ staff gauges (rather than depth to water minus bench mark elevation calculations), including NBH and NBU. The weirs and the flumes are not self-maintaining with respect to organic debris and sediment accumulation in the weir ponds or flume

itself. Routine maintenance will include removing said debris; however stage measurements should include 'before and after' readings to allow better estimation of stage before debris accumulation. Other than prevention of back-waters impeding the downstream flume discharge, downstream channel maintenance efforts are generally not needed.

4. Gauging stations at NBL, DCG, and FCG (all originally built by the USGS) have inside stage gauges located in their stilling well. These stage readings should be included in the routine maintenance of the gauging station. This confirms the stage reading and a responsive hydraulic connection between the stilling well and inlet pipes (stream level). See proposed discharge measurement form in Appendix VI (p. 1.23).
5. More frequent site visits to gauging stations and/or increased recording of stage during site visits. Stage values are rarely corrected or adjusted, but stage shifts are recognized at all streamflow gauging stations. Stage notes can be collected on the proposed discharge form in Appendix VI (p. 1.23).
6. All weirs and flumes are subject to leakage. It is advised that a small amount of fluorescein dye be injected into the upstream channel especially during low flows and to identify structure leakage. Maintenance can include caulking, mortar, or water proof epoxy.
7. More frequent discharge measurements should be made to build better rating curves for all stations. The rating curve (stage-discharge relationship) should not be considered constant. All stations are subject to channel shape changes which will affect the rating curve, specifically, the lower portion of the rating curve is subject to change. Offsets are rarely addressed in the streamflow reduction. We advise that each discharge measurement be plotted to assess rating curve functionality and consistency. A point to the left of the curve will show backwater conditions, conversely a point to the right of the curve may show a steeper energy slope - as on a rising limb. Each gauging station has a zero-flow stage that needs to be included in the rating curve. Units are often problematic, whereby streamflow may be measured as m/s and then incorrectly converted to ft/s. See proposed discharge measurement form in Appendix VI (p. 1.23).

METHODOLOGY

1. A rating curve was constructed using peak flow data from USGS and cross-section measurements made at DCG.

Equation 1: Rating Curve Equation

$$DCG\ Q[cfs] = 0.65(Stage\ ht.[ft])^{3.97}$$

$$R^2 = 0.99$$

   a. When the 10-minute stage data was available it was converted to a discharge value using Equation 1. The 10-minute data were averaged to get a mean daily value and labeled as raw DCG discharge.

2. When raw DCG discharge was missing it was predicted.
   a. When linear interpolation or hydrograph comparison could be used, it was.
   b. Linear interpolation was not used when there was a precipitation event during the section of missing data or when the section of missing data exceeded 7 days.
   c. If the section of missing data were greater than 7 days, Equation 2 was used.
   d. If Equation 2 did not sufficiently predict the missing data, all daily values were set at a constant value.

Equation 2: NBL to DCG Regression

$$DCG\ Q[cfs] = 3.93(NBL\ Q[cfs]) + 0.68$$

$$R^2 = 0.94$$

3. The mean daily discharge data were converted to a runoff (RO) value using the equation.

Equation 3: Runoff Equation

$$Raw\ DCG\ RO[in] = \frac{12 * 86400 * Q[cfs]}{Area[ft^2]}$$

4. The raw DCG RO was summed by month to determine a monthly RO value.
5. On a monthly time-step, raw DCG RO data was compared to RO data from East Fork of Lobster Creek (EFLC) and a linear regression was developed to relate the two parameters.

Equation 4: EFLC to DCG Regression

$$DCG\ RO[in] = 0.99(EFLC\ RO[in]) + 1.19$$

$$R^2 = 0.83$$

6. DCG RO was then predicted with Equation 4 and the difference between the predicted DCG RO and raw DCG RO was analyzed.
7. If the value of the difference between the predicted RO and the raw RO was greater than two inches/month, the RO was corrected. If the value of the difference between the predicted RO and the raw RO was less than two inches/month then it was assumed that the raw RO value was correct.
8. Once the corrected monthly DCG RO value had been obtained, this value was divided by the raw DCG RO value to come up with a 'correction factor' for that month. If no correction was needed, the correction factor is listed as 1.00. If correction was needed, the factor was scaled to the corrected monthly RO value.

LITERATURE CITED

Rantz, S.E. et al. 1982. *Measurement and Computation of Streamflow* (two volumes). USGS Water Supply Paper 2175. Washington DC: US Geological Survey.

TABLES AND FIGURES

Table 1. Summary of Stage Data Collected by Year at DCG

DCG Missing Data by Year			
Water Year	**Number of Days in Year**	**Number of Days Accounted For**	**Percent Missing**
1992	366	366	
1993	365	365	
1994	365	365	
1995	365	365	
1996	366	366	
1997	365	365	
1998	365	219	40.00
1999	365	365	
2000	366	0	100.00
2001	365	365	
2002	365	365	
2003	365	318	12.88
2004	366	243	33.61
2005	365	95	73.97
2006	365	274	24.93
2007	365	365	
2008	366	366	
2009	365	308	15.62
2010	365	362	0.82
2011	365	291	20.27
2012	366	342	6.56
2013	365	365	
2014	365	365	
2015	365	365	
Total	8766	7565	13.70

Table 2. Summary of DCG daily streamflow predictions

DCG Daily Flow Predictions	Number of Days	Total Number of Days	Percent
Observed Q value assumed correct	5275	8766	60.18
Observed Q value was adjusted with EFLC	2245	8766	25.61
Data are missing and daily values were not predicted	1065	8766	12.15
Linear Regression: DCG Q [cfs] = 3.93(NBL Q [cfs]) + 0.68 R^2 = 0.94	181	8766	2.06

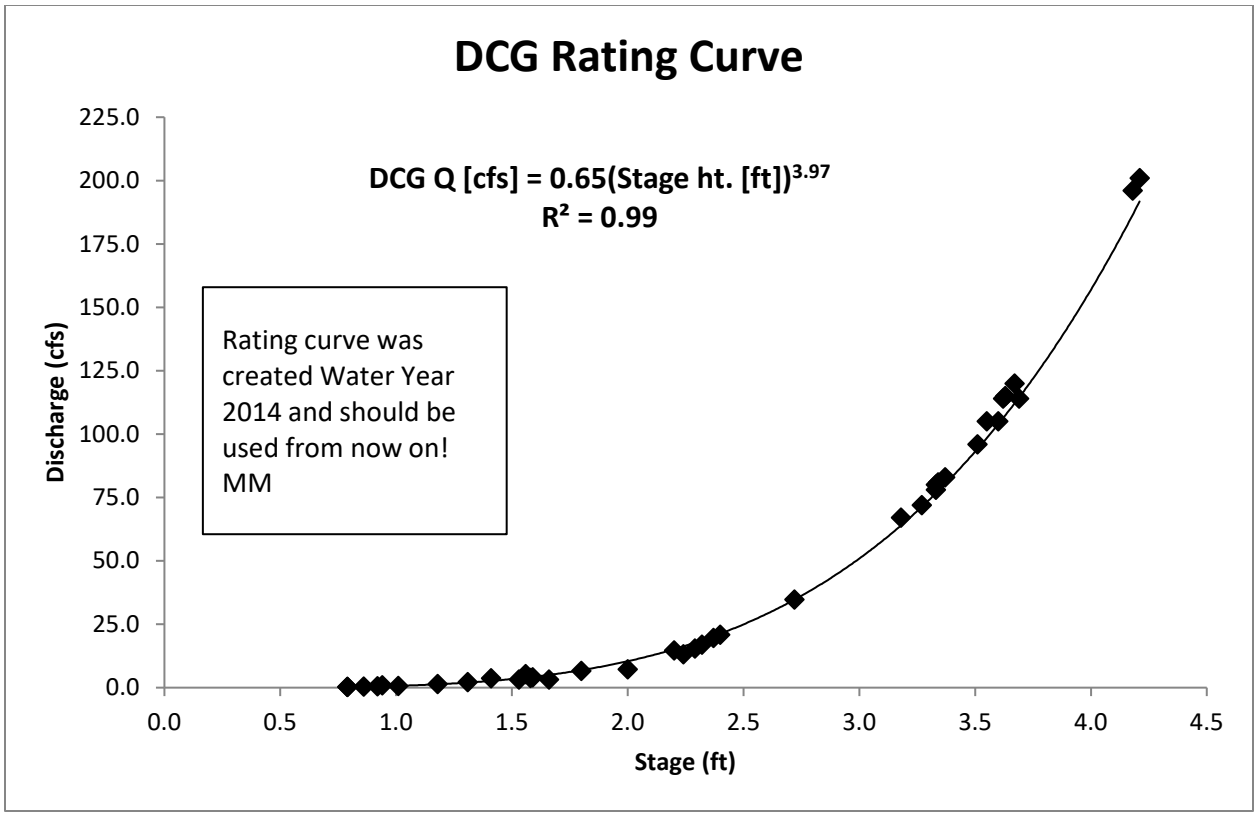


Figure 1. DCG Rating Curve

Table 3. Annual DCG Runoff Values were Assessed for Water Yield Efficiency (DCG runoff/AFH precipitation). Streamflow Corrections Made when Values were Considered Out of Range.

Water Year	AFH (in)	DCG RO (in)	DCG/AFH
1992	63.79	49.44	0.78
1993	83.43	59.00	0.71
1994	59.54	51.64	0.87
1995	112.05	80.33	0.72
1996	125.78	106.47	0.85
1997	124.18	100.84	0.81
1998	93.00	76.15	0.82
1999	113.97	89.35	0.78
2000	94.50	66.16	0.70
2001	51.67	27.92	0.54
2002	93.04	76.55	0.82
2003	75.93	61.74	0.81
2004	88.80	58.73	0.66
2005	68.92	41.50	0.60
2006	102.50	77.63	0.76
2007	98.26	75.97	0.77
2008	92.93	85.06	0.92
2009	79.52	69.59	0.88
2010	94.40	73.25	0.78
2011	103.22	84.39	0.82
2012	97.98	83.32	0.85
2013	100.02	81.19	0.81
2014	76.13	63.57	0.84
2015	78.91	64.12	0.81

Key
One or more months have been predicted
Missing data – All values are predicted (no stage record for year)

MONTHLY WATER YIELD

Key
Observed Q value assumed correct
Observed Q value was adjusted with EFLC
Data are missing and daily values were not predicted
Linear Regression: DCG Q [cfs] = 3.93(NBL Q [cfs]) + 0.68 R^2 = 0.94

Table 4. Monthly DCG Runoff Values were Assessed for Water Yield Efficiency (DCG runoff/AFH precipitation). Streamflow Corrections Made when Values were Considered Out of Range.

Water Year	Month	AFH (in)	DCG RO (in)	Correction Factor	Water Year	Month	AFH (in)	DCG RO (in)	Correction Factor
1992	October	3.30	1.47	1.00	1994	October	1.91	0.64	1.00
	November	12.08	5.893	0.56		November	2.45	1.453	0.30
	December	9.01	7.93	1.00		December	14.13	7.358	0.60
	January	13.80	7.948	0.78		January	9.20	10.17	1.00
	February	7.99	9.15	1.00		February	12.12	8.726	3.04
	March	2.17	3.466	0.36		March	6.53	8.765	0.63
	April	10.13	7.606	0.69		April	5.11	6.911	0.53
	May	0.18	2.428	0.44		May	2.78	2.374	0.36
	June	0.54	1.83	1.00		June	3.14	2.444	0.45
	July	0.71	0.86	1.00		July	0.10	1.40	1.00
	August	0.73	0.49	1.00		August	0.12	0.77	1.00
	September	3.15	0.36	1.00		September	1.96	0.62	1.00
1993	October	7.00	0.47	1.00	1995	October	9.32	0.75	1.00
	November	10.54	3.82	1.00		November	20.85	11.203	4.76
	December	14.45	10.21	1.00		December	14.63	15.069	1.91
	January	9.62	8.54	1.00		January	21.23	18.305	1.70
	February	3.59	3.596	0.38		February	8.51	12.014	1.20
	March	9.63	10.502	3.35		March	15.37	9.62	1.00
	April	14.62	10.733	1.80		April	10.26	7.13	1.00
	May	7.08	5.522	1.70		May	2.87	2.27	1.00
	June	4.54	4.482	5.59		June	3.48	1.66	1.00
	July	1.65	0.43	1.00		July	0.24	1.02	1.00
	August	0.70	0.28	1.00		August	1.32	0.44	1.00
	September	0.00	0.41	1.00		September	3.96	0.85	1.00

Water Year	Month	AFH (in)	DCG RO (in)	Correction Factor	Water Year	Month	AFH (in)	DCG RO (in)	Correction Factor
1996	October	7.63	2.07	1.00	1999	October	6.87	8.49	1.00
	November	21.81	11.59	1.00		November	22.51	7.69	1.00
	December	19.83	19.219	1.17		December	23.93	11.00	1.00
	January	20.46	16.93	1.00		January	18.73	20.54	1.00
	February	27.10	26.990	1.72		February	17.29	14.46	1.00
	March	5.84	8.95	1.00		March	11.62	13.11	1.00
	April	10.93	10.302	1.33		April	3.20	4.95	1.00
	May	6.05	6.024	1.74		May	6.88	3.90	1.00
	June	1.11	1.57	1.00		June	0.97	2.07	1.00
	July	1.68	1.08	1.00		July	0.21	1.22	1.00
	August	0.53	0.83	1.00		August	1.18	0.95	1.00
	September	2.80	0.92	1.00		September	0.57	0.98	1.00
1997	October	9.69	2.81	1.00	2000	October	5.30		N/A
	November	18.87	13.67	1.00		November	24.75	8.325	N/A
	December	33.97	28.521	1.55		December	14.98	15.579	N/A
	January	17.95	15.320	1.54		January	17.40	14.349	N/A
	February	5.51	9.878	0.73		February	9.22	11.100	N/A
	March	13.41	16.562	3.90		March	6.07	6.629	N/A
	April	7.89	6.339	0.71		April	3.74	2.581	N/A
	May	3.83	4.88	1.00		May	5.39	4.575	N/A
	June	3.18	1.27	1.00		June	3.76	3.018	N/A
	July	1.00	1.00	1.00		July	0.25		N/A
	August	1.66	0.28	1.00		August	0.09		N/A
	September	7.22	0.31	1.00		September	3.55		N/A
1998	October	13.67	7.645	2.80	2001	October	6.15	0.59	1.00
	November	10.93	9.591	3.94		November	4.58	1.805	0.13
	December	9.42	8.520	0.53		December	10.02	6.044	0.23
	January	17.97	17.881	2.22		January	5.21	2.950	0.18
	February	16.19	11.70	1.00		February	4.09	3.595	0.26
	March	11.11	10.630	0.59		March	6.30	3.867	0.46
	April	3.44	2.60	1.00		April	6.41	3.00	1.00
	May	5.85	3.45	1.00		May	3.15	3.09	1.00
	June	1.29	2.745	7.57		June	3.42	1.958	0.36
	July	0.25	0.38	1.00		July	0.51	1.21	1.00
	August	0.03		N/A		August	1.24	0.51	1.00
	September	2.84	0.34	1.00		September	0.59	0.39	1.00

Water Year	Month	AFH (in)	DCG RO (in)	Correction Factor	Water Year	Month	AFH (in)	DCG RO (in)	Correction Factor
2002	October	7.18	0.79	1.00	2005	October	9.04	2.701	5.07
	November	18.06	9.519	6.73		November	4.26	1.14	1.00
	December	17.33	18.492	2.97		December	10.78	7.169	20.22
	January	21.44	15.590	3.75		January	9.57	5.921	0.66
	February	3.88	8.527	2.76		February	2.00	2.873	N/A
	March	11.01	10.888	2.66		March	10.12	5.569	N/A
	April	6.48	4.07	1.00		April	5.85	6.378	N/A
	May	1.65	3.86	1.00		May	7.75	4.198	2.38
	June	3.18	1.90	1.00		June	6.97	4.086	N/A
	July	0.03	1.68	1.00		July	0.47		N/A
	August	0.62	0.54	1.00		August	0.09		N/A
	September	2.19	0.69	1.00		September	2.01		N/A
2003	October	0.58	0.06	1.00	2006	October	9.11	1.23	1.00
	November	8.21	2.232	0.49		November	12.55	6.735	0.76
	December	19.31	12.179	0.60		December	23.30	15.630	1.15
	January	10.09	10.257	0.50		January	27.28	26.14	1.00
	February	5.66	9.84	1.00		February	5.20	7.78	1.00
	March	15.86	11.89	1.00		March	11.66	8.46	1.00
	April	9.62	8.09	1.00		April	4.54	4.26	1.00
	May	2.96	2.38	1.00		May	3.69	1.69	1.00
	June	0.23	1.74	1.00		June	2.72	1.62	1.00
	July	0.17	1.72	1.00		July	0.22	1.26	1.00
	August	0.26	0.55	1.00		August	0.04	1.44	1.00
	September	2.98	0.80	1.00		September	2.18	1.39	1.00
2004	October	4.09	0.57	1.00	2007	October	1.89	0.36	1.00
	November	12.29	4.193	3.64		November	30.78	20.29	1.00
	December	19.80	13.384	N/A		December	16.16	16.41	1.20
	January	16.05	13.422	4.81		January	10.40	10.39	0.80
	February	9.51	9.074	N/A		February	19.12	9.04	0.81
	March	5.63	5.611	N/A		March	6.52	10.34	1.00
	April	4.49	4.501	0.40		April	6.27	5.45	1.00
	May	3.77	3.81	1.00		May	2.01	1.71	1.00
	June	2.36	1.42	1.00		June	1.31	0.80	1.00
	July	0.10	0.79	1.00		July	0.49	0.51	1.00
	August	4.95	0.48	1.00		August	0.65	0.37	1.00
	September	5.75	0.47	1.00		September	2.65	0.29	1.00

Water Year	Month	AFH (in)	DCG RO (in)	Correction Factor	Water Year	Month	AFH (in)	DCG RO (in)	Correction Factor
2008	October	6.63	1.01	1.00	2011	October	9.00	2.61	1.00
	November	9.26	3.95	1.00		November	13.05	7.526	0.63
	December	21.18	21.50	1.45		December	19.55	19.00	1.00
	January	19.68	21.48	1.20		January	11.51	11.595	0.75
	February	8.65	12.17	1.00		February	11.57	5.68	1.00
	March	10.98	8.32	1.00		March	19.06	19.457	1.36
	April	9.56	7.48	1.00		April	11.89	10.187	0.81
	May	1.17	2.61	1.00		May	3.91	4.46	1.00
	June	3.40	4.40	1.00		June	1.43	2.04	1.00
	July	0.06	0.92	1.00		July	1.35	0.94	1.00
	August	2.03	0.78	1.00		August	0.01	0.52	1.00
	September	0.33	0.45	1.00		September	0.89	0.38	1.00
2009	October	4.67	0.74	1.00	2012	October	6.16	0.69	1.00
	November	14.69	8.978	0.54		November	13.13	5.79	1.00
	December	14.20	14.582	0.69		December	11.00	8.58	1.00
	January	11.42	18.608	0.70		January	18.20	19.231	0.75
	February	7.00	3.23	1.00		February	9.33	7.382	0.76
	March	11.30	8.22	1.00		March	22.57	19.978	0.75
	April	5.47	6.19	1.00		April	7.73	8.808	0.75
	May	6.62	6.01	1.00		May	5.02	7.10	1.00
	June	1.45	1.44	1.00		June	4.02	2.94	1.00
	July	0.59	0.71	1.00		July	0.77	1.55	1.00
	August	0.43	0.48	1.00		August	0.02	0.84	1.00
	September	1.68	0.39	1.00		September	0.04	0.42	1.00
2010	October	7.64	0.92	1.00	2013	October	13.73	3.96	1.00
	November	13.32	5.130	0.51		November	18.29	11.43	0.80
	December	12.22	8.53	1.00		December	20.44	22.87	1.00
	January	11.29	12.239	0.72		January	8.25	7.39	0.78
	February	9.33	6.84	1.00		February	6.28	7.43	1.00
	March	13.97	12.54	1.00		March	5.91	6.93	1.00
	April	11.30	11.65	1.00		April	6.36	5.38	1.00
	May	5.73	6.32	1.00		May	6.43	4.97	1.00
	June	5.38	6.136	0.61		June	1.80	2.71	1.00
	July	0.22	1.33	1.00		July	0.01	0.69	1.00
	August	1.34	0.73	1.00		August	0.96	0.48	1.00
	September	2.66	0.89	1.00		September	11.55	6.96	2.58

Water Year	Month	AFH (in)	DCG RO (in)	Correction Factor	Water Year	Month	AFH (in)	DCG RO (in)	Correction Factor
2014	October	2.07	3.58	1.00	2015	October	11.69	2.20	1.00
	November	7.50	4.46	1.00		November	13.27	9.36	1.00
	December	5.22	3.29	0.56		December	19.85	19.71	1.00
	January	8.00	5.56	1.00		January	5.76	8.75	1.00
	February	16.61	15.36	1.00		February	12.49	11.18	1.00
	March	17.82	16.92	1.30		March	8.13	4.53	1.00
	April	6.22	6.91	1.00		April	4.53	2.85	1.00
	May	6.83	5.09	1.00		May	1.56	0.72	1.00
	June	2.76	1.31	1.00		June	0.40	1.12	1.00
	July	1.13	0.71	1.00		July	0.06	1.24	1.00
	August	0.23	0.22	1.00		August	1.16	1.27	1.00
	September	1.74	0.17	1.00		September	0.00	1.15	1.00

SUMMARY TABLES

Table 5. Summary Tables of Mean Daily Streamflow Values Have Been Compiled for Each Water Year. Along the Base of the Table, Monthly and Annual Statistics can be Found for that Water Year.

Key
Observed Q value assumed correct
Observed Q value was adjusted with EFLC
Data are missing and daily values were not predicted
Linear Regression: DCG Q [cfs] = 3.93(NBL Q [cfs]) + 0.68 R^2 = 0.94

Deer Creek, Alsea Watershed Study												
Water Year 1992												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.39	4.51	14.00	4.70	3.40	3.22	3.10	1.57	3.00	1.20	0.58	0.60
2	0.47	4.17	13.00	4.31	7.70	3.58	3.59	1.44	2.90	1.20	0.58	0.53
3	0.48	3.39	11.00	4.00	9.40	5.01	8.97	1.35	2.70	1.10	0.56	0.49
4	0.92	2.95	11.00	3.76	11.00	5.37	42.07	1.40	2.60	1.10	0.56	0.46
5	0.96	2.62	11.00	3.29	14.00	5.01	20.69	1.40	2.50	1.10	0.55	0.43
6	0.68	4.06	9.40	3.76	12.00	4.66	13.10	2.79	2.40	1.10	0.54	0.42
7	0.57	4.95	8.40	5.01	10.00	3.94	11.04	5.24	2.30	1.10	0.52	0.41
8	0.51	4.28	7.70	5.41	8.60	3.94	15.86	4.80	2.20	1.00	0.58	0.41
9	0.49	3.67	7.50	6.42	7.40	3.58	13.10	4.32	2.10	1.00	0.53	0.39
10	0.53	3.28	8.00	13.32	6.60	4.30	10.35	3.80	2.10	0.97	0.51	0.39
11	0.49	3.06	7.80	18.02	6.10	8.24	8.97	3.40	2.00	0.94	0.49	0.39
12	0.60	2.73	7.60	26.63	7.50	6.45	7.59	3.06	2.00	0.96	0.48	0.39
13	0.60	2.95	7.60	17.23	13.00	5.01	7.59	2.71	1.90	0.95	0.47	0.39
14	0.54	13.91	7.30	16.45	13.00	4.30	6.90	2.49	1.90	0.99	0.47	0.36
15	1.30	10.02	7.30	21.93	11.00	3.94	6.41	2.27	2.10	0.97	0.47	0.36
16	1.40	6.12	6.80	14.88	10.00	3.40	6.00	2.58	1.90	0.95	0.46	0.36
17	1.00	4.90	6.70	10.97	9.10	3.04	5.45	2.71	1.70	0.87	0.47	0.35
18	2.10	4.56	8.30	9.40	9.50	2.72	4.97	2.92	1.70	0.78	0.46	0.35
19	2.00	4.40	8.60	7.83	11.00	2.47	4.48	2.92	1.70	0.77	0.44	0.35
20	1.30	5.01	8.00	7.29	18.00	2.51	4.14	2.79	1.70	0.78	0.43	0.35
21	1.20	5.56	7.20	6.42	19.00	2.36	3.86	2.58	1.60	0.76	0.42	0.34
22	4.20	6.68	6.50	5.72	14.00	2.33	3.72	2.40	1.50	0.72	0.42	0.33
23	2.40	6.68	5.90	5.17	11.00	2.54	3.86	2.27	1.50	0.72	0.40	0.32
24	1.70	6.68	5.60	4.62	9.90	2.65	3.72	2.18	1.50	0.74	0.39	0.32
25	1.40	22.26	5.40	4.31	8.70	2.58	3.66	1.96	1.50	0.72	0.38	0.33
26	2.10	12.80	5.60	4.00	7.70	2.40	3.52	1.61	1.40	0.69	0.43	0.33
27	2.80	8.90	7.80	3.76	7.00	2.22	3.52	1.48	1.40	0.65	0.51	0.32
28	2.10	7.23	8.00	3.45	6.40	2.04	3.38	1.66	1.40	0.63	0.32	0.32
29	2.80	6.68	7.40	2.74	6.40	1.90	3.31	1.61	1.30	0.61	0.66	0.30
30	2.80	6.68	7.00	2.59		1.79	2.76	1.40	1.30	0.60	0.67	0.32
31	5.40		6.50	3.06		1.68		1.40		0.58	0.71	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.39	2.62	5.40	2.59	3.40	1.68	2.76	1.35	1.30	0.58	0.32	0.30
Max Q (cfs)	5.40	22.26	14.00	26.63	19.00	8.24	42.07	5.24	3.00	1.20	0.71	0.60
Mean Monthly Q (cfs)	1.49	6.19	8.06	8.08	9.94	3.52	7.99	2.47	1.93	0.88	0.50	0.38
Cumulative Q (cfs)	46.23	185.68	249.90	250.44	288.40	109.21	239.67	76.51	57.80	27.25	15.46	11.41
Annual Water Yield (in)		49.44				**Mean Annual Q (cfs)**			4.26			

Deer Creek, Alsea Watershed Study

Water Year 1993

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	0.33	0.42	10.00	7.35	4.12	21.34	3.24	19.68	5.54	0.57	0.33	0.30
2	0.33	0.38	5.41	6.80	3.70	19.69	3.17	15.69	5.54	0.57	0.32	0.28
3	0.32	0.64	8.58	8.12	3.36	18.29	3.27	13.09	5.31	0.55	0.31	0.27
4	0.32	4.34	9.61	8.27	3.02	18.22	3.42	11.22	4.87	0.55	0.31	0.31
5	0.30	1.49	36.50	7.76	2.71	17.55	3.83	9.94	4.64	0.57	0.31	0.29
6	0.30	0.97	29.60	6.99	2.48	16.48	3.78	8.90	4.64	0.59	0.41	0.28
7	0.30	0.80	16.00	6.31	2.34	13.63	3.45	8.24	4.42	0.56	0.38	0.27
8	0.30	0.69	12.70	5.82	2.21	11.76	3.43	6.66	4.20	0.51	0.36	0.33
9	0.28	0.63	11.00	6.99	2.05	10.72	9.48	5.71	4.20	0.49	0.34	0.32
10	0.28	0.72	9.99	8.60	1.95	10.05	7.86	5.91	4.42	0.49	0.33	0.28
11	0.28	0.80	9.77	8.81	1.87	9.61	9.17	5.12	5.99	0.49	0.31	0.28
12	0.28	1.00	9.49	8.34	1.68	9.14	8.67	4.71	5.87	0.49	0.30	0.27
13	0.27	0.94	8.69	7.54	1.42	8.74	8.99	4.42	6.15	0.49	0.29	0.27
14	0.27	0.80	7.61	6.76	1.34	8.41	8.51	4.20	6.04	0.47	0.27	0.27
15	0.34	1.06	6.97	7.25	1.29	8.71	8.34	4.04	5.71	0.40	0.26	0.29
16	0.32	1.36	6.12	7.42	1.91	10.01	14.69	3.86	5.48	0.39	0.25	0.28
17	0.30	1.96	8.74	7.14	3.89	11.22	35.43	3.65	5.43	0.38	0.24	0.27
18	0.30	3.46	11.10	6.63	7.78	9.61	34.89	3.45	5.09	0.36	0.22	0.26
19	0.30	12.10	10.30	6.16	19.23	8.94	26.44	3.33	4.98	0.36	0.28	0.26
20	0.33	8.90	10.60	5.99	11.68	8.57	17.93	3.18	4.81	0.36	0.26	0.26
21	0.63	5.13	11.60	5.40	6.83	8.34	14.84	3.08	4.59	0.37	0.26	0.26
22	0.54	3.18	11.00	5.33	5.30	8.11	13.16	2.92	4.36	0.43	0.27	0.25
23	1.32	2.76	9.77	6.13	4.62	7.84	11.80	2.80	4.14	0.42	0.27	0.51
24	1.10	10.80	8.75	7.94	4.08	7.64	10.68	2.70	4.14	0.40	0.25	1.75
25	1.23	12.40	7.73	7.98	3.64	7.40	9.82	2.65	3.75	0.37	0.23	1.07
26	0.85	10.20	6.86	11.50	3.27	7.17	9.15	2.79	3.41	0.35	0.23	0.80
27	0.74	8.95	6.24	23.60	2.92	6.87	10.52	2.63	3.30	0.34	0.22	0.80
28	0.72	8.25	5.77	16.40	2.64	6.60	10.16	2.50	3.52	0.33	0.22	0.69
29	0.58	7.59	5.37	14.00		6.50	14.39	2.40	3.41	0.33	0.22	0.62
30	0.52	7.66	5.03	13.50		7.27	15.72	2.33	3.30	0.31	0.22	0.58
31	0.46		4.84	12.30		6.50		2.23		0.32	0.40	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
Min Q (cfs)	0.27	0.38	4.84	5.33	1.29	6.50	3.17	2.23	3.30	0.31	0.22	0.25
Max Q (cfs)	1.32	12.40	36.50	23.60	19.23	21.34	35.43	19.68	6.15	0.59	0.41	1.75
Mean Monthly Q (cfs)	0.48	4.01	10.38	8.68	4.05	10.67	11.27	5.61	4.71	0.44	0.29	0.43
Cumulative Q (cfs)	14.74	120.38	321.74	269.13	113.32	330.91	338.21	174.01	141.24	13.61	8.87	12.97
Annual Water Yield (in)		59.00				Mean Annual Q (cfs)			5.09			

Deer Creek, Alsea Watershed Study

Water Year 1994

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	0.65	0.91	6.91	9.72	17.15	4.23	5.42	4.53	3.33	2.08	0.99	0.61
2	0.64	0.61	10.71	10.06	15.94	4.69	12.63	4.57	3.23	1.93	0.96	0.60
3	0.67	0.42	8.14	13.30	14.88	6.46	11.25	4.26	2.88	1.79	0.94	0.64
4	0.64	0.42	5.97	14.04	13.57	11.92	7.97	3.95	3.62	1.72	0.93	0.64
5	0.59	0.36	3.50	12.43	12.60	9.73	6.57	3.76	3.86	1.64	0.92	0.64
6	0.56	0.31	3.01	10.71	11.60	7.07	5.63	3.77	4.66	1.58	0.89	0.64
7	0.52	1.01	3.26	9.38	10.63	5.49	5.77	4.23	4.70	1.53	0.86	0.64
8	0.53	1.13	3.34	7.88	11.33	4.49	6.19	4.29	4.36	1.47	0.85	0.64
9	0.52	1.03	17.61	6.64	10.29	3.92	8.18	3.82	3.71	1.42	0.83	0.64
10	0.50	0.78	13.85	5.82	9.75	3.24	10.84	3.30	4.28	1.37	0.80	0.64
11	0.50	0.66	8.76	5.28	8.87	2.84	9.88	2.83	4.13	1.34	0.78	0.64
12	0.50	0.74	6.52	4.87	8.29	2.51	7.86	2.45	3.70	1.32	0.78	0.78
13	0.50	0.65	5.34	4.54	7.96	2.75	6.41	2.10	3.32	1.33	0.77	0.78
14	0.50	0.56	4.43	4.22	7.59	7.53	5.77	1.86	3.08	1.32	0.78	0.78
15	0.48	0.48	4.08	4.06	7.14	10.66	5.19	1.68	2.56	1.34	0.84	0.78
16	0.50	0.43	4.59	3.79	6.86	19.06	5.80	1.54	2.28	1.39	0.79	0.64
17	0.53	0.45	4.97	3.49	6.86	22.76	6.45	1.42	2.06	1.25	0.75	0.64
18	0.65	0.46	5.01	6.47	7.47	15.00	6.24	1.53	1.90	1.17	0.75	0.64
19	0.58	0.79	10.03	26.45	7.41	10.62	5.65	1.33	1.76	1.26	0.83	0.64
20	1.38	1.18	12.05	21.14	7.83	8.17	5.09	1.38	1.62	1.28	0.76	0.65
21	1.26	4.82	10.81	20.80	7.68	11.42	4.89	1.25	1.58	2.22	0.71	0.63
22	0.78	8.92	8.27	18.49	7.86	29.48	5.18	1.15	1.43	1.78	0.92	0.65
23	0.63	4.86	6.56	16.10	7.71	17.79	6.46	1.10	1.32	1.48	0.77	0.63
24	0.56	3.02	5.40	15.33	7.77	12.24	7.66	1.37	1.23	1.31	0.72	0.63
25	0.51	1.98	4.97	13.24	7.99	9.39	8.72	1.29	1.21	1.22	0.69	0.63
26	0.48	1.44	6.17	11.31	8.50	7.58	8.94	1.34	1.21	1.14	0.66	0.63
27	0.45	1.65	12.77	10.33	8.77	6.32	7.45	1.44	1.08	1.18	0.65	0.63
28	0.44	1.66	11.41	8.85	14.67	5.35	7.40	1.50	1.02	1.19	0.64	0.63
29	0.67	1.55	9.12	8.05		4.87	8.48	1.60	0.96	1.11	0.63	0.65
30	1.09	2.50	7.73	7.22		4.22	7.80	1.80	0.93	1.04	0.61	0.65
31	1.28		6.55	6.45		4.39		2.37		1.01	0.62	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.44	0.31	3.01	3.49	6.86	2.51	4.89	1.10	0.93	1.01	0.61	0.60
Max Q (cfs)	1.38	8.92	17.61	26.45	17.15	29.48	12.63	4.57	4.70	2.22	0.99	0.78
Mean Monthly Q (cfs)	0.65	1.53	7.48	10.34	9.82	8.91	7.26	2.41	2.57	1.43	0.79	0.66
Cumulative Q (cfs)	20.09	45.79	231.85	320.46	274.97	276.18	217.78	74.81	77.02	44.21	24.42	19.66
Annual Water Yield (in)		51.64				**Mean Annual Q (cfs)**			4.46			

Deer Creek, Alsea Watershed Study												
Water Year 1995												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.70	4.43	24.88	12.74	3.25	22.00	8.50	3.10	1.60	1.50	0.78	0.11
2	0.70	4.71	6.51	28.88	3.01	16.00	7.70	3.10	1.60	1.50	0.78	0.99
3	0.70	7.14	10.34	52.67	2.76	14.00	6.90	5.10	1.50	1.40	0.78	2.30
4	0.70	6.67	9.19	50.97	2.76	13.00	6.20	5.30	1.60	1.30	0.78	2.00
5	0.70	57.14	6.70	44.17	2.76	12.00	7.50	4.80	1.60	1.30	0.75	1.80
6	0.75	5.24	5.55	35.68	2.76	10.00	8.90	2.10	2.10	1.30	0.75	1.70
7	0.74	4.76	22.97	28.88	2.64	9.40	10.00	2.10	1.90	1.30	0.73	1.50
8	0.72	4.29	32.54	23.79	2.64	8.40	13.00	2.00	1.70	1.20	0.73	1.30
9	0.69	3.86	26.79	23.79	2.52	8.00	15.00	2.00	1.60	1.20	0.70	1.20
10	0.70	3.48	42.11	28.88	2.64	7.80	13.00	1.90	1.60	1.10	0.70	1.10
11	0.84	4.76	59.33	32.28	2.52	7.00	12.00	1.90	1.60	0.99	0.63	0.98
12	0.84	4.43	42.11	28.88	2.76	6.30	12.00	1.90	1.70	0.96	0.57	0.88
13	0.65	4.62	28.71	23.79	2.76	5.70	11.00	1.80	2.10	0.96	0.51	0.68
14	0.84	4.14	21.05	20.39	5.77	5.10	9.60	1.70	2.30	0.96	0.46	0.65
15	1.10	8.10	16.08	16.14	5.05	6.00	8.60	2.10	2.20	0.96	0.42	0.65
16	0.81	7.62	13.21	13.59	3.97	6.00	7.70	2.50	2.00	0.96	0.37	0.65
17	0.75	9.52	11.10	11.72	4.21	7.30	7.00	2.20	2.00	0.96	0.34	0.63
18	0.73	8.57	9.76	10.36	6.73	11.00	6.40	2.00	2.10	0.93	0.30	0.63
19	0.70	7.62	8.61	9.34	9.86	9.90	5.80	1.90	1.90	0.93	0.27	0.63
20	0.70	6.67	7.85	8.33	9.86	11.00	5.20	1.90	1.80	0.93	0.25	0.63
21	0.70	18.10	7.08	7.82	9.38	11.00	5.00	1.90	1.80	0.93	0.22	0.61
22	0.70	24.29	6.70	8.33	11.42	12.00	4.50	1.80	1.80	0.90	0.32	0.61
23	0.93	22.86	6.32	7.82	15.63	13.00	4.70	1.70	1.70	0.90	0.29	0.59
24	0.81	20.48	5.93	7.14	25.24	11.00	4.70	1.70	1.60	0.87	0.26	0.61
25	0.74	18.57	5.74	6.63	66.12	10.00	4.80	1.70	1.60	0.87	0.24	0.61
26	0.73	17.14	5.55	6.29	81.75	9.20	4.40	1.60	1.60	0.84	0.21	0.59
27	0.72	16.19	5.36	6.12	55.30	8.30	4.00	1.60	1.50	0.84	0.19	0.59
28	0.75	15.71	5.17	5.78	32.46	7.50	3.60	2.10	1.50	0.84	0.17	0.59
29	0.75	21.91	4.98	5.44		7.00	3.70	2.40	1.40	0.81	0.16	0.63
30	0.84	10.00	9.19	5.27		8.70	3.40	1.80	1.40	0.81	0.14	0.50
31	0.93		7.46	4.93		9.40		1.70		0.78	0.13	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.65	3.48	4.98	4.93	2.52	5.10	3.40	1.60	1.40	0.78	0.13	0.11
Max Q (cfs)	1.10	57.14	59.33	52.67	81.75	22.00	15.00	5.30	2.30	1.50	0.78	2.30
Mean Monthly Q (cfs)	0.76	11.77	15.32	18.61	13.52	9.77	7.49	2.30	1.75	1.03	0.45	0.90
Cumulative Q (cfs)	23.66	353.01	474.84	576.81	378.55	303.00	224.80	71.40	52.40	32.03	13.93	26.94
Annual Water Yield (in)		80.33				**Mean Annual Q (cfs)**			6.94			

Deer Creek, Alsea Watershed Study												
Water Year 1996												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.35	38.00	63.29	9.10	60.30	5.10	5.73	9.03	1.70	1.40	0.79	0.79
2	0.35	18.00	46.88	7.70	46.52	4.60	5.59	9.38	1.60	1.50	0.79	0.86
3	0.35	12.00	33.99	6.30	32.74	5.00	5.06	9.55	1.60	1.40	0.79	0.85
4	0.35	13.00	21.10	5.40	25.84	5.00	4.79	9.73	1.80	1.30	0.81	0.90
5	0.35	14.00	17.58	4.60	22.40	4.20	7.19	8.86	2.00	1.30	1.00	0.90
6	0.35	12.00	12.89	4.00	18.95	3.90	13.32	7.99	1.70	1.30	1.30	0.90
7	0.35	8.60	9.96	3.90	16.37	4.80	17.31	7.47	1.50	1.20	1.00	0.81
8	0.35	7.80	8.91	4.60	13.96	6.90	21.30	7.47	1.50	1.30	0.83	0.75
9	0.35	18.00	9.61	16.00	12.06	12.00	14.65	7.47	1.60	1.30	0.80	0.73
10	0.35	16.00	9.85	21.00	10.51	11.00	15.98	8.34	1.50	1.20	0.83	0.72
11	0.35	12.00	9.85	18.00	10.17	11.00	21.30	8.86	1.50	1.10	0.77	0.71
12	0.35	10.00	9.38	23.00	12.06	12.00	22.64	7.99	1.60	1.10	0.73	0.76
13	0.36	7.90	8.44	43.00	11.20	13.00	17.31	7.47	1.90	1.10	0.73	0.78
14	0.52	5.50	8.09	48.00	10.34	13.00	14.65	7.12	2.10	1.10	0.81	0.79
15	0.42	5.30	7.74	45.00	13.61	11.00	11.98	6.77	1.80	1.00	0.91	0.79
16	0.37	5.90	11.72	35.00	18.95	9.90	10.52	6.08	1.90	0.97	1.50	0.77
17	0.37	6.60	33.99	26.00	58.58	9.30	9.45	5.73	2.10	0.95	0.98	0.78
18	0.36	6.60	23.44	25.00	87.87	8.90	11.32	5.38	2.00	0.95	0.82	0.82
19	0.35	7.90	17.58	24.00	111.99	14.00	11.45	5.04	2.00	0.96	0.76	0.81
20	0.37	13.00	21.10	19.00	65.47	18.00	11.05	4.69	1.80	1.00	0.77	0.79
21	0.77	12.00	23.44	16.00	43.07	19.00	9.99	4.52	1.70	1.10	0.80	0.78
22	0.48	10.00	18.75	13.00	32.74	16.00	8.66	4.34	1.60	1.10	0.77	0.78
23	0.43	10.00	14.06	11.00	25.84	12.00	7.72	3.99	1.50	1.10	0.77	0.82
24	0.40	10.00	11.72	9.60	20.68	10.00	7.06	3.99	1.40	1.00	0.76	0.85
25	0.46	12.00	10.43	8.30	18.95	8.80	6.66	3.65	1.40	0.99	0.75	1.00
26	2.20	12.00	19.92	7.30	15.33	7.30	6.66	3.65	1.30	0.93	0.73	2.30
27	22.00	13.00	43.37	6.30	12.92	6.40	6.66	3.47	1.20	0.89	0.73	1.90
28	11.00	12.00	28.13	8.30	11.20	5.60	5.86	2.78	1.30	0.89	0.89	1.90
29	5.00	12.00	21.10	9.00	9.82	5.10	6.26	3.13	1.40	0.87	0.80	1.80
30	3.30	24.00	16.41	16.00		4.80	6.52	2.95	1.40	0.85	0.76	0.94
31	12.00		12.89	40.00		4.30		2.95		0.81	0.71	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.35	5.30	7.74	3.90	9.82	3.90	4.79	2.78	1.20	0.81	0.71	0.71
Max Q (cfs)	22.00	38.00	63.29	48.00	111.99	19.00	22.64	9.73	2.10	1.50	1.50	2.30
Mean Monthly Q (cfs)	2.11	12.17	19.54	17.21	29.33	9.09	10.82	6.12	1.65	1.10	0.84	0.97
Cumulative Q (cfs)	65.36	365.10	605.59	533.40	850.47	281.90	324.63	189.83	49.40	33.96	26.19	29.08
Annual Water Yield (in)		106.47				**Mean Annual Q (cfs)**			9.17			

Deer Creek, Alsea Watershed Study												
Water Year 1997												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.78	1.87	55.63	14.41	4.31	24.57	2.00	6.47	2.90	1.28	0.49	0.12
2	1.87	1.70	43.71	12.97	4.25	21.91	2.00	5.71	2.47	1.11	0.48	0.10
3	1.36	1.62	33.11	12.18	3.81	33.20	1.94	5.11	2.13	1.02	0.48	0.09
4	1.02	1.87	26.49	11.66	7.49	39.84	1.87	4.35	1.79	1.11	0.48	0.29
5	0.85	2.30	25.17	11.00	14.99	39.84	1.75	4.26	1.53	0.94	0.48	0.25
6	0.78	2.90	18.54	19.65	21.23	33.20	1.75	3.58	1.28	0.82	0.48	0.21
7	0.72	14.48	15.89	17.03	24.35	31.21	1.63	3.41	1.11	0.70	0.48	0.18
8	0.67	20.45	14.57	15.72	21.23	26.56	1.57	2.90	0.94	0.59	0.48	0.24
9	2.39	12.78	18.54	14.41	18.11	23.57	1.51	2.47	0.81	0.50	0.48	0.20
10	11.93	27.26	35.76	12.18	14.99	21.58	1.57	2.13	0.69	0.43	0.48	0.17
11	7.41	28.97	31.79	10.35	13.11	18.59	2.78	1.79	0.59	0.37	0.58	0.14
12	5.20	23.00	59.61	8.77	11.24	15.93	6.05	4.00	0.50	0.31	0.49	0.13
13	3.66	18.74	45.04	9.69	9.37	13.28	7.86	4.69	0.43	0.26	0.42	1.02
14	2.81	13.63	56.96	15.72	8.12	11.29	6.65	4.17	0.37	0.22	0.36	2.50
15	2.30	10.22	51.66	14.41	7.49	10.62	4.78	4.77	0.31	0.19	0.30	1.79
16	2.98	9.37	45.04	14.41	8.74	8.96	5.08	4.35	0.26	0.16	0.26	1.19
17	3.07	7.58	39.74	15.72	10.61	7.64	5.08	7.24	1.11	4.00	0.22	0.16
18	2.73	6.56	34.44	15.72	9.37	6.64	6.65	8.52	1.02	4.43	0.19	0.11
19	2.81	5.71	30.46	19.65	12.49	6.64	8.47	7.67	0.84	1.79	0.16	0.09
20	2.47	5.11	26.49	18.34	11.86	5.64	9.68	6.65	0.72	1.36	0.14	0.09
21	2.22	4.69	22.52	19.65	11.24	6.64	9.07	7.33	0.61	1.19	0.11	0.09
22	2.04	4.60	19.87	20.95	12.49	14.94	11.49	8.52	0.52	1.02	0.09	0.08
23	1.87	9.37	15.89	22.26	11.86	12.95	21.77	7.50	1.96	1.02	0.09	0.08
24	2.30	9.37	14.57	20.95	10.61	14.61	21.17	6.39	2.98	1.02	0.07	0.08
25	4.52	12.78	11.92	19.65	8.74	12.62	14.51	5.45	2.56	0.94	0.07	0.08
26	4.00	18.74	11.26	20.95	7.49	10.62	11.49	4.60	2.22	0.94	0.05	0.08
27	3.58	24.71	17.22	19.65	6.24	8.96	9.68	3.92	1.96	0.85	0.04	0.08
28	3.15	37.49	22.52	17.03	5.43	9.63	7.86	3.83	2.13	0.82	0.03	0.07
29	2.73	47.71	19.87	14.41		9.63	6.65	4.69	1.79	0.78	0.03	0.07
30	2.30	45.15	18.54	12.57		9.63	5.38	4.00	1.53	0.67	0.16	0.07
31	2.04		15.89	10.74		10.96		3.41		0.58	0.14	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.67	1.62	11.26	8.77	3.81	5.64	1.51	1.79	0.26	0.16	0.03	0.07
Max Q (cfs)	11.93	47.71	59.61	22.26	24.35	39.84	21.77	8.52	2.98	4.43	0.58	2.50
Mean Monthly Q (cfs)	2.86	14.36	28.99	15.57	11.12	16.83	6.66	4.96	1.33	1.01	0.28	0.33
Cumulative Q (cfs)	88.57	430.76	898.72	482.75	311.25	521.87	199.74	153.87	40.04	31.41	8.78	9.84
Annual Water Yield (in)		100.84				**Mean Annual Q (cfs)**			8.71			

Deer Creek, Alsea Watershed Study

Water Year 1998

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	1.03		5.03		56.44	8.61		7.48				
2	1.03		6.70		33.57	12.48		7.17				
3	1.03		6.22		24.57	13.94		7.33				
4	1.98		13.54		19.98	13.51		6.87				
5	1.66		12.53		16.62	11.69		6.30				
6	1.31		9.21		13.95	13.30		5.63				
7	1.25		12.73		12.05	19.37		5.01				
8	1.19		11.77		10.55	15.06		4.56				
9	1.14		7.88		9.19	14.38		4.14				
10	1.14		6.70		7.97	20.50		3.74				
11	1.25		6.58		7.97	23.23		3.47				
12	1.25		6.58		7.02	18.01		3.20				
13	2.25		6.46		6.44	14.38		2.96				
14	4.05		5.44		6.87	12.08		2.80				
15	3.91		4.02		6.87	11.50		2.65				
16	3.11		3.17		7.02	13.94		2.44				
17	2.45		2.58		7.17	14.16		2.30				
18	10.49		2.07		9.56	12.08		2.17				
19	10.23		1.82		16.62	12.68		2.11				
20	6.27		1.97		16.91	13.09		2.27				
21	5.20		2.52		14.20	11.50		2.20				
22	8.29		2.58		10.96	9.73		2.19				
23	6.83		3.39		10.35	8.16		2.18				
24	37.03		9.84		8.65	6.73		2.17				
25	37.03		30.83		7.33	5.56		2.35				
26	22.80		27.19		7.02	4.68		2.20				
27	14.72		13.96		6.72	4.11		2.27				
28	14.72		9.84		6.02	3.68		2.80				
29	14.39		11.58			3.52		2.37				
30	12.17		11.58			3.29		2.11				
31	9.71		12.15			3.00		5.50				
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	1.03	10.07	1.82	18.18	6.02	3.00	2.73	2.11	2.88	0.39	0.00	0.35
Max Q (cfs)	37.03	10.07	30.83	18.18	56.44	23.23	2.73	7.48	2.88	0.39	0.00	0.35
Mean Monthly Q (cfs)	7.77	10.07	8.66	18.18	13.16	11.35	2.73	3.64	2.88	0.39	0.00	0.35
Cumulative Q (cfs)	240.91	302.23	268.48	563.43	368.57	351.94	82.00	112.93	86.48	12.02	0.00	10.63
Annual Water Yield (in)		76.15				**Mean Annual Q (cfs)**			6.60			

Deer Creek, Alsea Watershed Study												
Water Year 1999												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	2.44	15.51	7.64	10.15	10.75	29.89	7.00	3.70	2.73	2.05	0.71	1.25
2	4.90	10.15	6.87	14.71	9.76	25.34	5.50	3.75	2.58	1.99	0.74	1.25
3	5.89	7.80	6.16	13.95	9.56	23.08	5.00	3.68	2.37	1.92	0.77	1.29
4	16.34	6.30	5.50	13.45	9.56	21.66	5.00	3.20	2.37	1.85	0.80	1.29
5	20.98	5.38	4.90	19.34	9.56	18.40	4.90	3.10	2.24	1.67	0.80	1.29
6	14.71	4.90	4.78	26.13	9.76	14.97	5.00	3.00	2.11	1.67	0.80	1.34
7	10.15	4.45	6.87	23.08	9.38	12.73	5.00	2.90	2.35	1.61	0.84	1.29
8	11.17	4.03	6.72	17.79	18.40	11.17	4.50	2.90	2.20	1.55	0.84	1.29
9	16.62	3.65	11.39	13.70	20.98	9.56	4.00	2.80	2.27	1.45	0.84	1.34
10	17.79	3.47	18.09	12.05	18.71	8.48	4.50	2.70	2.65	1.39	0.84	1.34
11	15.51	3.29	15.24	19.98	19.34	7.64	8.00	2.60	2.24	1.34	0.87	1.34
12	12.97	3.12	16.06	23.08	21.66	8.48	7.90	2.90	2.35	1.29	0.91	1.34
13	10.55	2.88	16.71	27.75	24.57	9.95	7.70	3.10	2.27	1.25	0.95	1.34
14	9.56	2.65	17.37	38.09	22.01	9.76	7.40	2.50	2.12	1.25	0.95	1.34
15	7.64	2.58	18.02	34.05	18.40	8.83	6.90	2.73	2.12	1.15	0.95	1.39
16	6.16	2.65	18.67	28.17	16.06	7.97	6.50	2.58	2.05	1.15	0.95	1.39
17	5.25	3.04	19.33	29.02	14.45	6.87	6.20	2.65	1.92	1.11	0.95	1.34
18	4.56	2.73	19.98	26.53	13.95	6.16	5.60	2.58	1.99	1.11	0.99	0.62
19	4.03	7.80	16.91	25.34	13.45	5.50	5.20	2.51	1.85	1.07	1.03	0.77
20	3.65	16.62	14.97	27.34	16.06	5.01	4.40	4.14	1.73	1.03	1.07	0.62
21	3.38	14.20	12.50	23.45	27.34	8.14	4.30	11.60	1.73	0.99	1.11	0.59
22	3.12	11.17	10.96	20.31	28.17	20.64	4.30	10.75	1.67	0.99	1.11	0.57
23	2.96	13.45	10.35	21.66	22.72	26.53	4.20	7.48	1.61	0.95	1.07	0.52
24	2.44	21.32	9.38	25.73	17.20	24.57	4.20	6.30	2.35	0.95	1.07	0.57
25	2.37	17.79	8.65	26.53	13.95	17.20	4.00	5.13	2.11	0.95	1.11	0.71
26	2.30	14.20	8.14	20.64	11.39	13.95	3.90	4.45	2.37	0.91	1.11	0.71
27	2.24	10.96	7.97	16.34	9.76	12.27	3.80	3.94	2.17	0.87	1.15	0.71
28	2.35	9.38	7.17	13.45	18.71	11.39	3.70	3.56	2.35	0.84	1.15	0.71
29	5.89	8.65	6.72	12.73		9.50	3.65	3.47	2.20	0.74	1.20	0.69
30	14.97	8.30	6.44	12.05		9.00	3.65	3.20	2.12	0.74	1.20	0.69
31	24.57		6.02	10.55		8.50		2.88		0.74	1.25	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	2.24	2.58	4.78	10.15	9.38	5.01	3.65	2.50	1.61	0.74	0.71	0.52
Max Q (cfs)	24.57	21.32	19.98	38.09	28.17	29.89	8.00	11.60	2.73	2.05	1.25	1.39
Mean Monthly Q (cfs)	8.63	8.08	11.18	20.87	16.27	13.33	5.20	3.96	2.17	1.24	0.97	1.03
Cumulative Q (cfs)	267.44	242.41	346.47	647.12	455.58	413.13	155.90	122.77	65.17	38.55	30.09	30.94
Annual Water Yield (in)		89.35				**Mean Annual Q (cfs)**			7.71			

Deer Creek, Alsea Watershed Study

Water Year 2000

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.00	8.74	15.84	14.59	12.06	6.74	2.71	4.65	3.17	0.00	0.00	0.00
Max Q (cfs)	0.00	8.74	15.84	14.59	12.06	6.74	2.71	4.65	3.17	0.00	0.00	0.00
Mean Monthly Q (cfs)	0.00	8.74	15.84	14.59	12.06	6.74	2.71	4.65	3.17	0.00	0.00	0.00
Cumulative Q (cfs)	0.00	262.34	490.90	452.16	349.77	208.88	81.31	144.15	95.10	0.00	0.00	0.00
Annual Water Yield (in)		66.16				**Mean Annual Q (cfs)**			5.71			

Deer Creek, Alsea Watershed Study

Water Year 2001

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	0.39	0.08	3.23	1.13	6.63	6.91	4.90	3.20	0.81	2.05	0.63	0.45
2	0.40	0.07	8.94	1.26	5.19	6.32	4.56	3.04	0.85	1.85	0.60	0.45
3	0.40	0.07	6.53	1.43	3.52	5.46	4.34	2.88	0.80	1.79	0.60	0.55
4	0.39	0.08	5.10	3.94	2.54	4.96	4.24	2.88	0.75	1.79	0.60	0.50
5	0.40	0.27	4.33	3.18	2.28	4.50	4.03	2.73	0.72	1.79	0.60	0.47
6	0.45	0.34	6.05	2.54	1.96	4.07	3.94	2.58	0.72	1.67	0.60	0.47
7	0.39	0.24	11.08	2.11	1.92	3.75	3.74	2.44	0.77	1.61	0.57	0.45
8	0.43	0.25	8.46	2.24	3.57	3.45	3.56	2.30	0.77	1.50	0.54	0.45
9	0.43	0.30	6.92	4.19	3.40	3.17	3.47	2.24	0.83	1.50	0.54	0.50
10	0.40	1.54	6.53	5.59	2.73	2.97	3.29	3.84	0.85	1.45	0.54	0.47
11	0.37	0.83	6.14	5.11	2.45	3.17	3.20	3.84	0.94	1.34	0.54	0.48
12	0.37	1.95	7.03	5.11	2.41	2.72	3.04	3.84	3.77	1.29	0.52	0.47
13	0.35	1.95	7.67	7.39	2.82	2.66	2.65	3.84	15.67	1.25	0.50	0.45
14	0.35	1.24	9.19	5.92	3.94	4.33	2.58	3.84	7.64	1.25	0.50	0.43
15	0.33	0.91	13.57	4.82	4.13	4.33	2.51	3.84	4.81	1.20	0.50	0.43
16	0.33	0.84	16.84	3.94	3.29	4.50	3.04	3.84	3.48	1.15	0.50	0.38
17	0.33	0.82	12.28	3.35	2.49	4.41	2.80	5.25	2.67	1.11	0.48	0.38
18	0.32	0.68	10.24	2.82	2.15	4.33	2.65	4.45	2.00	1.11	0.48	0.34
19	0.32	0.85	7.89	2.45	1.89	4.24	2.51	3.94	1.74	1.07	0.50	0.38
20	0.32	0.94	5.96	2.15	1.64	4.41	2.44	3.65	1.47	1.03	0.50	0.34
21	0.32	1.14	4.78	2.20	1.55	4.24	2.30	3.20	1.33	0.99	0.48	0.34
22	0.32	1.30	3.98	1.96	1.89	4.16	2.30	2.96	1.20	1.03	0.48	0.34
23	0.33	1.56	3.29	1.85	1.74	4.07	2.44	2.80	1.08	0.95	0.47	0.33
24	0.43	2.77	2.74	2.00	1.68	3.91	2.73	2.65	0.99	0.91	0.47	0.33
25	0.55	11.22	2.35	2.45	1.74	3.68	2.51	2.44	0.94	0.88	0.47	0.33
26	0.53	13.36	2.05	2.45	3.35	3.31	2.73	2.30	0.86	0.84	0.47	0.33
27	1.89	4.37	1.85	2.28	3.24	3.10	2.65	2.80	0.81	0.81	0.47	0.33
28	4.00	2.86	1.56	2.00	2.73	2.97	2.65	2.73	0.85	0.77	0.45	0.33
29	0.62	2.20	1.39	1.74		2.72	3.38	2.58	0.80	0.74	0.45	0.33
30	0.57	1.85	1.27	1.55		2.60	3.38	2.30	0.77	0.70	0.45	0.33
31	1.70		1.22	1.81		2.42		2.30		0.67	0.45	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.32	0.07	1.22	1.13	1.55	2.42	2.30	2.24	0.72	0.67	0.45	0.33
Max Q (cfs)	4.00	13.36	16.84	7.39	6.63	6.91	4.90	5.25	15.67	2.05	0.63	0.55
Mean Monthly Q (cfs)	0.60	1.90	6.14	3.00	2.82	3.93	3.15	3.15	2.06	1.23	0.51	0.41
Cumulative Q (cfs)	18.71	56.89	190.45	92.95	78.85	121.86	94.55	97.51	61.71	38.07	15.95	12.16
Annual Water Yield (in)		27.92				**Mean Annual Q (cfs)**			2.41			

Deer Creek, Alsea Watershed Study												
Water Year 2002												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.33	12.05	11.13	12.35	6.92	7.26	4.78	5.25	2.51	1.89	0.71	0.47
2	0.39	7.18	10.04	10.81	5.82	6.68	4.90	4.78	2.37	1.88	0.65	0.45
3	0.99	6.63	9.79	9.96	7.94	6.31	5.25	4.14	2.30	1.88	0.59	0.45
4	0.59	6.37	9.28	9.42	7.73	6.13	5.25	3.56	2.24	1.88	0.59	0.40
5	0.47	5.63	7.46	9.42	10.86	5.96	5.01	3.29	2.35	1.88	0.59	0.40
6	0.40	6.37	6.28	9.15	14.16	5.62	5.01	2.96	2.20	1.88	0.57	0.40
7	0.39	6.37	6.32	8.40	14.49	7.66	4.90	2.80	1.94	1.87	0.54	0.39
8	0.37	6.37	5.52	7.92	12.88	9.22	5.01	2.58	1.93	1.87	0.52	0.39
9	0.35	6.37	4.97	8.90	12.54	8.76	3.47	2.44	1.92	1.87	0.52	0.39
10	0.35	12.47	4.79	9.68	12.20	8.99	2.80	2.30	1.92	1.86	0.49	0.39
11	0.91	15.27	4.46	9.68	11.86	8.53	3.12	2.17	1.91	1.86	0.49	0.39
12	0.84	13.36	4.30	9.68	11.52	8.31	3.84	3.38	1.91	1.86	0.49	0.39
13	0.57	11.63	4.46	10.52	11.19	8.09	4.56	7.80	1.91	1.86	0.47	0.39
14	0.49	10.84	5.33	31.83	10.85	7.87	5.25	9.56	1.91	1.86	0.47	0.39
15	0.49	10.09	14.91	53.30	10.51	7.87	5.50	9.56	1.95	1.86	0.47	0.39
16	0.47	9.37	40.01	46.94	10.17	8.09	4.90	7.80	1.93	1.86	0.47	0.39
17	0.45	8.70	35.17	34.51	9.83	11.01	4.45	6.30	1.91	1.86	0.47	0.39
18	0.43	8.38	30.77	26.35	9.49	7.66	4.14	5.13	1.91	1.86	0.47	0.39
19	0.45	8.07	24.70	21.13	9.15	10.74	3.84	4.24	1.90	1.85	0.47	0.39
20	0.59	7.76	18.72	17.53	8.81	13.98	3.47	3.65	1.90	1.85	0.45	0.39
21	0.52	7.47	14.22	15.53	8.47	17.89	3.29	3.29	1.90	1.85	0.43	0.35
22	2.35	7.18	17.12	15.15	8.13	21.65	3.12	2.96	1.89	1.85	0.43	0.31
23	2.24	6.90	69.75	13.70	7.79	23.03	2.96	2.73	1.89	1.85	1.03	0.33
24	1.45	6.37	61.40	12.68	7.45	20.77	2.80	2.58	1.89	1.85	0.99	1.82
25	0.87	11.63	44.54	12.35	7.12	22.56	2.65	2.44	1.89	1.85	0.71	1.82
26	0.71	8.38	33.87	11.72	6.92	14.31	2.65	2.51	1.98	1.84	0.59	1.82
27	0.62	9.37	25.73	11.11	6.35	9.22	2.65	2.58	1.95	1.84	0.54	1.83
28	0.57	15.49	19.57	10.24	7.52	11.01	4.24	2.24	1.91	0.62	0.49	1.78
29	0.77	25.17	14.91	10.52		12.73	8.14	2.11	1.90	0.65	0.49	1.78
30	2.30	22.72	12.30	11.11		12.43	6.30	2.12	1.89	0.71	0.47	1.78
31	2.24		10.85	9.68		12.73		2.30		0.80	0.47	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.33	5.63	4.30	7.92	5.82	5.62	2.65	2.11	1.89	0.62	0.43	0.31
Max Q (cfs)	2.35	25.17	69.75	53.30	14.49	23.03	8.14	9.56	2.51	1.89	1.03	1.83
Mean Monthly Q (cfs)	0.80	10.00	18.80	15.85	9.60	11.07	4.27	3.92	2.00	1.71	0.55	0.72
Cumulative Q (cfs)	24.90	299.96	582.69	491.26	268.68	343.08	128.24	121.55	59.92	53.05	17.08	21.59
Annual Water Yield (in)		76.55				**Mean Annual Q (cfs)**			6.61			

Deer Creek, Alsea Watershed Study												
Water Year 2003												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1			20.65	2.70	18.09	3.65	4.34	3.84	2.05	3.04	1.29	0.30
2			26.43	2.96	20.64	3.47	4.14	3.65	1.85	2.65	1.29	0.32
3			18.41	3.38	18.40	3.29	3.84	3.38	1.73	2.37	1.25	0.32
4			13.59	3.38	17.20	6.72	3.56	3.20	1.67	2.24	1.11	0.32
5			13.59	3.16	15.51	7.80	3.38	3.04	1.61	2.11	1.11	0.32
6			17.88	3.53	14.20	8.87	3.29	3.12	1.67	2.20	1.11	0.32
7			20.36	8.94	13.21	9.95	3.20	3.12	1.61	2.12	0.59	0.32
8			16.60	22.50	18.71	8.14	3.04	2.88	1.55	2.05	0.59	0.29
9			12.34	22.80	24.19	7.80	2.80	2.65	1.67	2.05	0.57	0.29
10			10.11	14.58	19.66	7.02	4.24	2.58	1.61	2.05	0.52	0.29
11			9.94	10.20	15.78	7.48	4.78	2.44	1.55	1.99	0.49	0.59
12			10.64	8.49	12.97	12.73	6.02	2.30	1.55	1.92	0.47	0.57
13			12.15	8.21	11.17	35.52	10.55	2.24	1.55	1.85	0.47	0.54
14			19.23	7.13	9.76	27.34	12.27	2.11	1.50	1.61	0.43	0.54
15			25.40	6.51	8.65	20.98	28.60	2.35	1.50	1.34	0.40	0.54
16			16.85	5.72	7.64	17.79	24.95	2.27	1.52	1.39	0.40	0.54
17			15.62	5.30	6.87	15.78	19.66	2.20	1.50	1.55	0.40	0.59
18			16.11	4.62	6.16	14.20	18.71	2.20	2.35	1.61	0.40	11.17
19			14.02	5.20	6.02	12.97	16.06	2.05	2.11	1.61	0.40	0.74
20			11.56	7.93	5.76	20.31	13.45	1.92	1.99	1.67	0.40	0.68
21			9.94	19.66	5.76	26.93	10.75	1.99	1.92	1.45	0.39	0.62
22			8.64	21.33	5.89	19.66	8.83	1.92	1.73	1.39	0.31	0.59
23			7.48	14.15	5.38	14.97	7.48	1.92	1.73	1.39	0.31	0.57
24			6.07	11.41	5.13	12.05	6.72	1.79	1.73	1.34	0.33	0.57
25			5.28	13.32	4.78	10.35	5.89	1.73	1.67	1.29	0.33	0.54
26			4.67	26.62	4.56	8.65	5.13	1.67	1.55	1.29	0.33	0.54
27			3.85	19.40	4.14	7.64	5.25	1.61	1.50	1.29	0.33	0.54
28			3.76	13.94	3.84	6.87	5.38	1.67	1.45	1.29	0.33	0.54
29			4.11	10.54		5.89	4.56	2.11	3.56	1.34	0.31	0.54
30			4.29	8.49		5.13	4.14	2.73	3.84	1.45	0.30	0.59
31			4.20	7.13		4.78		2.27		1.34	0.30	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.06	2.34	3.76	2.70	3.84	3.29	2.80	1.61	1.45	1.29	0.30	0.29
Max Q (cfs)	0.06	2.34	26.43	26.62	24.19	35.52	28.60	3.84	3.84	3.04	1.29	11.17
Mean Monthly Q (cfs)	0.06	2.34	12.38	10.43	11.07	12.09	8.50	2.42	1.83	1.75	0.56	0.84
Cumulative Q (cfs)	1.78	70.32	383.76	323.21	310.04	374.73	255.00	74.93	54.83	54.33	17.28	25.21
Annual Water Yield (in)		61.74				**Mean Annual Q (cfs)**			5.36			

Deer Creek, Alsea Watershed Study												
Water Year 2004												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.68	1.96					4.65	5.01	2.05	1.07	0.57	0.43
2	0.62	1.96					4.92	4.67	1.99	1.03	0.57	0.40
3	0.62	1.96					6.89	4.67	1.99	1.03	0.57	0.40
4	0.74	1.96					9.40	7.64	1.85	0.99	0.57	0.40
5	0.80	1.96					9.11	7.80	1.79	0.99	0.57	0.39
6	0.68	1.96					11.29	7.02	1.73	0.99	0.57	0.39
7	0.62	2.25					10.00	6.44	1.67	0.95	0.54	0.43
8	0.62	6.51					7.88	5.89	1.67	0.95	0.54	0.54
9	0.62	5.26					6.55	5.25	1.61	0.95	0.54	0.57
10	0.59	7.47					5.59	4.78	1.61	0.91	0.52	0.65
11	0.59	4.88					4.92	4.45	1.55	0.87	0.52	0.68
12	0.59	5.07					4.56	4.14	1.55	0.84	0.52	0.80
13	0.57	7.72					4.23	3.84	1.73	0.84	0.52	0.65
14	0.52	6.29					3.83	3.74	1.61	0.80	0.52	0.59
15	0.52	5.26					3.61	3.47	1.50	0.80	0.52	0.54
16	0.52	4.70					3.47	3.38	1.45	0.77	0.52	0.68
17	0.52	6.29					3.54	3.29	1.39	0.77	0.49	0.77
18	0.52	5.45					3.33	3.12	1.39	0.74	0.49	0.59
19	0.52	9.12					3.19	2.88	1.39	0.74	0.47	0.57
20	0.52	9.38					2.81	2.80	1.34	0.71	0.47	0.54
21	0.52	7.68					2.58	2.65	1.34	0.71	0.45	0.49
22	0.49	7.47					2.36	2.51	1.29	0.71	0.45	0.49
23	0.49	6.74					2.94	2.44	1.29	0.71	0.45	0.47
24	0.52	6.29					3.33	2.44	1.25	0.68	0.43	0.45
25	0.54	6.51					3.26	2.37	1.20	0.68	0.43	0.45
26	0.54	6.55					3.33	2.24	1.15	0.68	0.43	0.27
27	0.54	6.55					3.06	2.11	1.11	0.65	0.43	0.40
28	0.54	6.18					2.64	2.35	1.07	0.65	0.43	0.31
29	0.57	6.18					2.41	2.27	1.07	0.62	0.43	0.31
30	0.62	5.82					2.15	2.27	1.11	0.59	0.43	0.33
31	0.54							2.20		0.59	0.43	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.49	1.96	13.60	13.64	9.86	5.70	2.15	2.11	1.07	0.59	0.43	0.27
Max Q (cfs)	0.80	9.38	13.60	13.64	9.86	5.70	11.29	7.80	2.05	1.07	0.57	0.80
Mean Monthly Q (cfs)	0.57	5.45	13.60	13.64	9.86	5.70	4.73	3.87	1.49	0.80	0.49	0.50
Cumulative Q (cfs)	17.82	163.41	421.73	422.95	285.91	176.81	141.84	120.11	44.76	24.94	15.28	14.96
Annual Water Yield (in)		58.73				**Mean Annual Q (cfs)**			5.06			

Deer Creek, Alsea Watershed Study

Water Year 2005

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	1.59							5.36				
2	1.67							5.34				
3	1.59							5.33				
4	1.59							5.33				
5	1.59							5.03				
6	2.27							5.41				
7	3.58							5.06				
8	2.49							5.49				
9	3.14							5.23				
10	3.00							5.03				
11	2.74							5.65				
12	3.00							5.41				
13	2.61							4.73				
14	2.38							4.42				
15	2.61							4.27				
16	2.38							4.27				
17	2.16							3.98				
18	1.95							4.27				
19	4.43							4.12				
20	4.07							3.70				
21	4.07							3.70				
22	4.07							4.73				
23	4.07							4.42				
24	3.28							4.12				
25	2.87							3.70				
26	2.61							5.03				
27	2.49							7.05				
28	3.14							12.81				
29	4.07							10.72				
30	3.58							10.72				
31	3.15							10.72				
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	1.59	1.20	7.29	6.02	3.23	5.66	6.70	3.70	4.29	0.00	0.00	0.00
Max Q (cfs)	4.43	1.20	7.29	6.02	3.23	5.66	6.70	12.81	4.29	0.00	0.00	0.00
Mean Monthly Q (cfs)	2.85	1.20	7.29	6.02	3.23	5.66	6.70	5.65	4.29	0.00	0.00	0.00
Cumulative Q (cfs)	88.27	35.94	225.89	186.58	90.54	175.47	200.98	175.14	128.75	0.00	0.00	0.00
Annual Water Yield (in)		41.50				**Mean Annual Q (cfs)**			3.57			

Deer Creek, Alsea Watershed Study												
Water Year 2006												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	2.00	12.46	9.40	36.54	29.39	4.52	5.16	2.30	2.07	0.77	1.53	1.43
2	2.00	9.24	11.06	25.64	25.02	4.86	4.86	2.17	2.83	0.74	1.53	1.43
3	2.19	9.34	15.72	20.20	23.23	4.49	4.62	2.04	2.94	0.72	1.53	1.43
4	1.91	11.34	17.06	16.74	22.93	4.19	4.22	1.93	3.08	0.69	1.53	1.43
5	1.72	11.85	14.37	14.28	20.13	4.01	3.90	1.84	3.10	0.66	1.53	1.43
6	1.62	15.68	11.53	14.74	16.72	4.41	3.60	1.84	2.93	0.63	1.43	1.43
7	1.62	10.37	9.23	22.96	13.82	6.77	3.36	2.00	2.75	0.61	1.43	1.43
8	1.62	6.86	7.36	26.17	11.47	9.81	3.20	1.91	2.55	0.62	1.43	1.43
9	1.62	4.91	6.16	24.72	9.58	17.85	3.08	1.68	2.35	0.60	1.43	1.43
10	0.48	3.96	5.38	70.00	7.93	16.82	2.95	1.60	2.12	0.59	1.53	1.43
11	0.44	3.86	4.78	53.81	6.80	14.27	2.87	1.53	1.92	1.62	1.43	1.43
12	0.44	5.12	4.30	33.86	5.94	12.19	2.85	1.49	1.74	1.72	1.53	1.43
13	0.45	10.86	3.84	26.66	5.20	10.73	2.59	1.45	1.61	1.72	1.53	1.43
14	0.48	12.80	3.51	22.13	4.78	9.98	3.21	1.42	1.52	1.72	1.43	1.43
15	1.55	9.60	3.24	19.15	4.21	9.70	6.88	1.35	1.47	1.62	1.43	1.53
16	1.20	7.17	3.02	18.27	3.74	10.90	10.98	1.27	1.45	1.62	1.43	1.53
17	0.79	5.35	2.82	39.83	3.41	12.47	10.47	1.25	1.47	1.62	1.53	1.53
18	0.64	4.13	2.69	35.49	3.12	12.74	8.37	1.23	1.25	1.62	1.43	1.53
19	0.98	3.33	3.94	25.73	2.93	11.76	6.77	1.20	1.19	1.62	1.43	1.62
20	1.14	2.81	4.82	32.45	2.76	10.09	5.69	1.18	1.12	1.53	1.43	1.72
21	0.94	2.47	10.15	31.79	2.69	8.45	5.36	1.17	1.09	1.53	1.43	1.72
22	0.76	2.18	31.50	25.01	2.63	7.14	4.44	1.23	1.10	1.53	1.43	1.53
23	0.68	1.97	32.92	19.82	2.52	6.78	3.96	1.38	1.08	1.53	1.43	1.53
24	0.62	2.12	19.22	16.08	2.45	7.11	3.61	1.32	1.03	1.53	1.43	1.43
25	0.71	5.82	14.47	13.77	2.26	6.76	3.32	1.23	0.98	1.53	1.43	1.43
26	1.01	8.39	16.09	13.48	2.33	6.90	3.08	2.43	0.92	1.53	1.43	1.43
27	0.81	7.86	17.24	17.11	3.10	6.78	2.91	2.51	0.87	1.53	1.43	1.34
28	1.59	7.06	48.64	24.11	4.12	6.61	2.75	2.64	0.84	1.53	1.43	1.34
29	1.65	6.91	36.78	26.35		6.28	2.64	2.41	0.81	1.53	1.43	1.34
30	1.42	6.39	56.66	30.47		5.82	2.46	2.14	0.80	1.53	1.43	1.34
31	3.52		64.57	26.34		5.53		2.00		1.53	1.43	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.44	1.97	2.69	13.48	2.26	4.01	2.46	1.17	0.80	0.59	1.43	1.34
Max Q (cfs)	3.52	15.68	64.57	70.00	29.39	17.85	10.98	2.64	3.10	1.72	1.53	1.72
Mean Monthly Q (cfs)	1.25	7.07	15.89	26.57	8.76	8.60	4.47	1.71	1.70	1.28	1.46	1.46
Cumulative Q (cfs)	38.64	212.23	492.50	823.70	245.20	266.71	134.14	53.13	50.96	39.83	45.23	43.89
Annual Water Yield (in)		77.63				**Mean Annual Q (cfs)**			6.70			

Deer Creek, Alsea Watershed Study												
Water Year 2007												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.28	0.36	15.96	6.79	1.99	21.38	5.16	2.97	0.96	0.65	0.45	0.30
2	0.27	1.33	13.82	8.05	1.89	26.15	4.61	3.17	0.93	0.62	0.40	0.30
3	0.27	2.81	11.62	34.80	1.81	30.12	4.20	2.96	0.91	0.60	0.39	0.30
4	0.27	5.45	9.70	27.53	1.73	21.95	3.85	2.68	0.93	0.58	0.38	0.34
5	0.27	26.23	8.13	20.36	1.66	17.24	3.57	2.49	1.00	0.57	0.38	0.30
6	0.28	24.90	6.95	30.05	1.60	14.04	3.32	2.35	0.96	0.55	0.38	0.30
7	0.28	123.35	6.11	24.52	1.64	12.34	3.34	2.23	0.91	0.54	0.39	0.30
8	0.28	38.08	5.45	27.51	1.57	10.18	3.50	2.14	0.87	0.53	0.39	0.30
9	0.27	18.09	5.66	20.81	1.64	9.25	4.13	2.02	1.04	0.52	0.38	0.29
10	0.24	17.15	6.19	17.17	1.58	8.59	3.63	1.93	1.36	0.50	0.38	0.29
11	0.24	28.27	7.18	14.72	1.75	8.47	4.23	1.86	1.10	0.49	0.37	0.27
12	0.26	19.07	8.77	12.15	1.87	9.53	10.40	1.80	0.94	0.48	0.38	0.26
13	0.26	20.35	23.36	10.08	1.65	9.89	12.12	1.73	0.90	0.47	0.37	0.27
14	0.27	18.41	41.60	8.42	1.75	9.03	11.26	1.65	0.85	0.46	0.32	0.27
15	0.39	16.13	50.12	7.05	12.75	7.80	9.64	1.61	0.84	0.47	0.32	0.27
16	0.69	16.01	30.55	6.29	31.72	6.69	8.42	1.54	0.80	0.46	0.32	0.27
17	0.42	13.26	21.12	5.37	19.19	5.78	7.72	1.47	0.78	0.48	0.31	0.29
18	0.37	10.74	16.25	4.72	12.69	5.16	8.02	1.42	0.76	0.52	0.31	0.27
19	0.92	12.73	13.18	4.45	9.96	5.13	7.94	1.45	0.73	0.50	0.40	0.28
20	0.67	15.53	11.23	4.43	17.17	5.97	7.36	1.54	0.72	0.51	0.54	0.27
21	0.48	15.26	11.93	4.01	17.42	5.43	6.88	1.48	0.70	0.61	0.49	0.27
22	0.41	19.32	11.63	3.78	13.20	5.16	6.15	1.34	0.69	0.54	0.43	0.25
23	0.37	23.28	12.36	3.52	11.02	4.82	5.40	1.28	0.68	0.53	0.40	0.26
24	0.37	29.36	13.45	3.27	15.76	4.95	4.90	1.24	0.76	0.48	0.38	0.29
25	0.37	25.08	26.40	3.05	25.39	11.01	4.47	1.19	0.69	0.46	0.36	0.26
26	0.35	23.86	27.88	2.86	29.91	11.02	4.10	1.15	0.65	0.46	0.33	0.26
27	0.34	24.73	30.81	2.66	23.58	10.22	3.77	1.15	0.64	0.46	0.33	0.26
28	0.33	19.84	24.27	2.47	21.07	8.57	3.48	1.09	0.79	0.45	0.33	0.33
29	0.35	15.78	18.68	2.32		7.56	3.23	1.05	0.78	0.48	0.31	0.30
30	0.35	14.46	14.80	2.19		6.53	3.01	1.01	0.69	0.48	0.30	1.01
31	0.34		12.04	2.07		5.94		0.98		0.49	0.29	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.24	0.36	5.45	2.07	1.57	4.82	3.01	0.98	0.64	0.45	0.29	0.25
Max Q (cfs)	0.92	123.35	50.12	34.80	31.72	30.12	12.12	3.17	1.36	0.65	0.54	1.01
Mean Monthly Q (cfs)	0.36	21.31	16.68	10.56	10.18	10.51	5.73	1.74	0.85	0.51	0.37	0.31
Cumulative Q (cfs)	11.28	639.24	517.21	327.47	284.98	325.92	171.79	53.95	25.36	15.94	11.55	9.21
Annual Water Yield (in)		75.97				**Mean Annual Q (cfs)**			6.56			

Deer Creek, Alsea Watershed Study												
Water Year 2008												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.89	0.59	6.96	16.11	34.25	3.22	9.82	4.85	1.97	1.41	0.74	0.61
2	0.73	0.57	13.53	16.88	35.45	2.83	8.38	4.42	1.85	1.36	0.70	0.58
3	0.98	0.55	62.73	19.82	38.51	2.84	7.17	4.09	3.75	1.36	0.65	0.56
4	0.74	0.54	44.24	25.36	25.89	2.86	6.85	3.82	4.79	1.25	0.63	0.55
5	0.58	0.53	25.44	33.43	20.04	2.73	7.04	3.56	4.94	1.26	0.61	0.53
6	0.52	0.51	19.00	29.23	18.11	2.66	9.61	3.33	8.29	1.21	0.61	0.52
7	0.58	0.50	15.19	24.83	26.53	2.81	12.35	3.13	17.52	1.14	0.61	0.51
8	0.65	0.50	12.91	37.45	24.91	3.29	13.62	2.97	13.98	1.08	0.61	0.49
9	0.64	0.51	11.13	52.06	22.24	3.06	12.10	2.78	9.93	1.04	0.59	0.48
10	0.83	1.09	9.72	36.59	19.18	3.14	10.25	2.71	8.62	1.01	0.57	0.47
11	0.71	0.77	8.42	38.03	16.03	3.19	8.61	2.76	7.41	0.98	0.55	0.46
12	0.62	1.27	7.21	34.20	13.51	3.08	7.38	2.48	6.54	0.96	0.54	0.46
13	0.55	1.81	6.30	28.02	11.66	5.40	6.34	2.34	5.58	0.94	0.53	0.45
14	0.51	1.31	5.68	23.77	9.88	10.52	5.80	2.23	4.76	0.89	0.52	0.44
15	0.50	1.87	5.94	21.62	8.45	15.80	5.20	2.13	4.13	0.87	0.52	0.44
16	0.64	8.33	5.38	19.41	7.28	15.24	4.70	1.98	3.69	0.85	0.51	0.43
17	1.03	16.78	6.17	16.72	6.35	12.39	4.28	1.87	3.36	0.85	0.52	0.43
18	1.21	16.59	9.56	14.22	5.62	17.40	3.99	1.77	3.06	0.83	0.58	0.43
19	4.52	15.50	21.74	12.20	5.03	18.11	3.98	1.68	2.79	0.81	0.59	0.42
20	2.89	11.94	48.61	11.24	4.52	14.27	3.95	2.01	2.61	0.82	2.81	0.43
21	2.10	8.68	30.14	9.40	4.16	11.45	3.97	3.00	2.43	0.79	2.26	0.43
22	1.59	6.13	22.19	8.16	4.09	9.56	4.36	2.70	2.33	0.77	1.31	0.48
23	1.27	4.54	29.30	7.36	3.69	10.12	9.44	2.51	2.19	0.79	0.97	0.44
24	1.11	3.60	56.51	6.74	3.44	10.66	16.91	2.39	2.04	0.79	0.90	0.44
25	0.98	2.96	35.36	6.06	3.17	10.23	13.33	2.28	1.95	0.70	0.90	0.54
26	0.85	2.89	26.49	7.27	2.97	10.52	10.10	2.23	1.82	0.69	0.78	0.47
27	0.78	2.92	23.99	13.56	2.80	9.74	7.93	2.14	1.71	0.69	0.73	0.44
28	0.72	2.59	27.68	13.66	2.65	10.53	6.65	2.11	1.62	0.67	0.70	0.43
29	0.69	3.68	29.79	20.18	3.07	11.21	6.07	2.11	1.54	0.70	0.67	0.40
30	0.64	4.35	27.26	25.25		11.95	5.46	2.00	1.45	0.71	0.64	0.39
31	0.62		22.98	48.12		11.33		1.97		0.67	0.63	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.50	0.50	5.38	6.06	2.65	2.66	3.95	1.68	1.45	0.67	0.51	0.39
Max Q (cfs)	4.52	16.78	62.73	52.06	38.51	18.11	16.91	4.85	17.52	1.41	2.81	0.61
Mean Monthly Q (cfs)	1.02	4.15	21.86	21.84	13.22	8.46	7.86	2.66	4.62	0.93	0.79	0.47
Cumulative Q (cfs)	31.67	124.39	677.56	676.95	383.46	262.14	235.67	82.36	138.64	28.91	24.48	14.15
Annual Water Yield (in)		85.06				**Mean Annual Q (cfs)**			7.32			

Deer Creek, Alsea Watershed Study

Water Year 2009

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	0.41	0.53	2.73	37.14	2.81	5.56	6.19	2.73	2.21	1.04	0.53	0.40
2	0.44	1.02	3.75	112.85	2.73	7.97	19.63	3.36	2.10	0.97	0.53	0.40
3	0.59	1.41	3.24	39.86	2.73	6.59	26.87	3.16	2.06	0.94	0.53	0.38
4	2.07	4.17	3.16	24.49	2.61	6.01	18.58	5.64	2.17	0.89	0.53	0.38
5	0.99	3.35	3.04	26.07	2.53	7.48	12.24	6.90	2.14	0.85	0.52	0.49
6	1.18	7.80	2.93	38.11	2.93	7.66	7.46	13.81	2.07	0.84	0.53	0.53
7	1.22	9.99	2.93	45.01	2.53	7.14	6.21	20.60	1.88	0.83	0.55	0.47
8	0.97	8.06	2.93	68.51	2.61	6.09	5.64	11.95	1.75	0.82	0.55	0.44
9	1.02	8.23	2.73	44.76	2.73	5.61	5.28	7.52	1.69	0.80	0.55	0.43
10	1.08	7.99	2.61	26.13	2.81	5.23	4.84	5.94	1.61	0.77	0.54	0.41
11	0.93	10.16	2.53	18.53	3.16	4.89	4.45	5.11	1.51	0.78	0.52	0.40
12	0.85	37.38	3.24	14.28	3.24	4.63	5.25	5.40	1.42	0.88	0.55	0.39
13	0.80	80.49	4.10	11.38	3.36	4.37	5.73	5.58	1.69	0.89	0.52	0.37
14	0.75	28.02	4.43	9.51	3.24	5.29	5.59	12.73	1.45	0.79	0.53	0.37
15	0.71	13.77	4.75	8.35	3.24	17.28	5.62	12.85	1.34	0.73	0.52	0.39
16	0.70	8.03	4.98	7.01	3.16	26.04	5.45	9.33	1.26	0.70	0.51	0.45
17	0.67	6.03	5.27	6.03	2.93	14.97	5.34	7.30	1.15	0.67	0.49	0.45
18	0.64	4.90	6.60	5.26	2.81	9.23	4.80	5.85	1.10	0.65	0.45	0.42
19	0.62	4.33	6.47	4.66	2.73	6.66	4.40	5.21	1.70	0.64	0.44	0.42
20	0.69	4.31	7.65	4.18	2.61	5.99	4.04	4.56	1.46	0.64	0.43	0.41
21	0.69	3.86	22.30	3.86	2.53	5.35	3.84	4.08	1.42	0.63	0.43	0.39
22	0.62	3.70	44.43	3.59	3.41	6.05	3.48	3.82	1.28	0.62	0.43	0.36
23	0.59	3.75	31.78	3.04	3.70	5.33	3.36	3.54	1.19	0.61	0.43	0.36
24	0.56	3.48	19.95	2.81	3.53	5.58	3.16	3.33	1.21	0.59	0.43	0.35
25	0.55	3.36	16.81	3.04	5.18	9.55	3.04	3.22	1.24	0.58	0.44	0.36
26	0.53	3.24	14.74	2.61	10.74	15.99	2.93	3.03	1.11	0.57	0.42	0.34
27	0.52	3.04	33.21	3.16	9.10	11.36	2.81	2.82	1.06	0.57	0.41	0.35
28	0.51	2.93	94.85	3.24	6.17	8.46	2.73	2.68	1.03	0.55	0.48	0.35
29	0.51	2.81	51.53	3.04		10.30	3.24	2.54	1.02	0.54	0.47	0.43
30	0.51	2.73	30.89	2.93		9.42	2.93	2.41	1.06	0.54	0.42	0.47
31	0.53		18.93	2.93		7.09		2.30		0.53	0.40	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.41	0.53	2.53	2.61	2.53	4.37	2.73	2.30	1.02	0.53	0.40	0.34
Max Q (cfs)	2.07	80.49	94.85	112.85	10.74	26.04	26.87	20.60	2.21	1.04	0.55	0.53
Mean Monthly Q (cfs)	0.76	9.43	14.82	18.91	3.64	8.36	6.50	6.11	1.51	0.72	0.49	0.41
Cumulative Q (cfs)	23.45	282.89	459.50	586.36	101.86	259.17	195.13	189.28	45.39	22.47	15.05	12.18
Annual Water Yield (in)		69.59				**Mean Annual Q (cfs)**			6.01			

Deer Creek, Alsea Watershed Study												
Water Year 2010												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.41	1.50	6.84	25.22	5.22	12.71	22.60	11.82	2.36	2.08	1.07	1.57
2	0.39	1.21	5.46	20.72	5.08	10.19	20.19	9.64	10.71	2.22	1.05	0.88
3	0.49	0.98	4.71	14.52	5.29	9.12	21.68	12.94	16.48	1.92	1.05	0.69
4	0.53	0.77	4.16	11.93	5.26	7.81	24.25	13.95	17.17	1.79	1.01	0.62
5	0.46	0.74	3.87	13.81	5.06	6.81	21.83	12.49	14.40	1.67	0.97	0.58
6	0.42	1.47	3.62	21.96	5.03	6.06	22.99	10.46	10.19	1.59	0.97	0.56
7	0.39	3.87	3.42	18.15	5.14	5.60	20.95	8.99	8.68	1.50	0.95	0.62
8	0.38	7.50	3.42	14.01	4.93	4.90	19.30	7.72	7.25	1.44	0.98	0.60
9	0.36	6.94	3.42	11.87	4.78	4.34	16.81	6.70	8.68	1.43	0.95	0.62
10	0.36	6.44	3.40	10.18	4.86	4.57	14.66	6.00	14.72	1.40	0.96	0.59
11	0.35	5.40	3.33	8.97	6.36	6.47	12.68	5.19	13.58	1.36	0.92	0.56
12	0.34	6.95	3.30	11.55	9.56	27.78	10.89	4.65	10.48	1.31	0.89	0.54
13	0.37	6.78	3.26	16.05	10.43	25.37	9.18	4.19	8.18	1.28	0.80	0.53
14	0.68	5.41	3.16	18.00	11.29	18.40	7.89	3.81	6.51	1.26	0.62	0.52
15	0.51	4.10	14.92	17.89	10.43	13.79	7.14	3.50	5.48	1.22	0.62	0.65
16	0.46	2.98	24.04	23.40	10.46	10.86	6.21	3.20	4.85	1.20	0.61	0.84
17	0.79	8.95	16.41	18.65	9.43	8.83	5.50	2.90	4.28	1.25	0.61	0.85
18	0.78	9.43	12.41	17.06	8.57	7.31	4.97	2.77	3.67	1.26	0.61	1.21
19	0.64	7.40	9.66	15.18	7.44	6.24	4.60	2.75	3.39	1.23	0.61	1.66
20	0.58	7.83	8.96	12.08	6.40	5.49	4.67	3.03	3.19	1.21	0.59	1.85
21	0.68	7.75	19.05	10.20	5.57	6.11	4.13	5.13	2.83	1.19	0.57	1.25
22	0.64	7.67	22.56	8.57	4.99	5.78	3.71	7.00	2.50	1.17	0.56	1.04
23	1.29	6.62	16.87	6.89	5.29	5.22	3.42	7.08	2.26	1.13	0.55	0.95
24	1.24	5.51	13.25	6.12	7.37	4.99	3.64	6.39	2.08	1.10	0.53	0.90
25	0.89	4.16	10.76	6.04	7.06	8.09	3.17	6.39	1.89	1.08	0.52	0.85
26	2.18	4.87	8.77	5.29	10.97	22.64	4.30	6.09	1.72	1.09	0.52	0.91
27	2.62	9.33	7.27	4.89	17.17	19.87	15.44	5.69	1.59	1.08	0.51	0.98
28	1.83	8.33	6.09	4.42	16.20	17.41	18.31	5.27	1.51	1.09	0.50	1.53
29	2.08	6.22	4.86	4.16		28.53	17.48	4.83	1.40	1.05	0.50	1.53
30	2.47	4.51	5.17	4.10		41.81	14.43	4.36	1.31	1.07	0.76	1.53
31	3.36		12.35	3.78		32.16		4.25		1.08	0.64	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.34	0.74	3.16	3.78	4.78	4.34	3.17	2.75	1.31	1.05	0.50	0.52
Max Q (cfs)	3.36	9.43	24.04	25.22	17.17	41.81	24.25	13.95	17.17	2.22	1.07	1.85
Mean Monthly Q (cfs)	0.93	5.39	8.67	12.44	7.70	12.75	12.23	6.43	6.44	1.35	0.74	0.93
Cumulative Q (cfs)	28.97	161.65	268.76	385.65	215.62	395.29	367.04	199.19	193.33	41.77	23.02	27.99
Annual Water Yield (in)		73.25				**Mean Annual Q (cfs)**			6.32			

Deer Creek, Alsea Watershed Study

Water Year 2011

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	1.53	1.87	36.42	11.88	3.54	18.83	12.80	12.01	3.59	1.31	0.71	0.46
2	1.53	3.50	27.76	9.15	3.29	17.97	12.51	9.68	3.65	1.25	0.68	0.41
3	1.53	2.59	19.67	7.42	3.07	17.00	11.58	7.89	3.41	1.23	0.62	0.41
4	1.53	1.99	15.31	5.78	2.94	22.74	10.94	6.56	3.15	1.17	0.62	0.40
5	1.53	3.10	12.36	4.57	2.89	26.47	11.95	5.61	2.92	1.13	0.61	0.40
6	1.53	3.17	10.34	3.77	2.79	22.00	13.67	5.16	2.79	1.08	0.61	0.39
7	1.53	6.33	8.79	3.37	3.24	18.41	13.98	5.31	2.75	1.06	0.61	0.39
8	1.62	6.72	9.26	3.35	3.43	17.54	12.19	5.23	2.56	1.04	0.59	0.39
9	1.82	7.04	11.42	3.32	3.34	17.67	9.99	4.63	2.41	1.03	0.57	0.38
10	2.10	11.19	20.52	3.07	3.73	25.82	8.39	4.32	2.29	1.00	0.56	0.38
11	1.82	9.69	27.72	2.88	3.54	25.03	9.17	4.55	2.19	0.98	0.56	0.38
12	1.72	7.26	24.85	3.76	3.54	20.58	8.03	4.25	2.19	1.02	0.55	0.38
13	1.62	5.56	26.76	12.07	4.30	18.95	7.86	3.98	2.30	1.05	0.55	0.40
14	1.53	4.68	40.14	17.40	5.73	20.50	9.01	3.87	2.10	0.96	0.53	0.38
15	1.53	4.50	26.76	22.49	15.29	22.11	13.69	3.84	2.01	0.92	0.52	0.38
16	1.53	4.82	17.20	71.84	13.38	28.67	22.11	3.73	1.91	1.21	0.51	0.37
17	1.53	5.47	12.43	43.74	8.79	33.90	17.25	3.72	1.82	1.02	0.50	0.36
18	1.53	19.31	11.47	25.85	8.03	26.75	13.14	3.58	1.87	0.95	0.50	0.36
19	1.53	15.59	12.43	21.75	6.98	20.99	10.30	3.38	1.82	0.93	0.49	0.38
20	1.53	14.64	19.12	17.25	6.12	17.30	8.37	3.19	1.74	0.88	0.48	0.37
21	1.53	12.38	18.16	13.68	5.73	15.60	6.97	3.03	1.65	0.86	0.48	0.37
22	1.53	11.08	12.43	11.08	5.73	13.61	5.87	2.85	1.59	0.84	0.48	0.36
23	1.62	10.75	9.37	9.05	6.12	12.18	4.99	2.71	1.53	0.80	0.48	0.36
24	7.74	9.33	7.74	7.46	6.31	11.28	4.64	2.56	1.47	0.77	0.47	0.36
25	14.34	7.68	6.79	6.20	5.73	9.99	7.96	2.90	1.42	0.76	0.46	0.45
26	7.55	7.50	8.22	5.20	5.35	10.04	9.96	2.78	1.38	0.75	0.45	0.40
27	4.11	8.75	14.34	4.46	5.54	13.76	10.21	3.60	1.39	0.73	0.45	0.63
28	3.25	9.32	42.06	3.93	30.59	17.43	9.83	3.97	1.45	0.72	0.44	0.49
29	2.87	8.79	45.88	3.60		19.02	11.74	3.87	1.37	0.72	0.45	0.43
30	2.58	12.60	23.90	3.16		25.92	11.86	3.84	1.44	0.72	0.44	0.40
31	2.96		19.15	2.86		25.05		3.83		0.70	0.46	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	1.53	1.87	6.79	2.86	2.79	9.99	4.64	2.56	1.37	0.70	0.44	0.36
Max Q (cfs)	14.34	19.31	45.88	71.84	30.59	33.90	22.11	12.01	3.65	1.31	0.71	0.63
Mean Monthly Q (cfs)	2.65	7.91	19.31	11.79	6.40	19.78	10.70	4.53	2.14	0.95	0.53	0.40
Cumulative Q (cfs)	82.20	237.16	598.75	365.38	179.06	613.09	320.98	140.42	64.18	29.58	16.43	12.02
Annual Water Yield (in)		84.39				**Mean Annual Q (cfs)**			7.29			

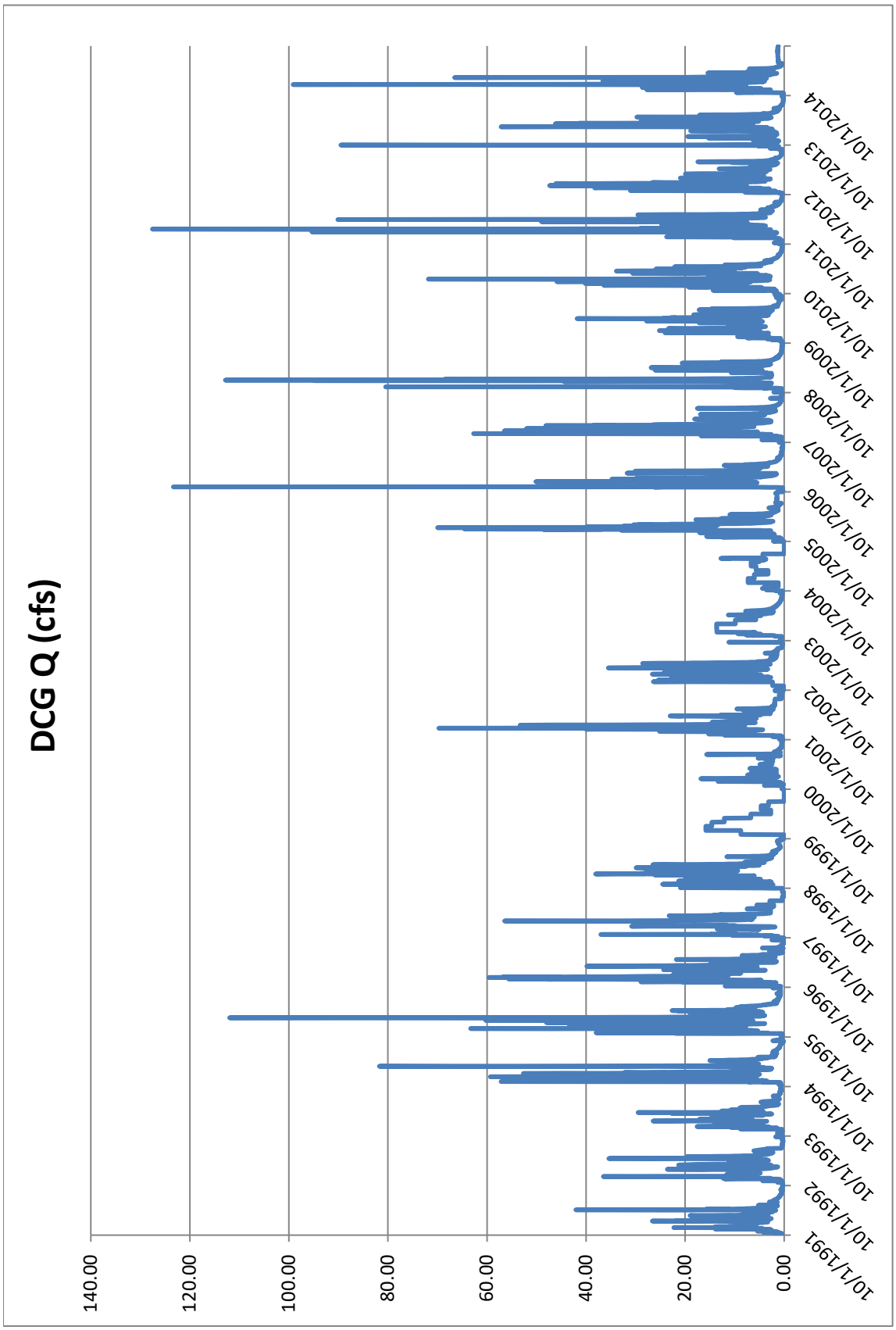
Deer Creek, Alsea Watershed Study												
Water Year 2012												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.45	0.71	5.56	16.28	11.54	12.82	33.71	8.99	2.52	2.38	1.86	0.51
2	0.49	0.73	4.69	11.53	9.48	13.98	24.18	9.65	2.59	2.21	1.86	0.51
3	0.72	1.38	4.07	8.98	8.15	12.15	16.06	20.60	2.35	2.61	1.86	0.50
4	0.70	1.17	3.54	8.16	7.06	10.86	14.19	29.55	2.75	2.19	1.86	0.49
5	1.17	1.19	3.17	8.25	6.06	11.57	13.19	22.13	3.22	2.03	1.76	0.49
6	0.69	1.36	2.85	7.43	5.28	13.16	12.09	16.26	2.83	1.91	1.76	0.48
7	0.63	1.18	2.61	6.39	4.64	11.72	10.40	12.57	3.57	1.80	0.74	0.48
8	0.57	1.08	2.39	5.39	4.75	9.83	8.79	10.18	4.18	1.73	0.74	0.48
9	0.60	0.98	2.26	4.64	4.43	8.18	7.46	8.51	4.74	1.64	0.72	0.48
10	1.19	0.89	2.27	4.07	4.09	7.45	6.38	7.23	4.20	1.58	0.71	0.50
11	2.04	0.94	2.27	3.61	3.84	9.42	5.60	6.24	3.81	1.52	0.69	0.47
12	1.25	1.20	2.26	3.25	3.78	12.36	5.08	5.44	3.32	1.47	0.68	0.45
13	0.91	1.71	2.28	2.95	3.83	17.97	4.82	4.81	3.32	1.42	0.66	0.44
14	0.76	1.53	2.30	2.96	4.07	20.31	4.12	4.28	3.03	1.37	0.65	0.43
15	0.69	1.46	2.12	2.90	4.17	49.03	3.76	3.89	2.93	1.39	0.64	0.43
16	0.62	2.54	2.00	2.75	4.24	35.53	7.12	3.54	2.83	1.38	0.63	0.42
17	0.57	10.16	1.96	7.24	4.63	28.15	8.05	3.25	2.74	1.35	0.62	0.42
18	0.54	10.06	1.91	87.20	5.63	22.65	7.49	3.02	2.83	1.31	0.62	0.42
19	0.52	8.65	1.82	127.56	6.01	17.19	7.74	2.81	2.96	1.25	0.62	0.42
20	0.51	6.75	1.76	53.32	6.80	15.81	10.64	2.68	2.77	1.28	0.60	0.42
21	0.49	6.12	1.71	41.83	10.10	20.72	10.56	3.21	2.62	1.18	0.59	0.44
22	0.49	12.62	1.65	27.63	24.74	18.07	8.72	3.13	2.79	1.13	0.58	0.42
23	0.48	23.72	1.59	19.53	21.28	16.10	7.09	3.02	3.38	1.08	0.56	0.41
24	0.47	21.87	1.51	21.66	14.15	14.55	5.90	4.81	3.22	1.05	0.56	0.40
25	0.45	16.12	1.60	29.12	11.47	13.17	5.56	4.40	3.31	1.01	0.56	0.39
26	0.45	11.83	1.63	20.76	10.29	11.62	5.90	3.96	3.21	1.00	0.56	0.39
27	0.44	9.89	2.55	16.01	9.36	10.31	5.89	3.64	2.92	1.01	0.56	0.39
28	0.47	9.22	27.22	12.96	8.83	9.69	5.69	3.41	2.73	1.95	0.55	0.39
29	0.60	8.20	43.91	12.64	9.89	30.78	5.30	3.11	2.56	1.95	0.54	0.38
30	0.82	7.28	95.35	15.42		90.14	6.07	2.87	2.49	1.95	0.53	0.37
31	0.94		37.49	13.54		54.23		2.68		1.86	0.53	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.44	0.71	1.51	2.75	3.78	7.45	3.76	2.68	2.35	1.00	0.53	0.37
Max Q (cfs)	2.04	23.72	95.35	127.56	24.74	90.14	33.71	29.55	4.74	2.61	1.86	0.51
Mean Monthly Q (cfs)	0.70	6.09	8.72	19.55	8.02	20.31	9.25	7.22	3.09	1.58	0.85	0.44
Cumulative Q (cfs)	21.75	182.56	270.29	605.97	232.60	629.50	277.54	223.85	92.73	48.99	26.39	13.22
Annual Water Yield (in)		83.32				**Mean Annual Q (cfs)**			7.17			

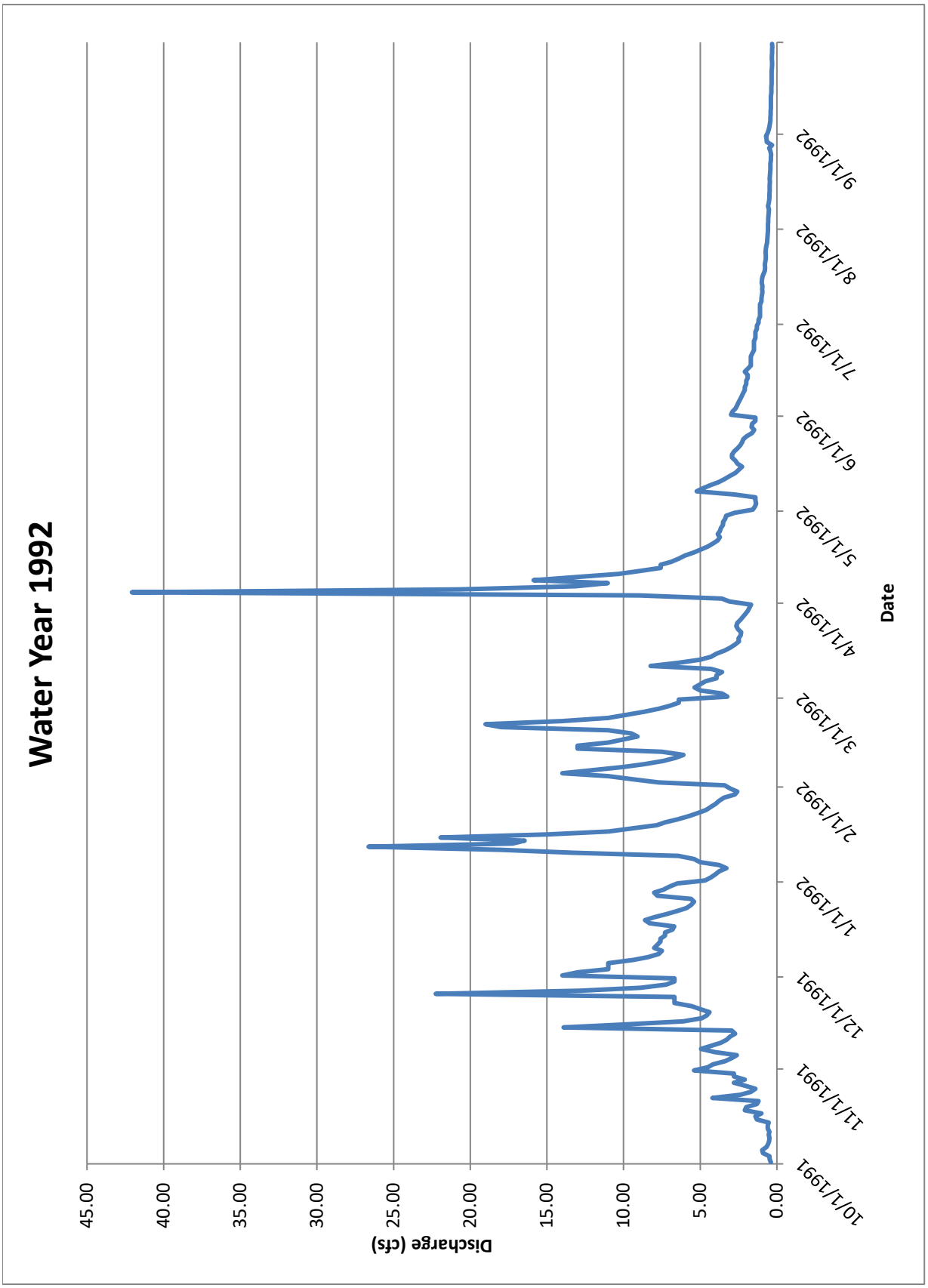
Deer Creek, Alsea Watershed Study												
Water Year 2013												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.37	22.48	16.85	7.40	16.08	19.94	3.17	2.78	9.99	1.06	0.57	1.16
2	0.37	20.06	33.26	6.27	12.58	16.96	3.00	2.62	7.71	1.01	0.60	1.12
3	0.36	12.93	29.04	5.45	10.15	13.23	2.84	2.46	6.14	0.96	0.59	1.08
4	0.35	9.36	38.54	4.94	8.51	10.71	3.01	2.34	5.10	0.92	0.57	1.07
5	0.35	7.37	47.34	4.27	7.64	9.48	3.43	2.21	4.36	0.89	0.57	1.96
6	0.35	5.91	27.74	3.86	7.35	8.93	5.04	2.08	3.85	0.87	0.51	2.86
7	0.35	4.78	20.94	4.87	7.50	8.02	10.00	1.97	3.43	0.85	0.48	1.68
8	0.35	4.33	17.82	5.99	6.83	7.39	13.16	1.90	3.13	0.82	0.49	1.43
9	0.35	3.70	15.74	11.25	6.37	6.71	10.82	1.82	2.89	0.80	0.48	1.32
10	0.36	3.24	13.63	15.10	5.88	6.08	9.24	1.75	2.68	0.77	0.49	1.22
11	0.37	3.02	13.25	13.74	5.39	5.52	7.87	1.69	2.55	0.74	0.50	1.18
12	0.66	6.61	15.47	11.54	5.41	5.02	7.03	1.62	2.39	0.72	0.48	1.13
13	1.01	7.67	15.90	9.29	5.36	4.59	6.49	1.61	2.75	0.71	0.45	1.15
14	0.76	6.70	14.16	7.62	5.31	4.24	6.15	1.53	2.29	0.69	0.45	1.13
15	4.98	5.56	14.08	6.36	5.10	3.99	5.77	1.52	2.09	0.67	0.50	1.17
16	7.92	4.67	18.91	5.40	4.84	4.11	5.37	1.49	1.95	0.67	0.47	1.23
17	2.78	4.85	26.12	4.68	4.51	3.89	5.00	1.41	1.86	0.66	0.46	1.15
18	1.77	14.23	20.71	4.13	4.30	3.56	4.61	1.40	1.78	0.64	0.45	1.10
19	1.97	38.28	17.78	3.69	4.34	3.59	5.41	1.39	1.73	0.63	0.43	1.07
20	2.10	37.63	46.12	3.35	4.11	7.85	6.37	1.27	1.75	0.63	0.42	1.17
21	2.21	25.08	38.06	3.07	4.78	9.32	6.94	2.43	1.60	0.61	0.42	1.24
22	2.34	18.59	30.43	2.87	8.08	8.87	6.46	4.64	1.49	0.59	0.42	2.19
23	2.29	15.24	27.01	3.09	16.27	7.78	5.68	8.89	1.46	0.58	0.42	3.21
24	2.21	17.56	25.02	2.82	14.97	6.90	4.98	10.46	1.55	0.57	0.41	3.75
25	1.97	15.33	22.71	3.02	14.00	6.04	4.41	9.31	1.70	0.56	0.41	5.34
26	1.75	12.13	23.85	3.75	12.66	5.34	3.95	7.47	1.88	0.55	0.46	3.65
27	3.13	9.74	26.60	6.13	11.39	4.77	3.57	11.71	1.51	0.54	0.53	3.12
28	15.28	8.08	21.61	13.10	14.27	4.42	3.35	17.08	1.33	0.54	0.46	19.00
29	31.08	7.55	16.93	20.98		4.01	3.42	17.43	1.20	0.54	0.55	62.02
30	18.48	7.50	13.64	18.93		3.69	3.00	16.84	1.12	0.54	0.60	89.54
31	16.25		11.31	15.83		3.40		13.34		0.55	0.50	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.35	3.02	11.31	2.82	4.11	3.40	2.84	1.27	1.12	0.54	0.41	1.07
Max Q (cfs)	31.08	38.28	47.34	20.98	16.27	19.94	13.16	17.43	9.99	1.06	0.60	89.54
Mean Monthly Q (cfs)	4.03	12.01	23.24	7.51	8.36	7.04	5.65	5.05	2.84	0.70	0.49	7.31
Cumulative Q (cfs)	124.87	360.17	720.56	232.80	233.98	218.33	169.51	156.48	85.28	21.84	15.17	219.43
Annual Water Yield (in)		81.19				**Mean Annual Q (cfs)**			7.01			

Deer Creek, Alsea Watershed Study												
Water Year 2014												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	21.39	1.08	1.89	2.52	6.45	7.22	9.00	5.56	1.81	1.37	0.31	0.20
2	14.92	1.68	19.47	2.37	5.49	7.97	7.34	4.79	1.72	1.25	0.30	0.19
3	10.30	2.18	11.63	2.29	4.82	14.03	6.49	4.67	1.65	1.17	0.29	0.17
4	7.39	2.13	7.37	2.12	4.25	15.87	5.87	4.95	1.58	1.10	0.28	0.17
5	5.50	2.81	5.44	2.02	3.81	32.02	5.76	4.92	1.51	1.03	0.26	0.16
6	4.32	3.31	4.33	1.94	3.60	46.19	7.48	4.40	1.44	0.98	0.25	0.15
7	3.89	5.04	3.47	2.04	3.42	34.57	8.25	4.10	1.39	0.94	0.24	0.15
8	3.64	6.31	2.91	3.30	4.25	27.42	7.40	5.65	1.34	0.90	0.24	0.15
9	3.33	5.36	2.55	6.41	9.80	41.40	6.45	12.99	1.30	0.86	0.23	0.15
10	2.97	4.47	2.30	7.02	11.78	36.21	5.57	17.06	1.25	0.83	0.23	0.15
11	2.74	3.78	2.10	10.55	23.52	26.43	4.88	14.37	1.21	0.81	0.23	0.15
12	2.68	3.61	2.06	14.67	57.15	21.08	4.35	10.20	1.25	0.79	0.23	0.14
13	2.47	3.06	2.09	18.91	41.05	17.08	3.94	7.62	2.00	0.79	0.22	0.14
14	2.28	2.89	1.87	14.15	36.41	14.36	3.62	6.15	1.44	0.77	0.23	0.14
15	2.13	2.86	1.75	10.04	31.45	11.68	3.35	5.12	1.31	0.73	0.22	0.14
16	2.00	3.99	1.67	7.59	29.21	10.52	3.12	4.45	1.23	0.71	0.21	0.14
17	1.88	4.31	1.59	6.04	26.40	11.09	3.46	3.98	1.24	0.68	0.20	0.15
18	1.77	5.54	1.53	5.01	27.08	9.77	3.10	3.94	1.13	0.66	0.20	0.15
19	1.67	14.56	1.45	4.33	28.96	9.08	2.86	4.48	1.08	0.65	0.19	0.15
20	1.59	15.32	1.58	3.86	25.27	8.12	2.64	3.56	1.08	0.59	0.19	0.15
21	1.51	10.37	2.53	3.52	22.88	7.24	2.58	3.22	1.01	0.53	0.18	0.15
22	1.44	7.46	2.63	3.24	18.34	6.47	3.01	2.98	0.97	0.47	0.18	0.15
23	1.38	5.75	2.72	3.01	14.76	5.84	6.12	2.83	0.94	0.59	0.18	0.20
24	1.33	4.65	2.72	2.80	12.12	5.35	29.77	2.69	0.92	0.56	0.18	0.47
25	1.29	3.90	2.60	2.62	9.97	5.10	21.57	2.50	0.92	0.46	0.17	0.23
26	1.25	3.44	2.35	2.47	8.30	6.38	13.59	2.42	0.99	0.42	0.17	0.20
27	1.25	3.09	2.12	2.38	7.23	9.94	11.79	2.26	2.07	0.40	0.17	0.18
28	1.20	2.78	1.92	2.67	6.27	20.76	9.73	2.38	2.10	0.38	0.17	0.17
29	1.15	2.54	1.78	7.71		28.89	7.97	2.16	1.78	0.36	0.17	0.18
30	1.11	2.37	1.65	9.66		20.08	6.63	2.00	1.54	0.34	0.24	0.20
31	1.11		1.52	7.85		15.06		1.90		0.33	0.22	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	1.11	1.08	1.45	1.94	3.42	5.10	2.58	1.90	0.92	0.33	0.17	0.14
Max Q (cfs)	21.39	15.32	19.47	18.91	57.15	46.19	29.77	17.06	2.10	1.37	0.31	0.47
Mean Monthly Q (cfs)	3.64	4.69	3.34	5.65	17.29	17.20	7.26	5.17	1.37	0.72	0.22	0.17
Cumulative Q (cfs)	112.85	140.64	103.61	175.11	484.02	533.22	217.67	160.24	41.21	22.47	6.80	5.21
Annual Water Yield (in)		63.57				**Mean Annual Q (cfs)**			5.49			

Deer Creek, Alsea Watershed Study												
Water Year 2015												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.19	5.53	14.45	10.29	3.82	3.11	3.22	1.04	1.15	1.23	1.28	1.30
2	0.18	4.75	11.35	9.04	4.16	3.03	3.30	0.98	1.16	1.23	1.29	1.31
3	0.17	4.64	9.26	7.75	3.80	2.81	3.30	0.93	1.16	1.24	1.30	1.29
4	0.16	4.92	10.46	7.11	3.55	2.69	2.94	0.84	1.16	1.23	1.29	1.26
5	0.16	5.11	10.66	6.32	4.26	2.59	2.70	0.76	1.15	1.24	1.28	1.24
6	0.16	5.21	12.77	5.78	21.83	2.48	2.46	0.75	1.16	1.24	1.27	1.24
7	0.12	4.76	13.15	5.37	28.55	2.38	2.20	0.70	1.16	1.25	1.27	1.25
8	0.10	4.33	11.23	4.98	25.20	2.30	2.67	0.66	1.17	1.25	1.28	1.25
9	0.09	3.93	9.95	4.61	35.93	2.21	3.29	0.62	1.18	1.26	1.29	1.27
10	0.09	3.44	13.33	4.39	66.53	1.93	3.07	0.59	1.18	1.26	1.30	1.27
11	0.09	3.03	21.47	4.11	29.11	1.65	3.80	0.51	1.17	1.27	1.31	1.27
12	0.08	2.72	24.86	4.56	20.02	1.62	3.26	0.90	1.16	1.27	1.31	1.28
13	0.09	14.31	19.17	4.12	15.90	1.51	3.87	0.75	1.15	1.27	1.32	1.29
14	0.21	27.79	14.63	3.97	13.07	5.18	6.57	0.60	1.15	1.27	1.32	1.27
15	0.38	17.30	11.75	4.61	10.99	15.41	7.03	0.56	1.15	1.27	1.32	1.24
16	0.18	11.91	9.64	12.98	9.26	12.87	6.10	0.54	1.16	1.27	1.30	1.25
17	0.14	9.17	8.31	23.93	7.80	8.93	4.58	0.49	1.16	1.26	1.29	1.26
18	0.44	7.51	7.67	36.64	6.64	6.48	3.77	0.46	1.17	1.26	1.29	1.25
19	0.29	5.85	11.95	22.52	5.76	4.89	2.92	0.43	1.18	1.27	1.30	1.25
20	0.21	4.68	64.66	16.40	5.15	4.08	2.52	0.41	1.18	1.28	1.31	1.25
21	0.21	6.58	99.13	12.99	4.67	3.59	2.22	0.45	1.18	1.29	1.30	1.26
22	3.91	16.99	48.61	10.70	4.27	3.09	1.98	0.39	1.19	1.27	1.28	1.24
23	9.67	13.60	29.81	9.10	3.94	4.77	1.87	0.39	1.18	1.27	1.28	1.22
24	7.91	10.72	23.99	7.76	3.68	7.51	1.75	0.36	1.19	1.26	1.28	1.22
25	6.23	10.42	21.44	6.76	3.46	7.51	1.81	0.59	1.19	1.27	1.26	1.24
26	7.70	10.87	18.26	6.05	3.33	6.46	1.62	1.14	1.20	1.27	1.26	1.25
27	5.82	9.80	16.11	5.46	4.13	5.59	1.49	1.14	1.21	1.26	1.27	1.22
28	5.08	16.91	15.12	4.93	3.39	4.63	1.33	1.15	1.22	1.26	1.29	1.19
29	6.62	28.64	14.08	4.52		3.91	1.18	1.15	1.22	1.27	1.30	1.18
30	6.32	19.39	12.47	4.20		3.52	1.10	1.15	1.23	1.28	1.31	1.18
31	6.44		11.39	3.93		3.89		1.15		1.29	1.31	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.08	2.72	7.67	3.93	3.33	1.51	1.10	0.36	1.15	1.23	1.26	1.18
Max Q (cfs)	9.67	28.64	99.13	36.64	66.53	15.41	7.03	1.15	1.23	1.29	1.32	1.31
Mean Monthly Q (cfs)	2.24	9.83	20.04	8.90	12.58	4.60	3.00	0.73	1.18	1.26	1.29	1.25
Cumulative Q (cfs)	69.46	294.82	621.16	275.85	352.18	142.61	89.94	22.57	35.26	39.13	40.08	37.49
Annual Water Yield (in)		64.12				**Mean Annual Q (cfs)**			5.54			

HYDROGRAPHS

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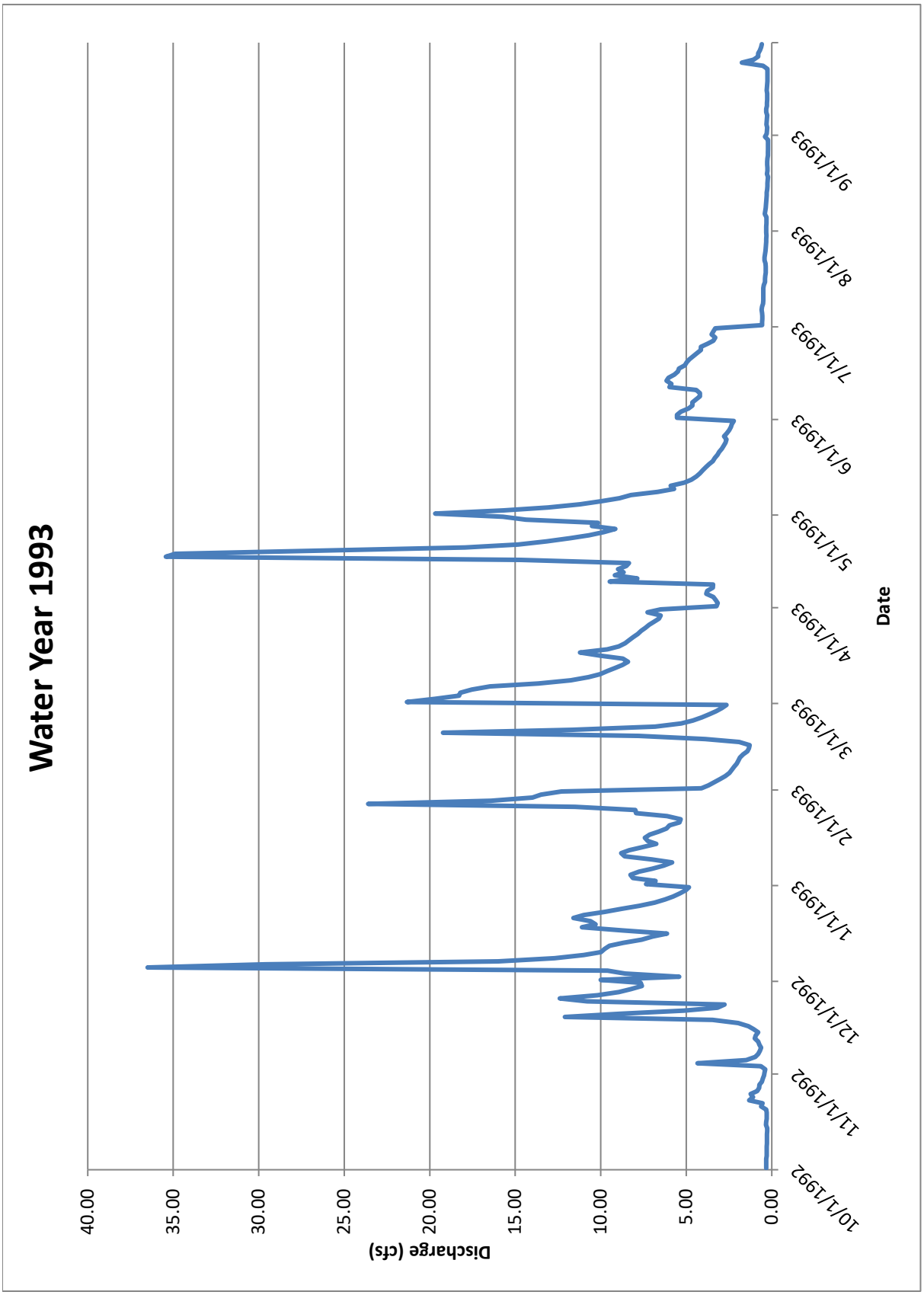
12/1/1991
1/1/1992
2/1/1992
3/1/1992
4/1/1992
5/1/1992
6/1/1992
7/1/1992
8/1/1992
9/1/1992
Date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15.00
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5.00
0.00
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11/1/1992
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1/1/1993
2/1/1993
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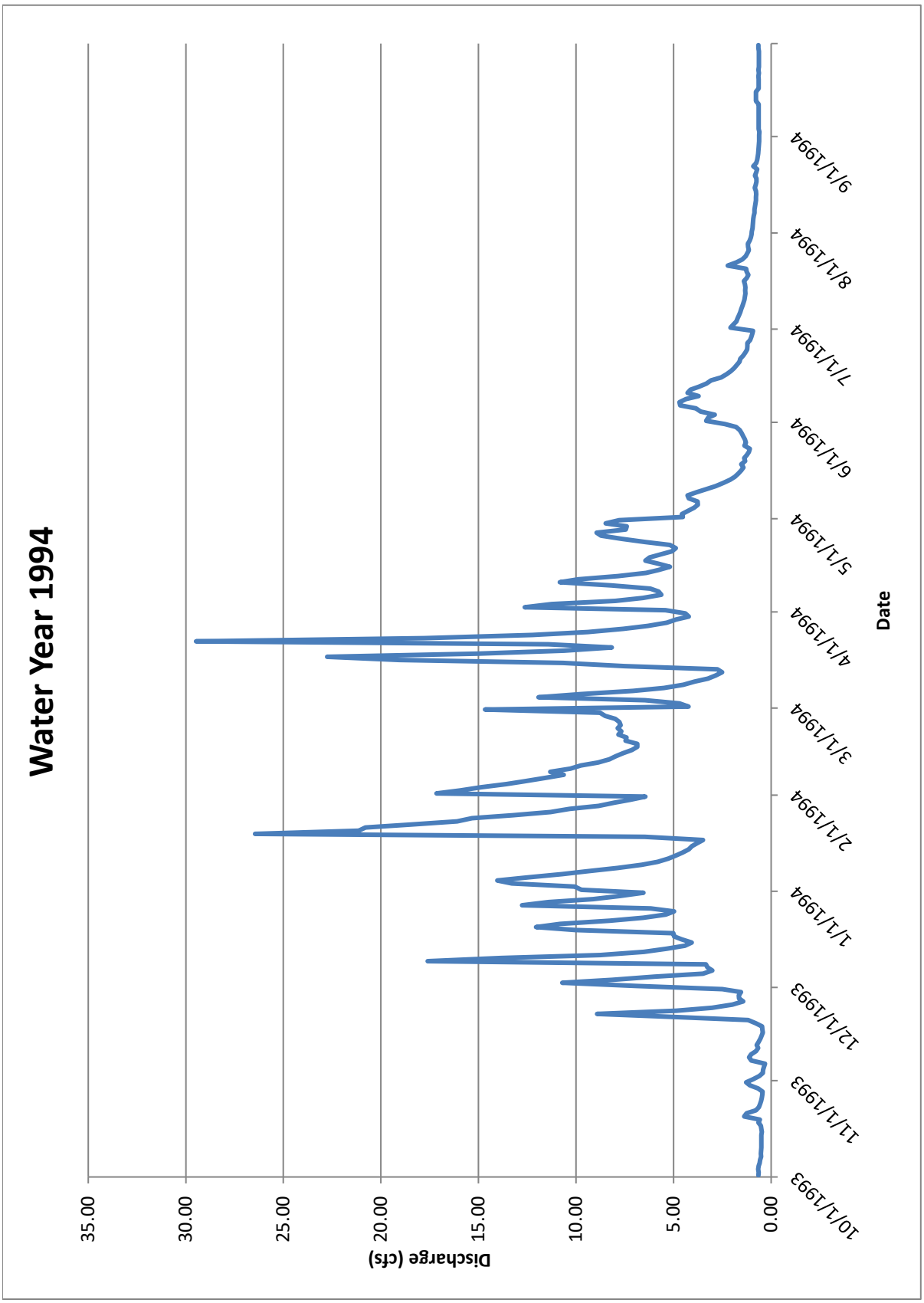
4/1/1993
5/1/1993
6/1/1993
7/1/1993
8/1/1993
9/1/1993
Date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Discharge (cfs)
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30.00
25.00
20.00
15.00
10.00
5.00
0.00
10/1/1993
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1/1/1994
2/1/1994
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4/1/1994
5/1/1994
6/1/1994
7/1/1994
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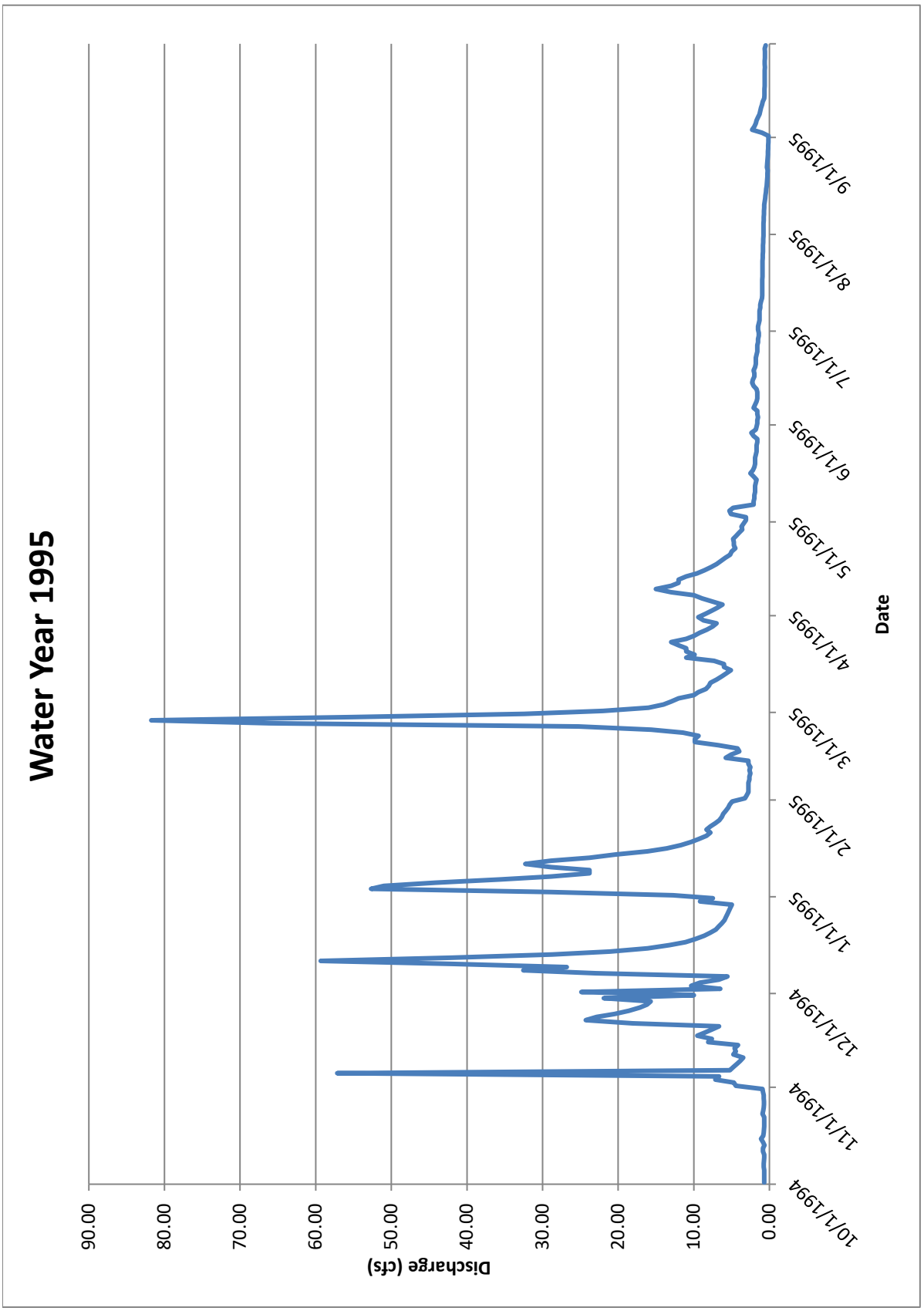
Date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40.00
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1/1/1995
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6/1/1995
7/1/1995
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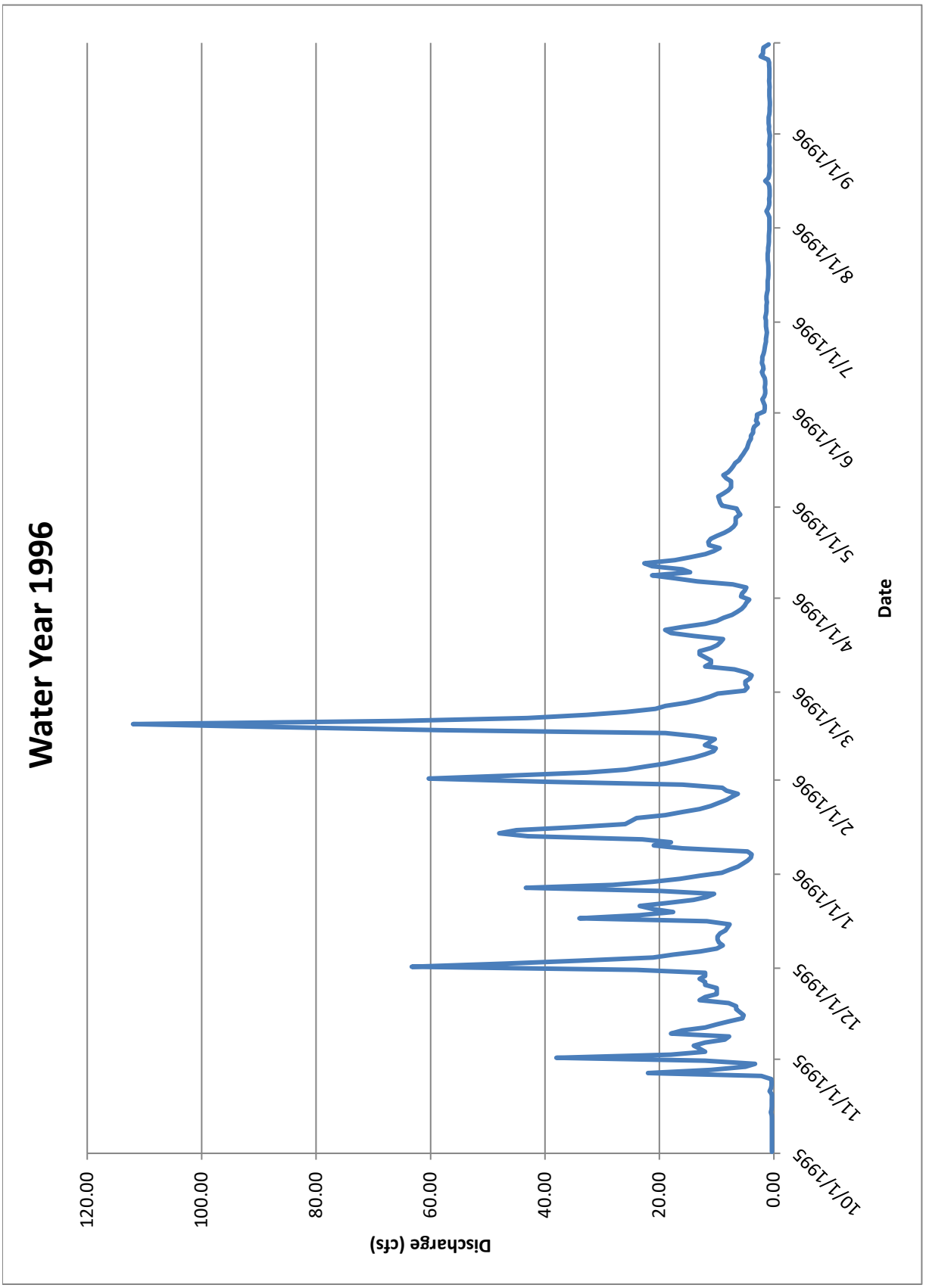
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1/1/1996
2/1/1996
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4/1/1996
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7/1/1996
8/1/1996
9/1/1996
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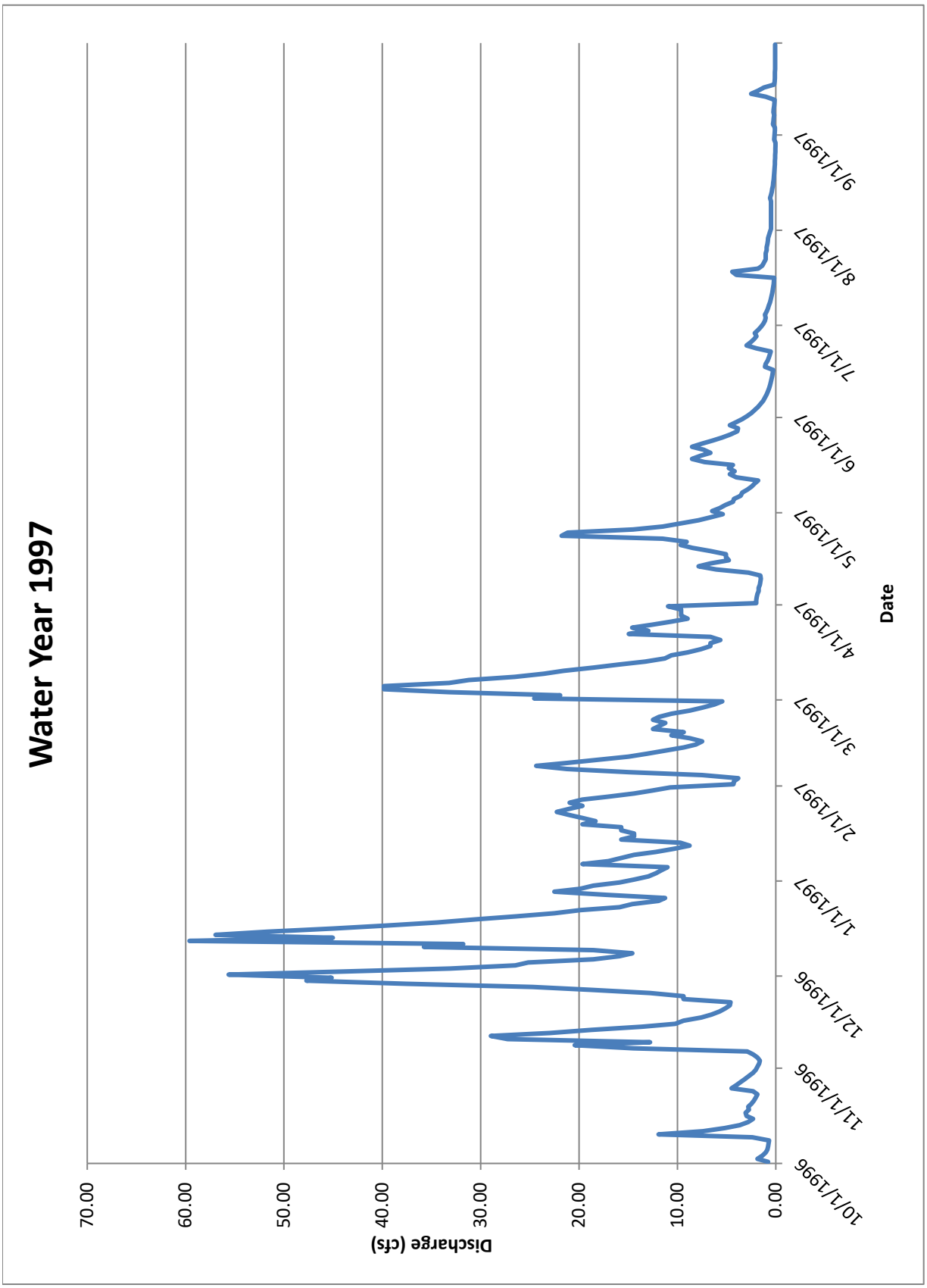
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0.00
10/1/1996
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1/1/1997
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4/1/1997
5/1/1997
6/1/1997
7/1/1997
8/1/1997
9/1/1997
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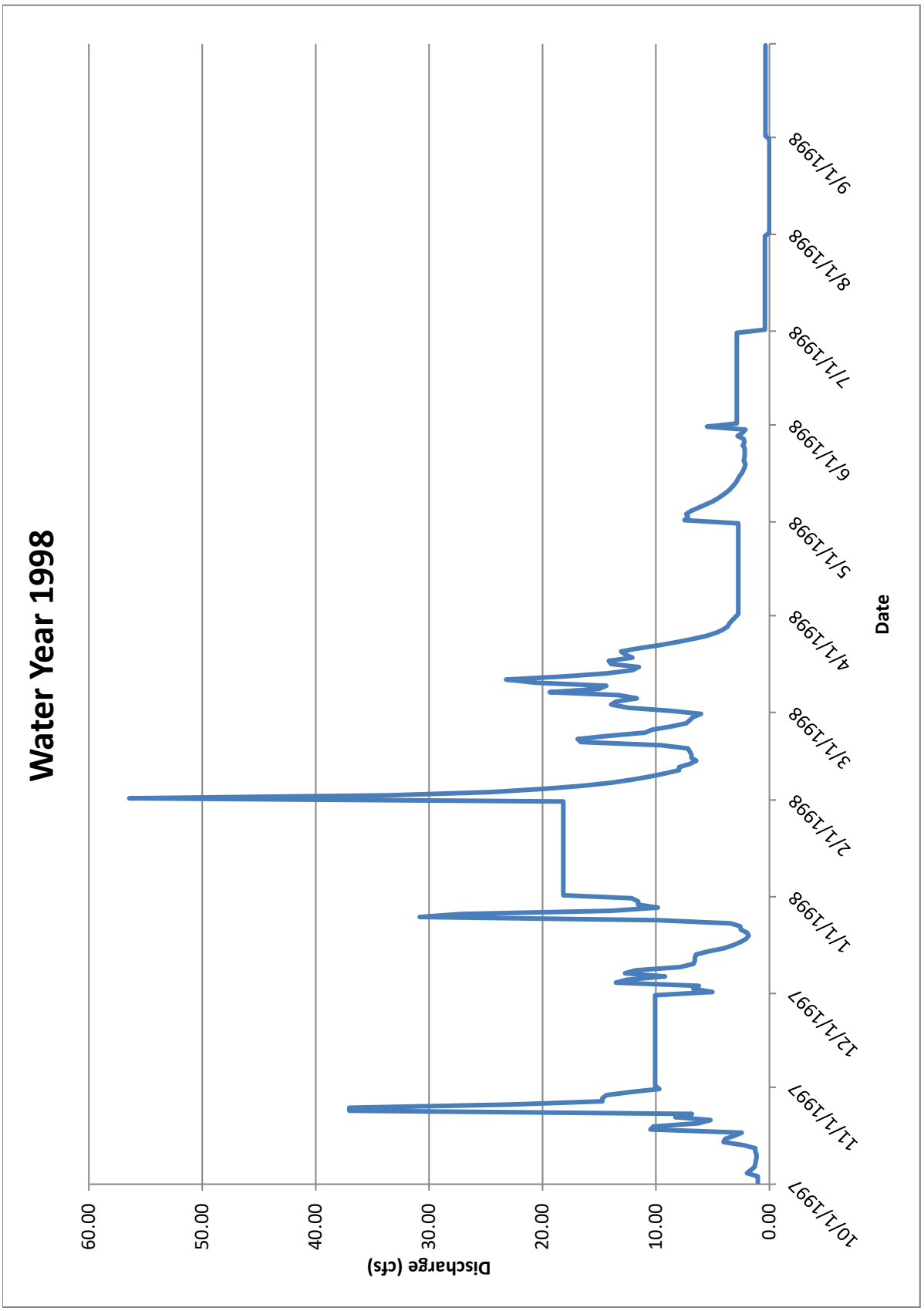
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11/1/1997
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1/1/1998
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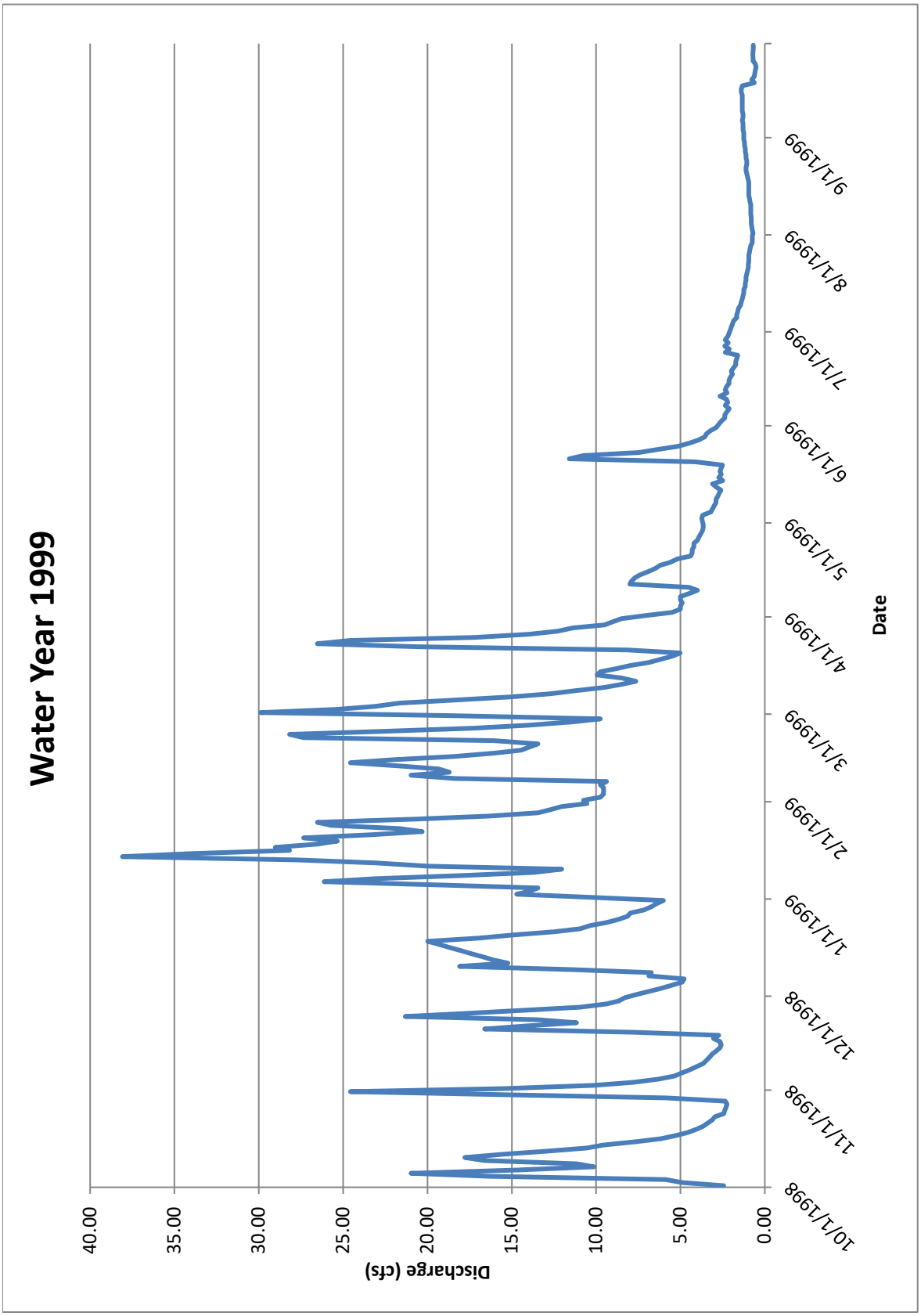
4/1/1998
5/1/1998
6/1/1998
7/1/1998
8/1/1998
9/1/1998
Date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Discharge (cfs)
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25.00
20.00
15.00
10.00
5.00
0.00
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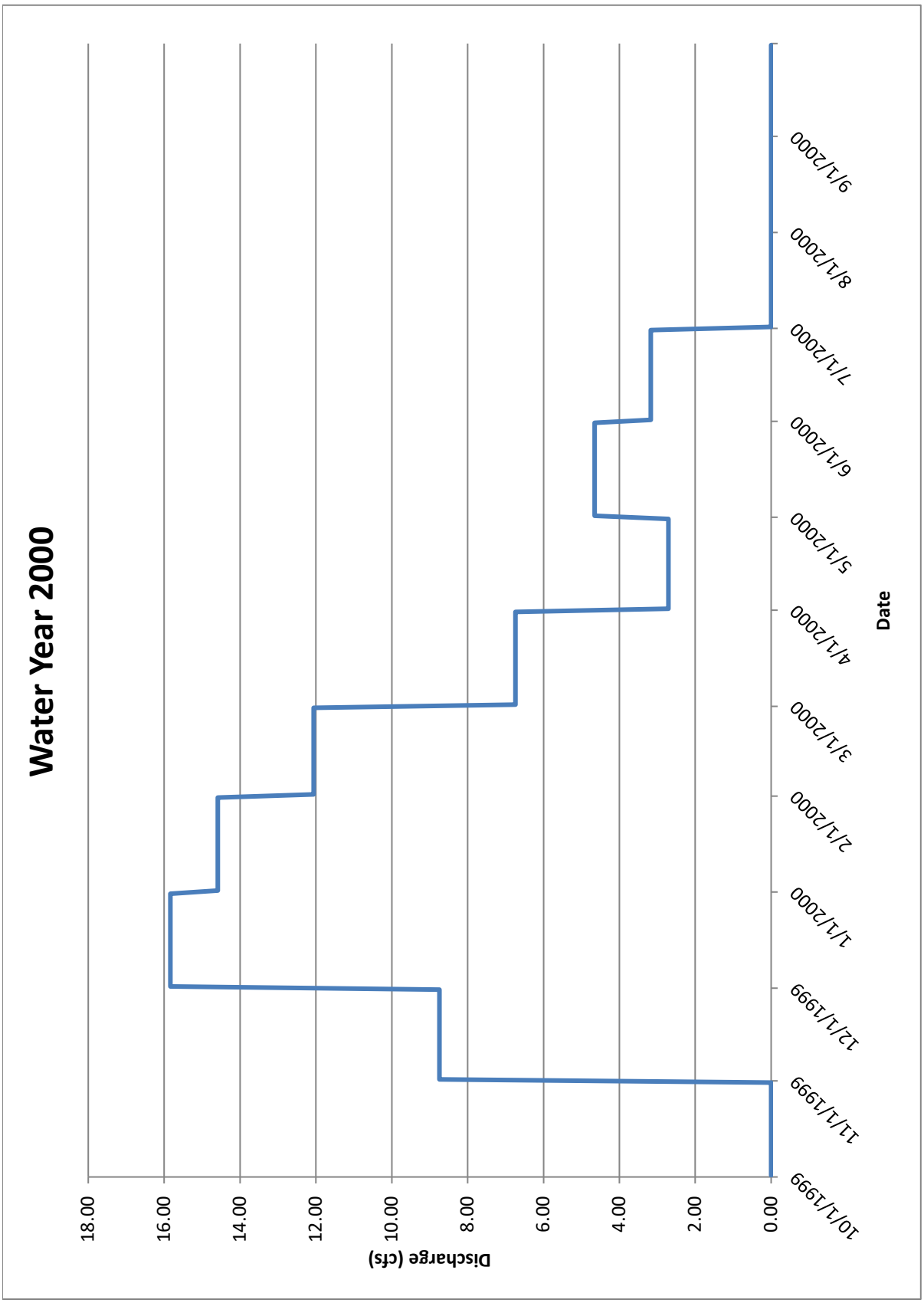
11/1/1998
12/1/1998
1/1/1999
2/1/1999
3/1/1999
4/1/1999
5/1/1999
6/1/1999
7/1/1999
8/1/1999
9/1/1999
Date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8.00
6.00
4.00
2.00
0.00
10/1/1999
11/1/1999
12/1/1999
1/1/2000
2/1/2000
3/1/2000
4/1/2000
5/1/2000
6/1/2000
7/1/2000
8/1/2000
9/1/2000
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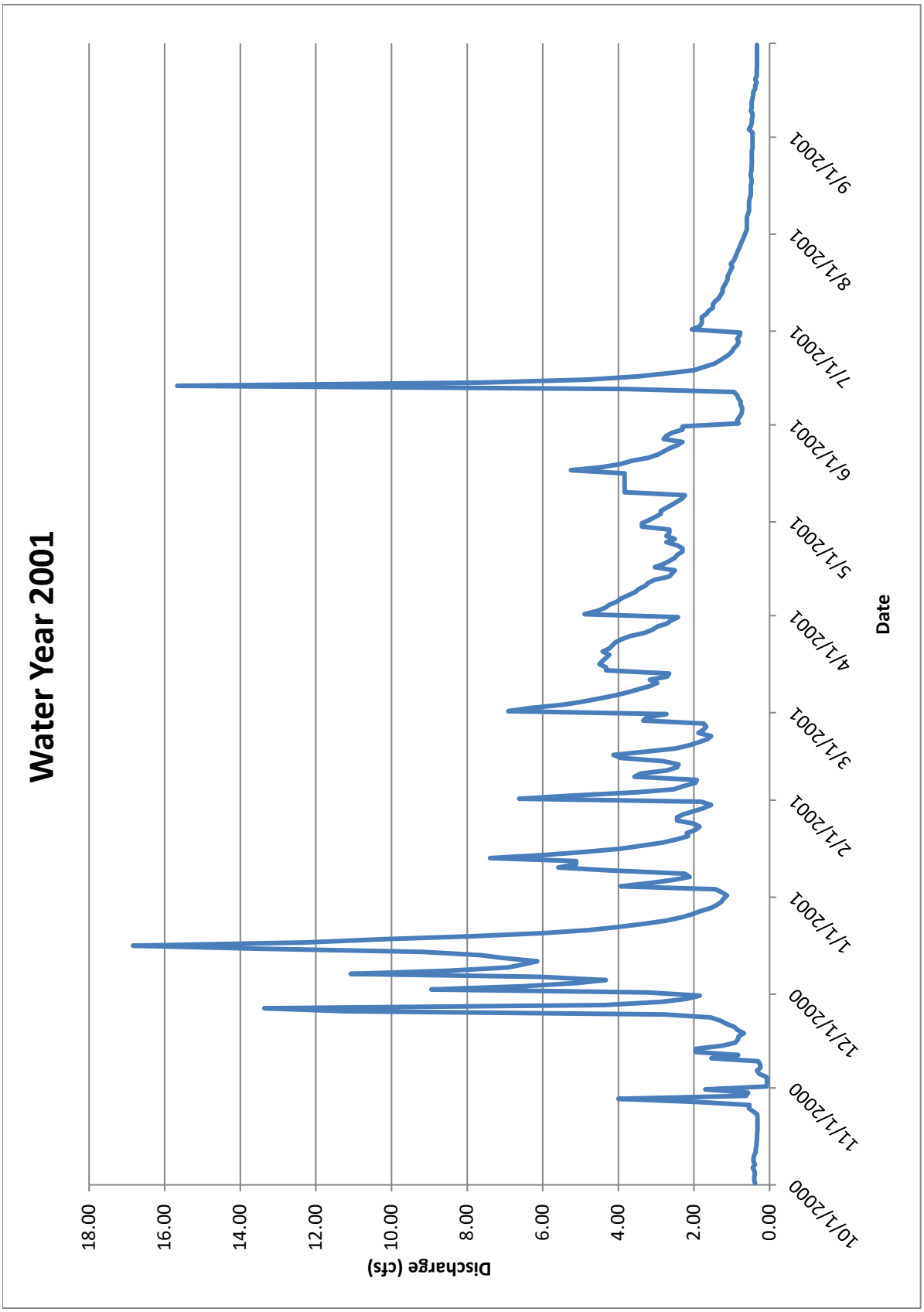
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10/1/2000
11/1/2000
12/1/2000
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6/1/2001
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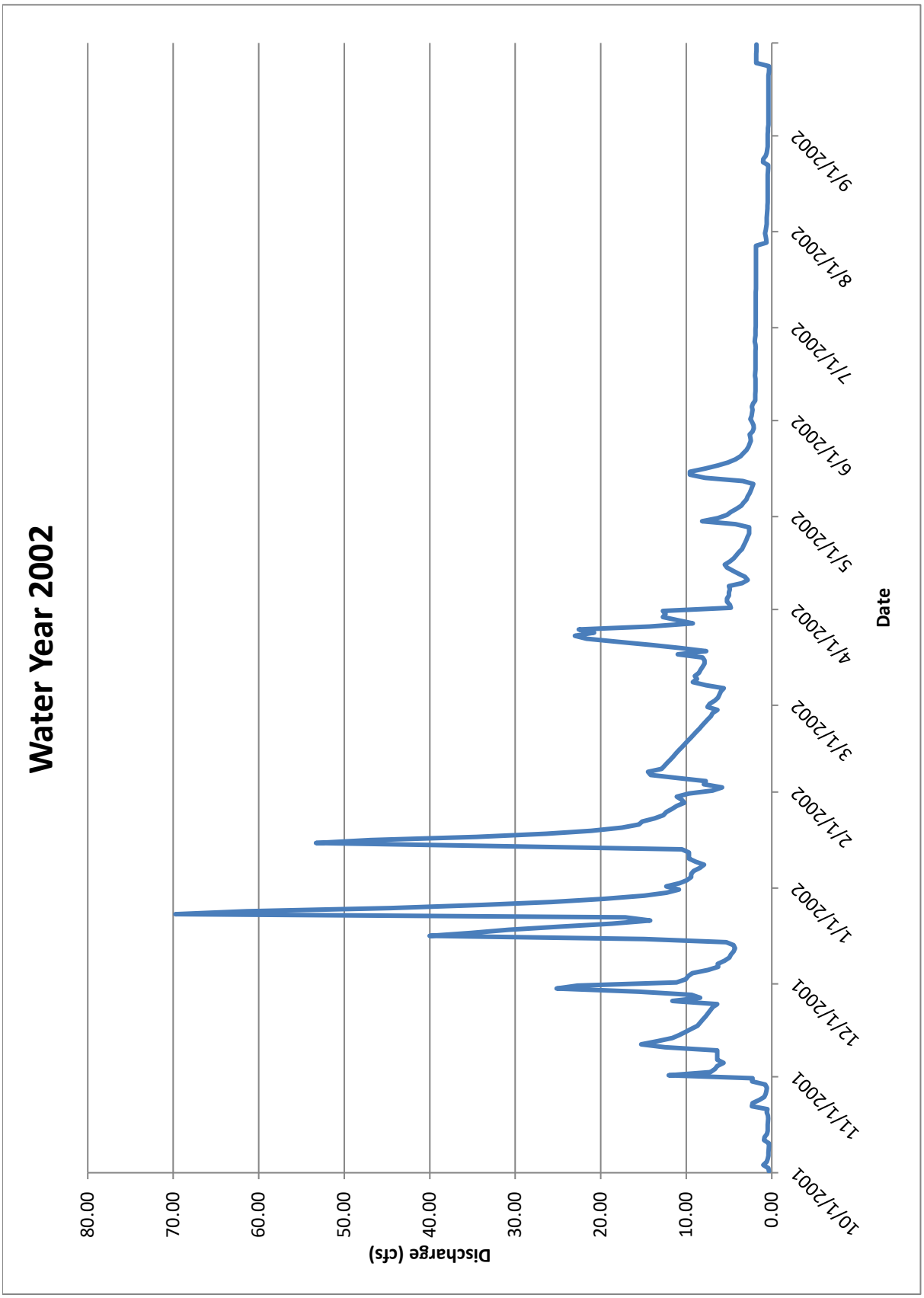
9/1/2001
Date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80.00
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11/1/2001
12/1/2001
1/1/2002
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4/1/2002
5/1/2002
6/1/2002
7/1/2002
8/1/2002
9/1/2002
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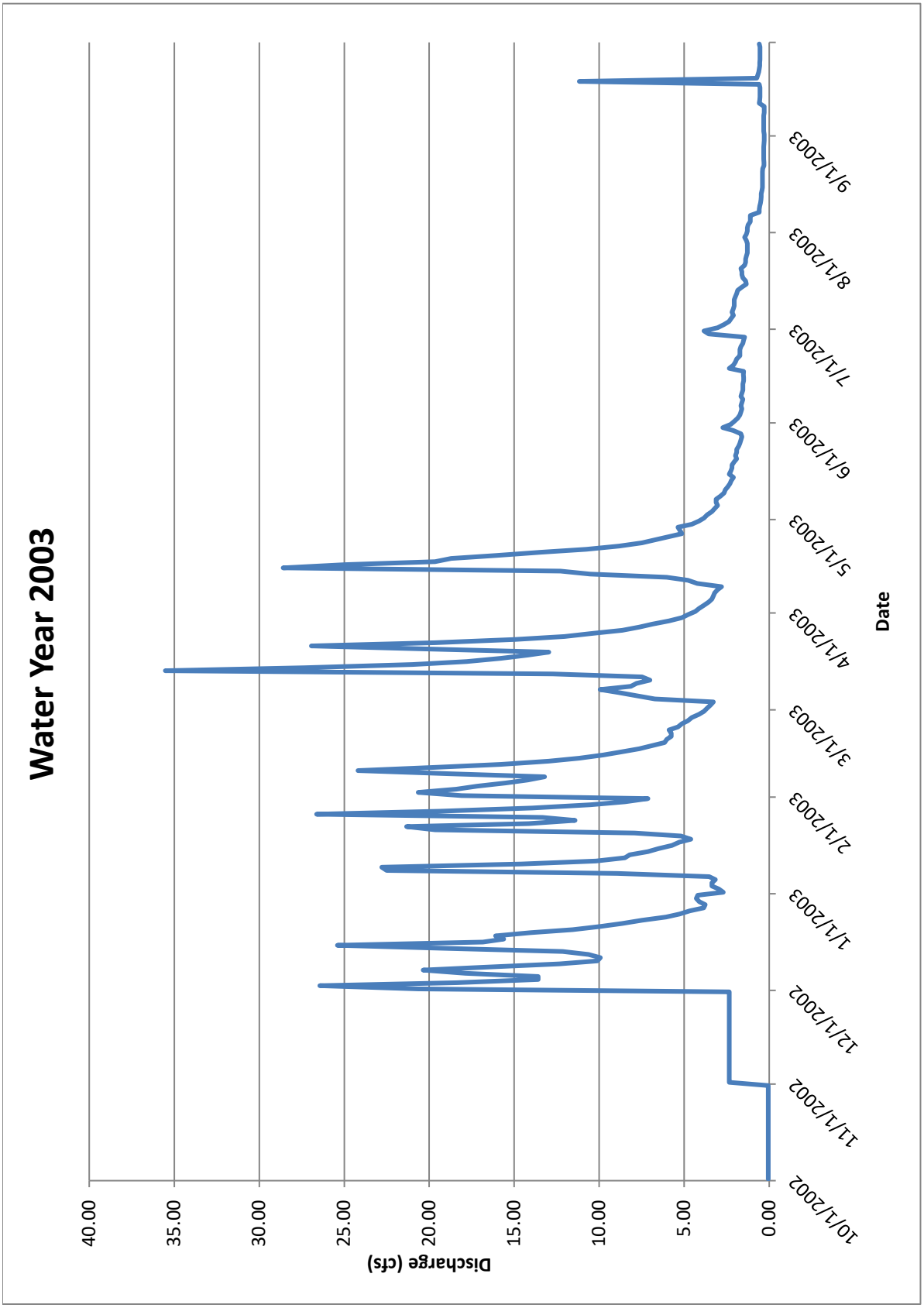
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25.00
20.00
15.00
10.00
5.00
0.00
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11/1/2002
12/1/2002
1/1/2003
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6/1/2003
7/1/2003
8/1/2003
9/1/2003
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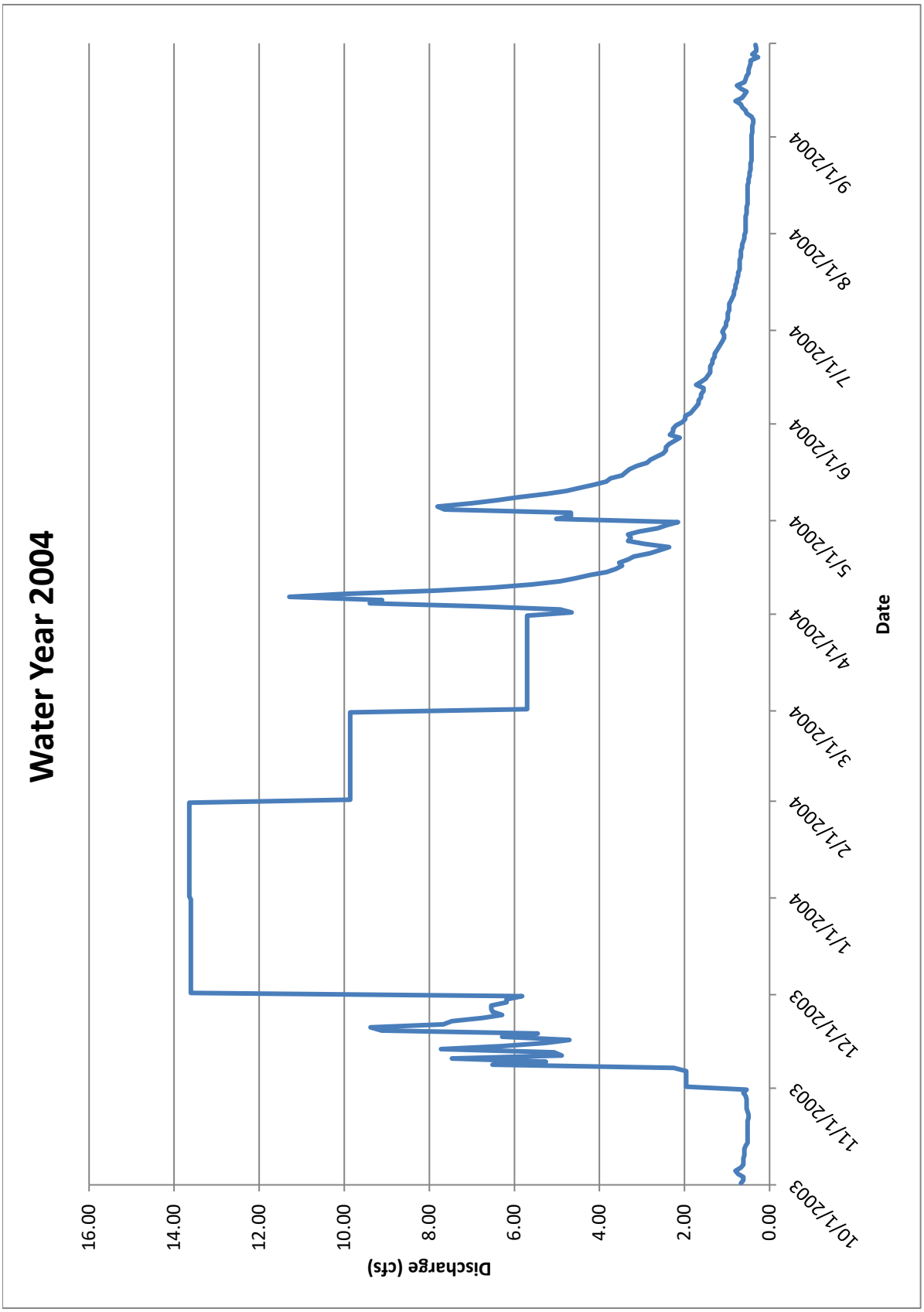
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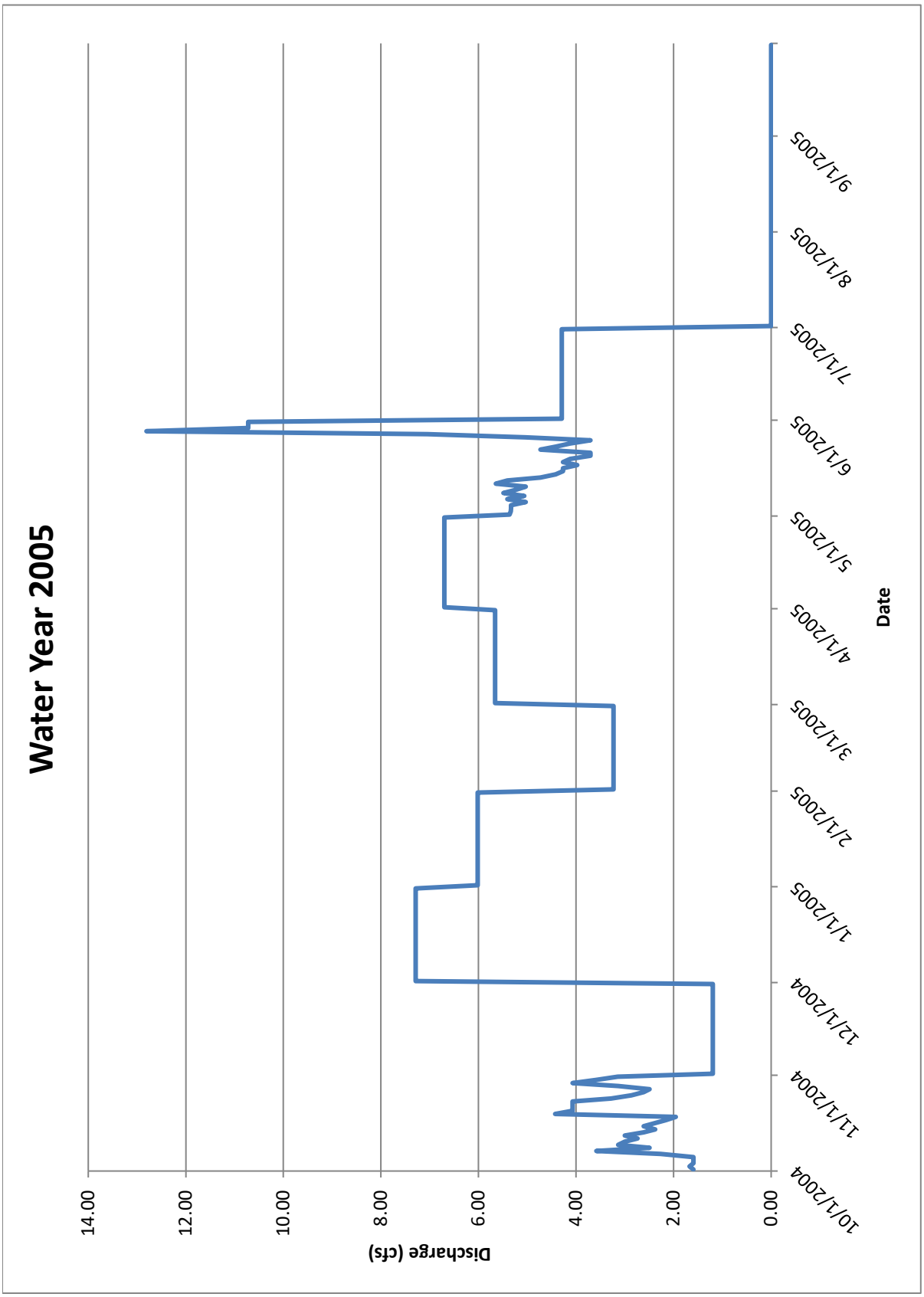
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9/1/2005
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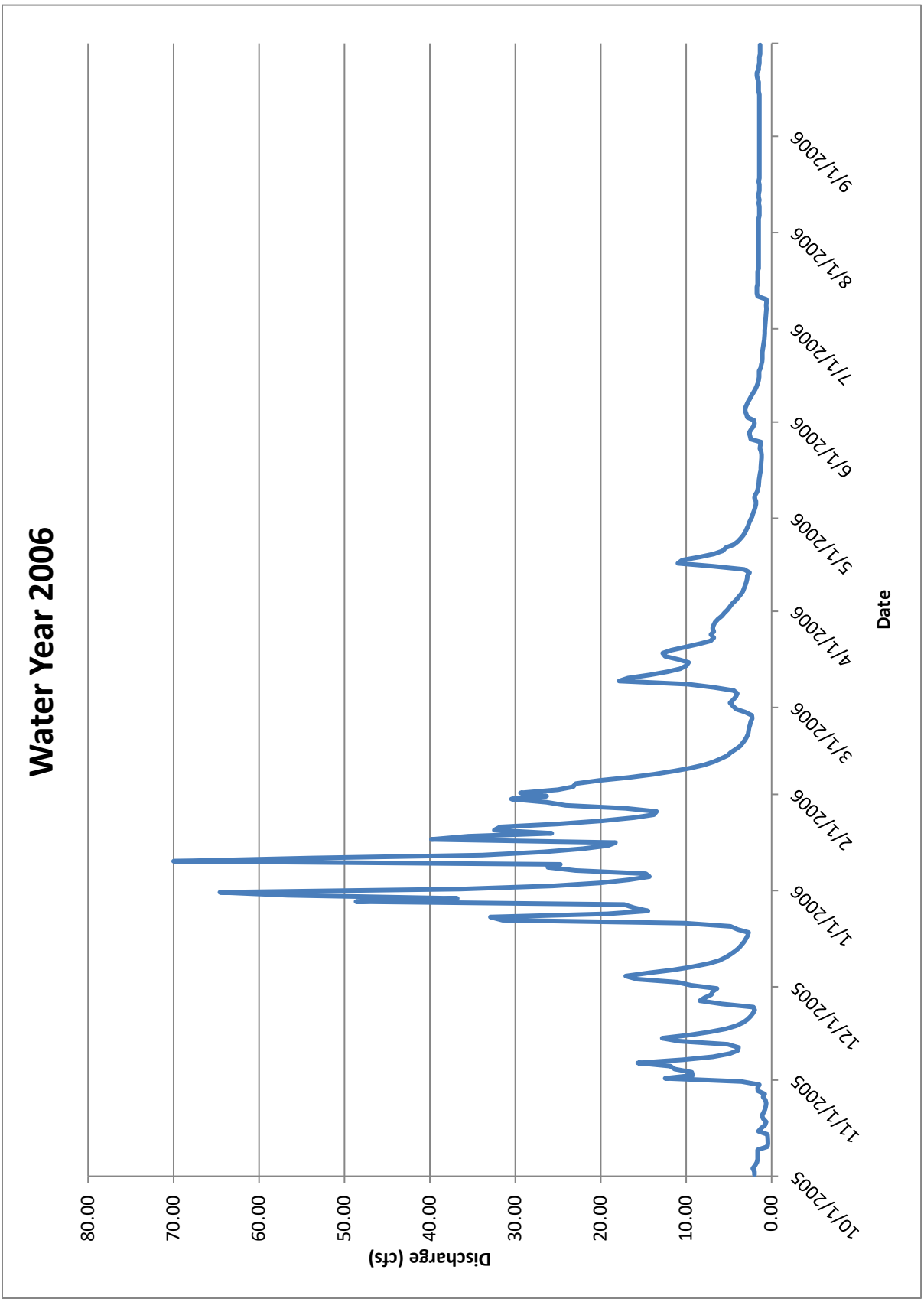
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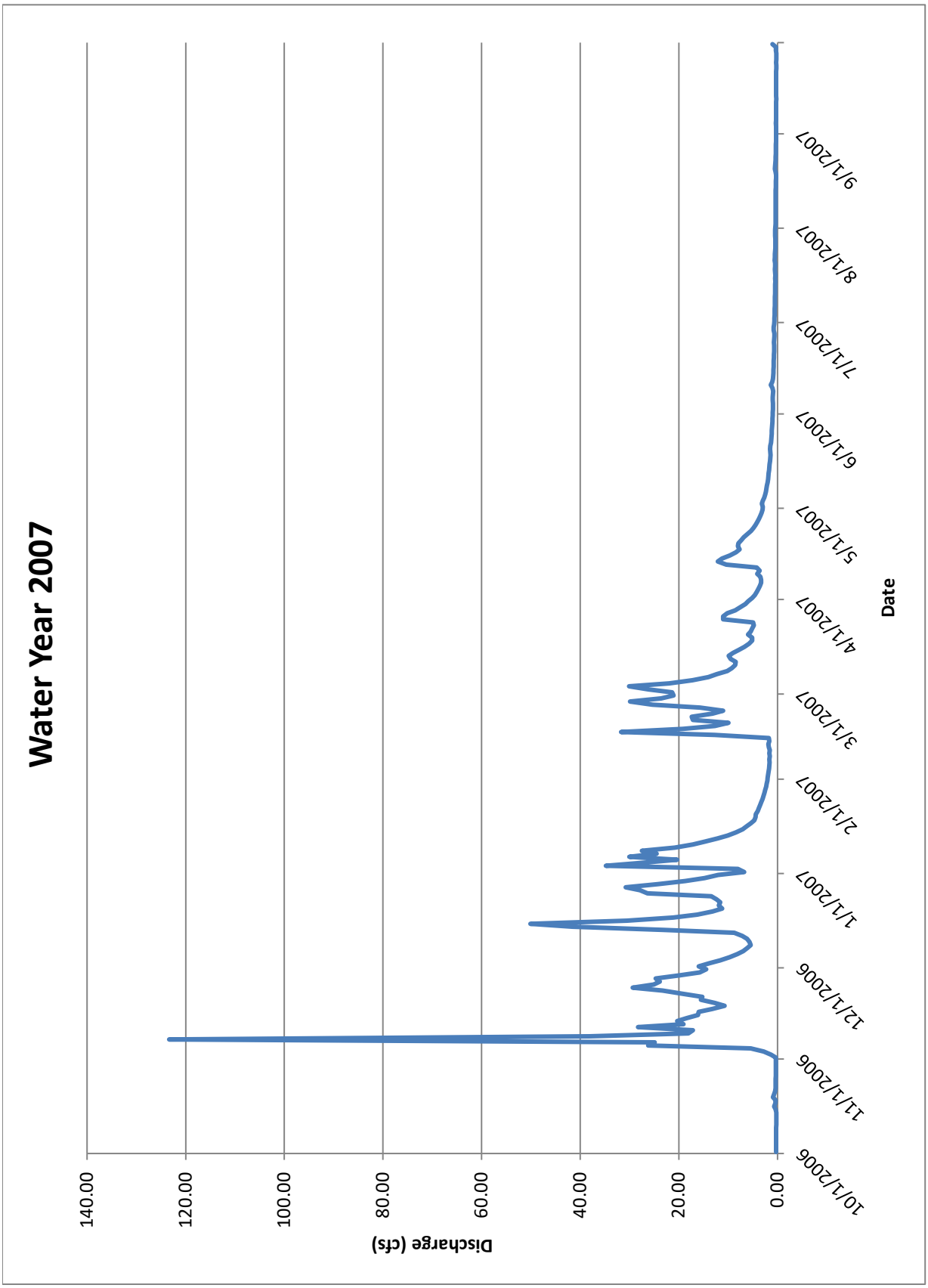
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20.00
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10/1/2006
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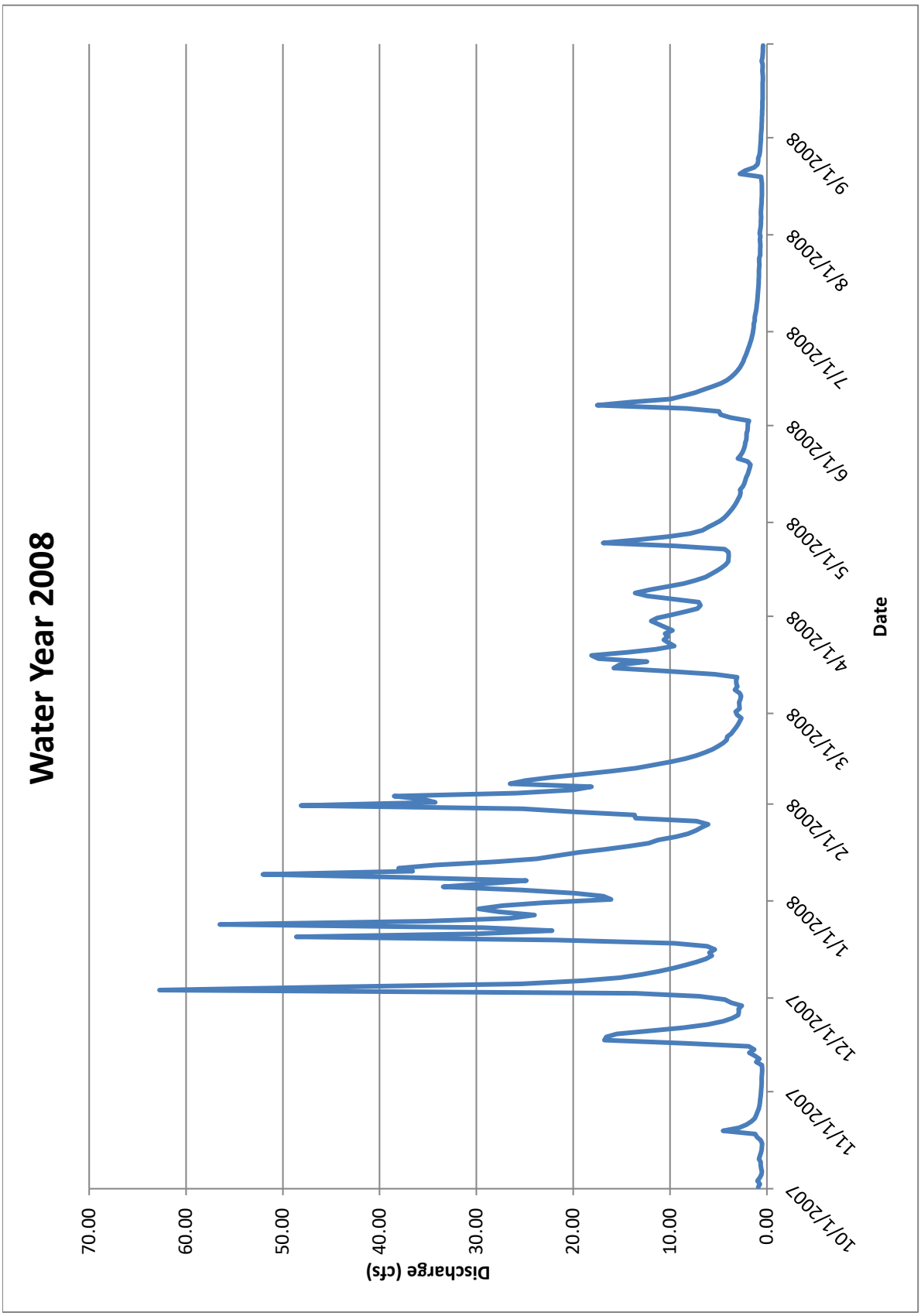
Date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10/1/2007
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12/1/2007
1/1/2008
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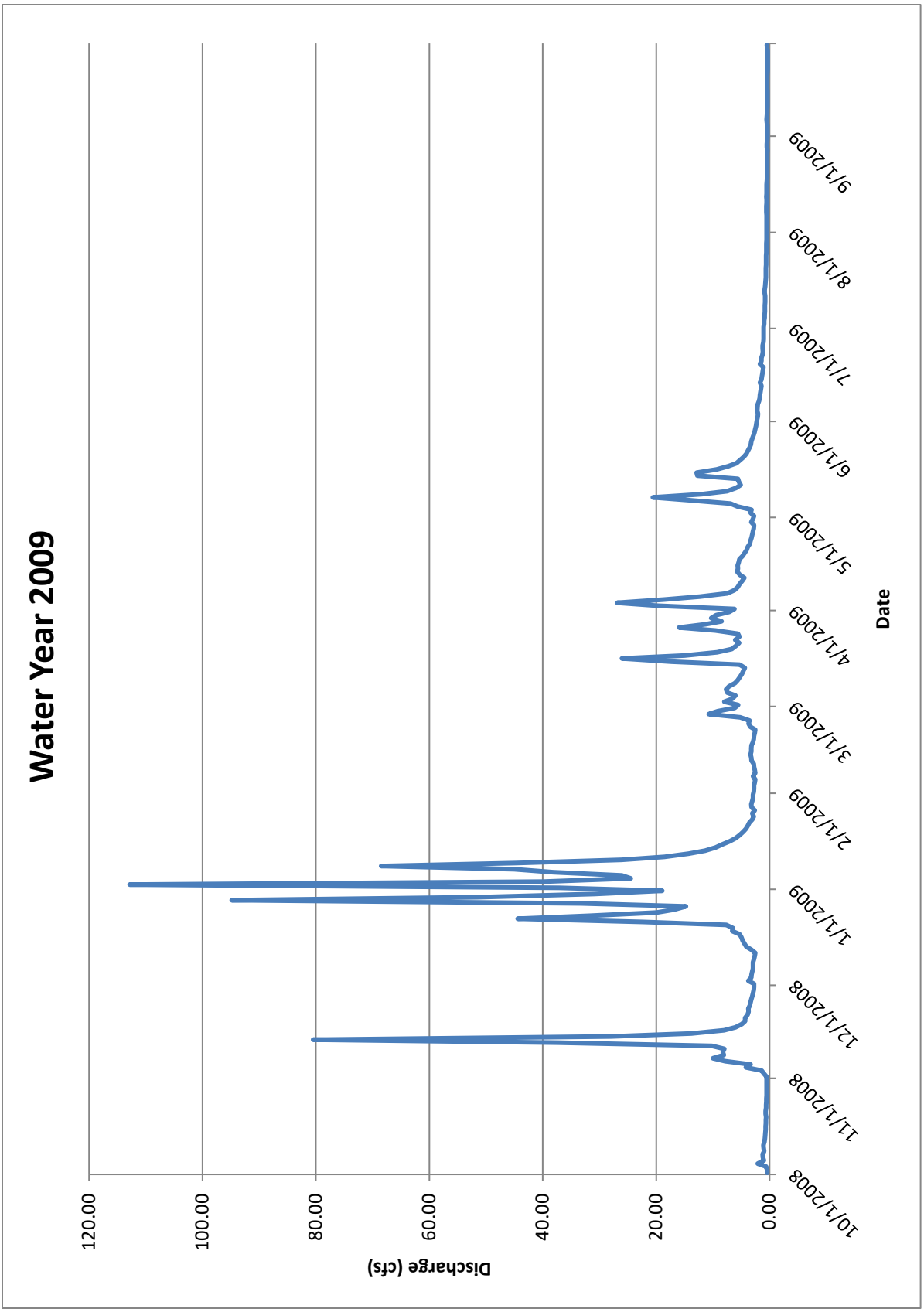
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11/1/2008
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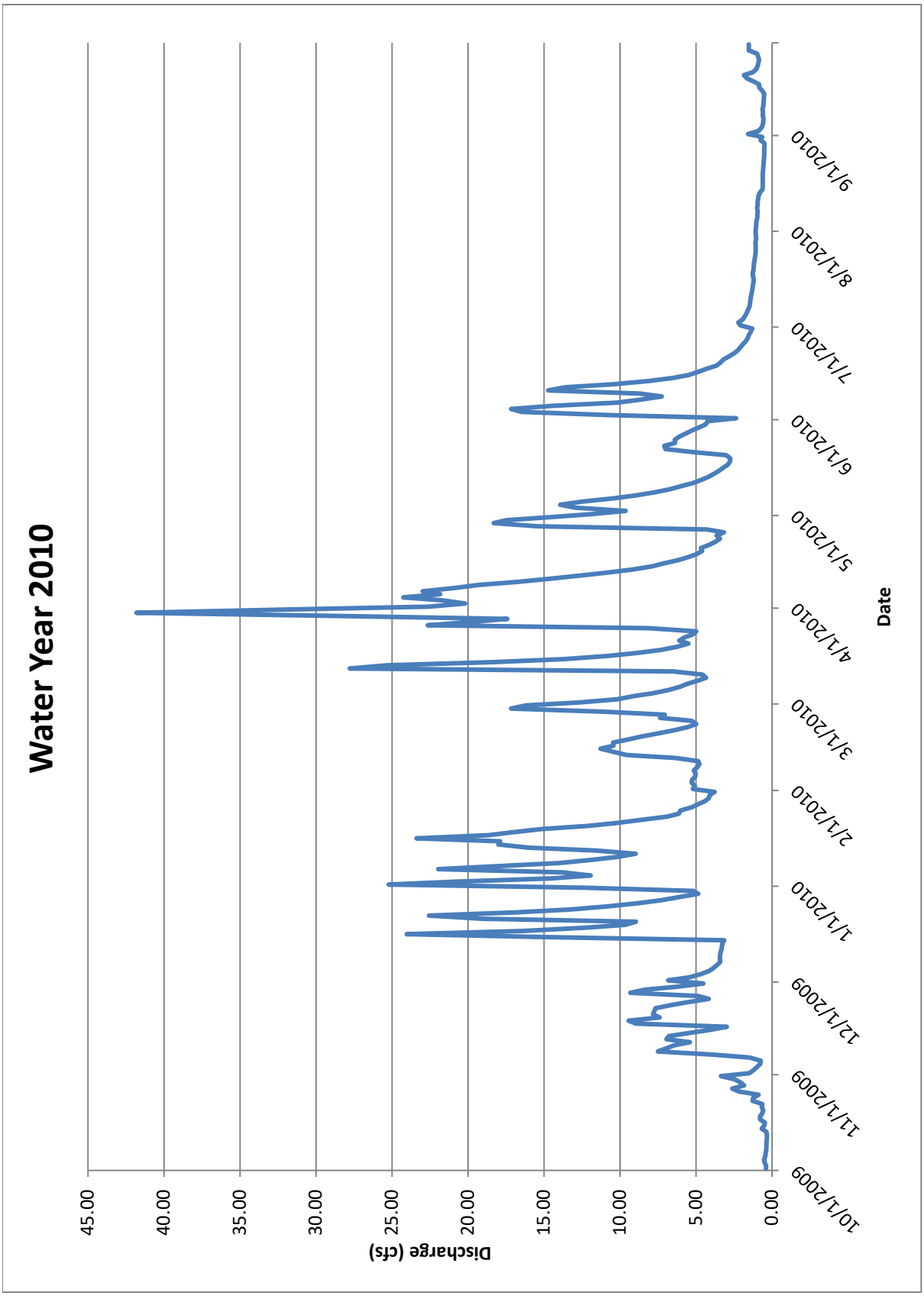
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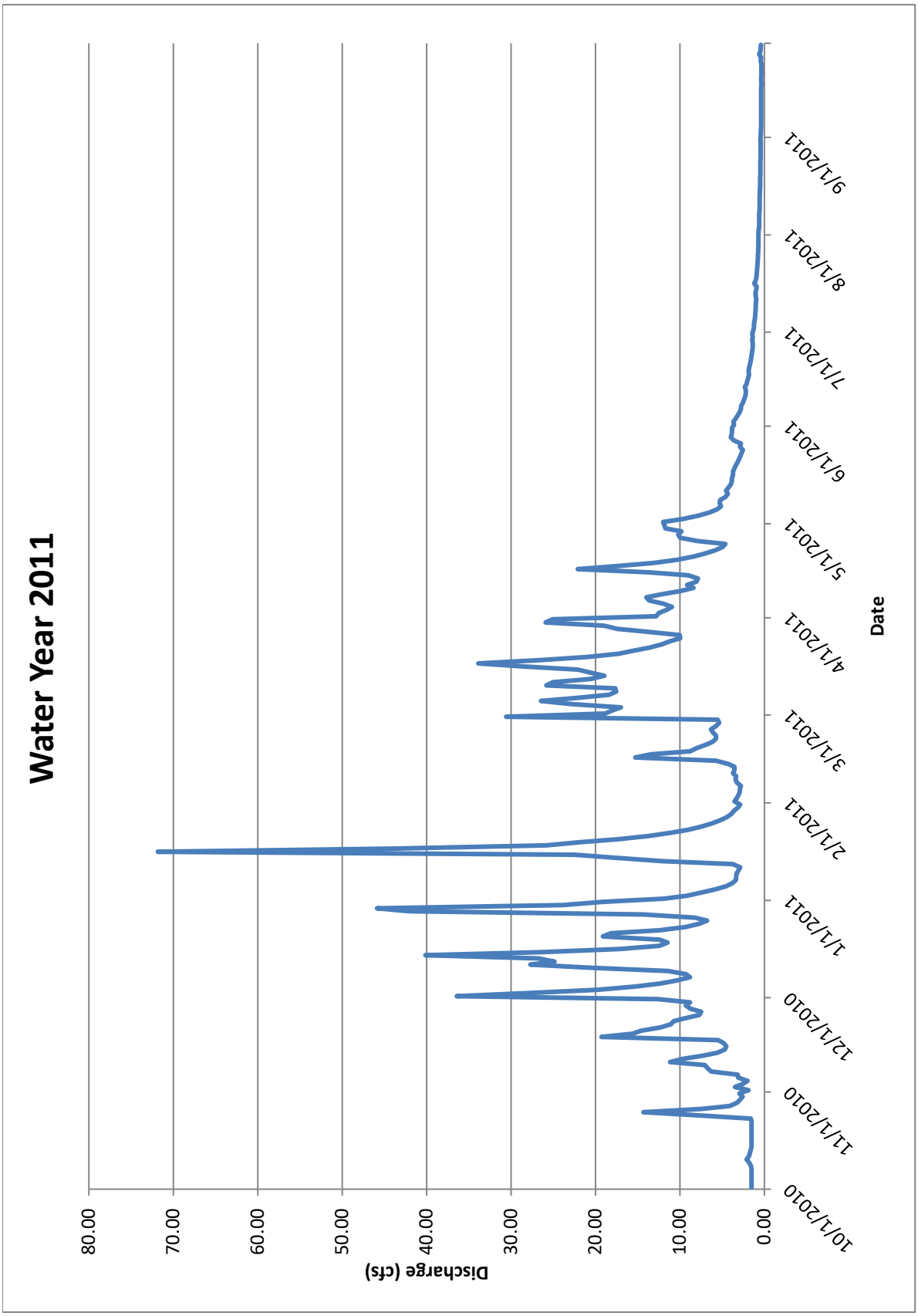
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1/1/2011
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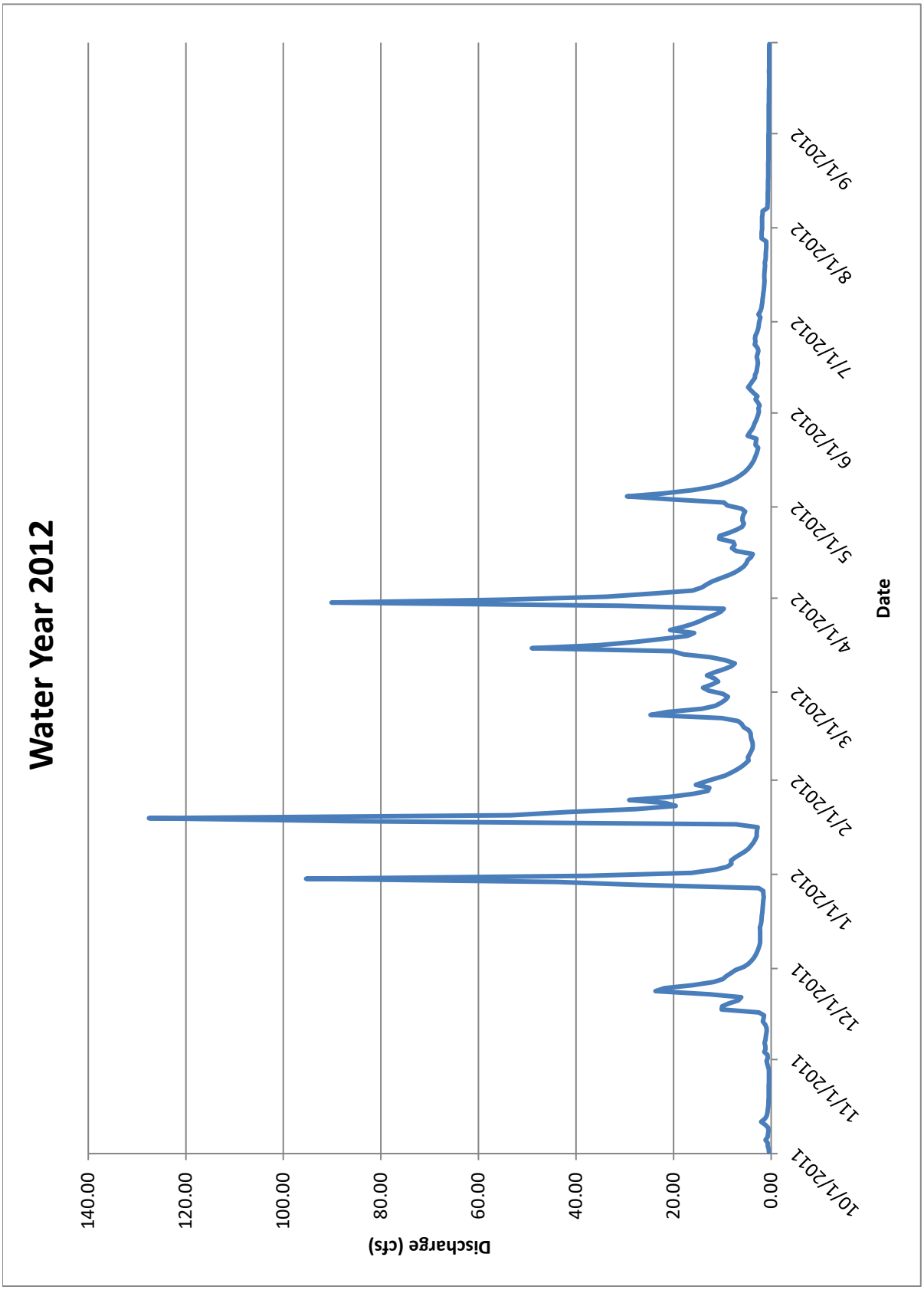
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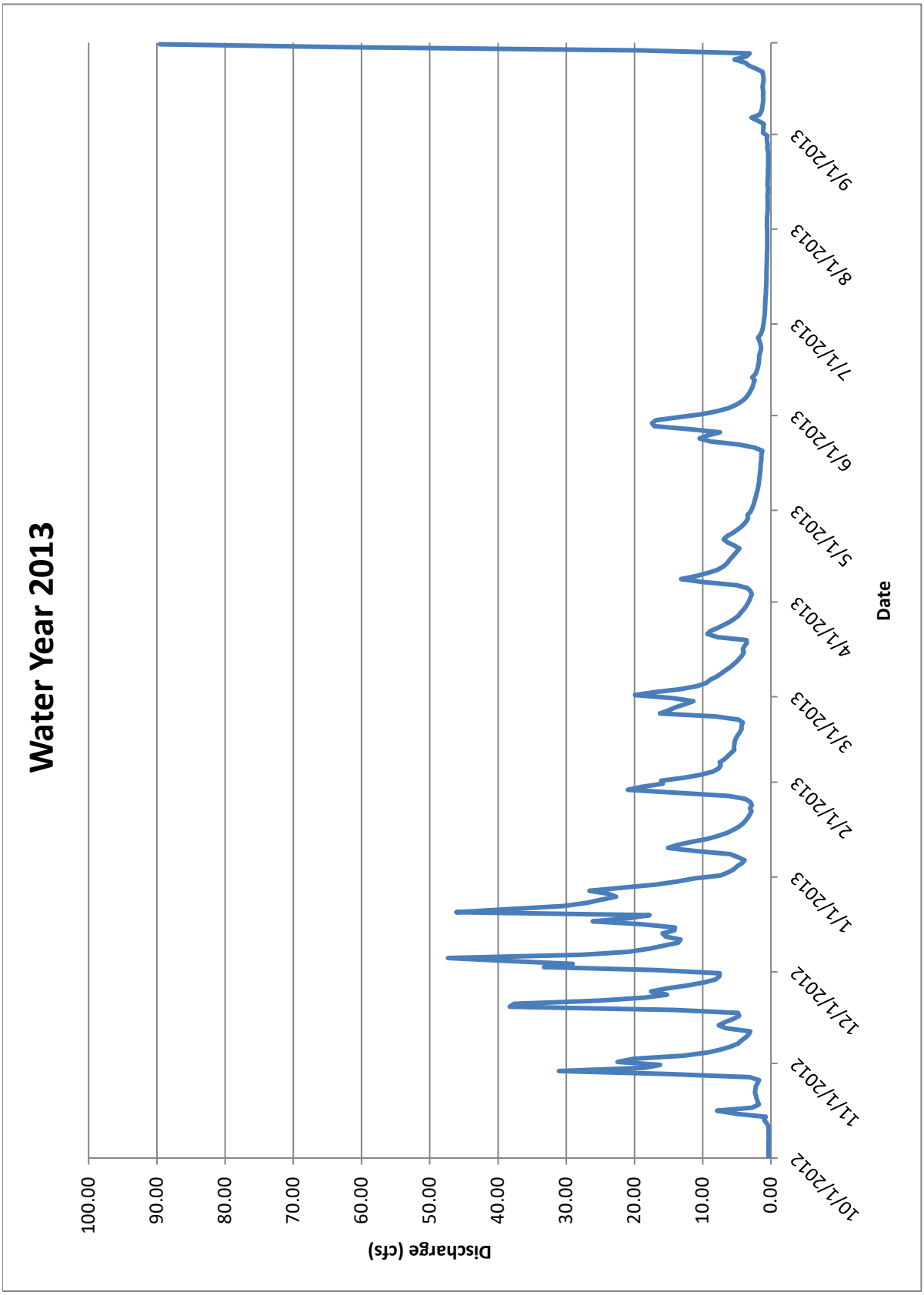
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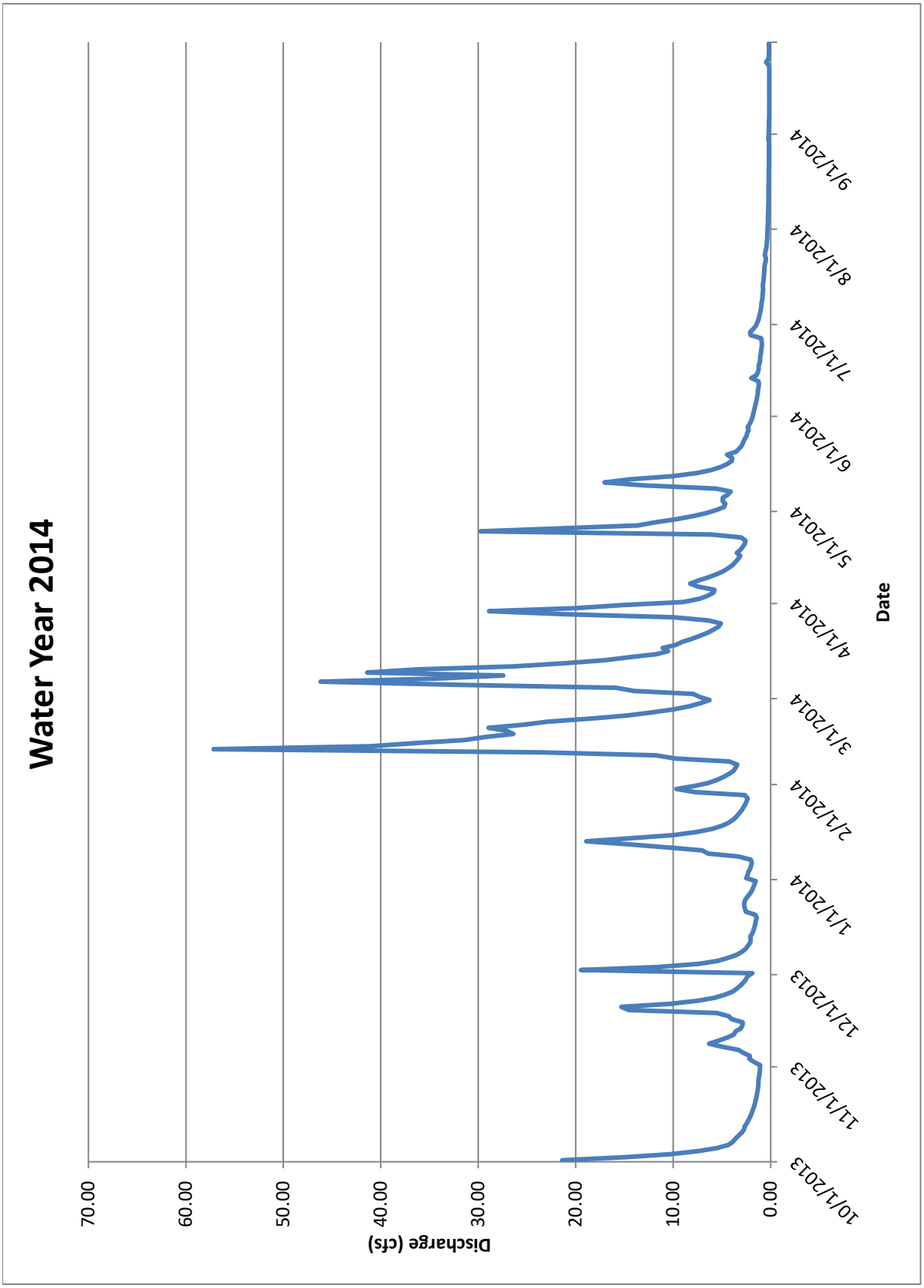
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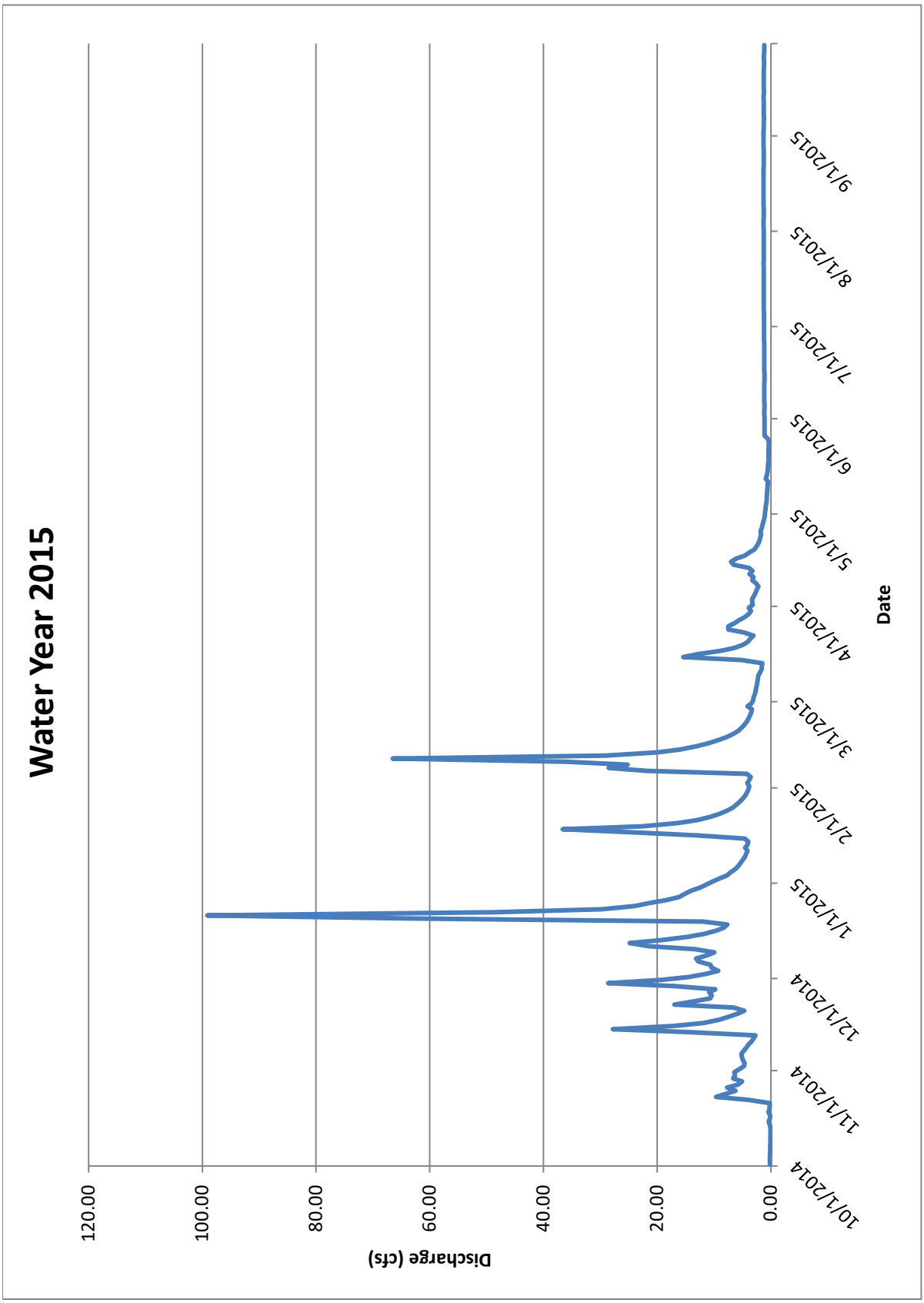
5/1/2014
6/1/2014
7/1/2014
8/1/2014
9/1/2014
Date


Water Year 2015
Discharge (cfs)
120.00
100.00
80.00
60.00
40.00
20.00
0.00
10/1/2014
11/1/2014
12/1/2014
1/1/2015
2/1/2015
3/1/2015
4/1/2015
5/1/2015
6/1/2015
7/1/2015
8/1/2015
9/1/2015
Date

NEEDLE BRANCH LOWER
STREAMFLOW WATER YEARS 1992-2015

SUMMARY

This report summarizes the methods and compilation of the streamflow data for Needle Branch Lower (NBL) (Needle Branch Gauging station, watershed area 175 acres) for water years 1992-2015. See the Excel file titled, NBL_Final_WY1992-2015, for all data. Given the amount of prediction and confidence in the actual stage measurements, the streamflow data are rated as fair (per Rantz et al. 1982). Daily streamflow values can be used for relative comparisons between the different years and different gauging locations. The data cannot be used to estimate stationarity of annual water yields or effects of timber harvesting on streamflow metrics. A series of new recommendations have been made to improve streamflow measurement and water yield quantification.

Stage data were collected every 10 minutes by a pressure transducer located in the weir stilling pond. These data are recorded on a logger and physically downloaded at various intervals, and all files are shared at the water year end. As noted from the field notes, there are very few stage corrections resulting from frequent debris removal and/or sediment removal from the stilling pond. The resultant higher stage measurement thus overestimates streamflow.

A rating curve (stage-discharge relationship) was developed for the station using historical high flows as measured by the US Geological Survey (USGS) in the original study, coupled with more recent streamflow measurements, taken at lower flows. Regression analysis between stage and discharge may suggest a good fit based on the coefficient of determination; however, deviations from the regression line are apparent. As a result, a lookup table (LUT) was developed, whereby the user inputs the stage to get the corresponding discharge.

Stage data were used to calculate daily, monthly, and annual streamflow. These runoff values (measured as depth) were compared to on-site precipitation values. Precipitation recorders are located throughout the watershed; however, data quality is generally poor due to missing records or equipment failure (see Recommendations). The nearest available long-term precipitation data are at the Alsea Fish Hatchery (AFH) (NOAA 350145). The AFH data were confirmed by monthly PRISM data (on-file at Oregon State University). Water yield efficiency (runoff depth divided by precipitation depth) was calculated, and many months had more runoff than precipitation, indicating an overestimation of streamflow. There are different efficiencies in monthly water yield (wet or dry soil mantle), however it was determined that streamflow estimates were often too high.

Streamflow corrections were made by simple linear prediction from Deer Creek (DCG) discharge when possible, since it is the closest streamflow gauging station. However, data gaps at DCG dictated the need for another streamflow gauge. Thus East Fork Lobster Creek (EFLC) (USGS 14306340 East Fork Lobster Creek near Alsea, OR) was used as the independent variable. Predictions for short periods of missing records were based on hydrograph comparisons (Rantz et al. 1982) a visual comparison of paired hydrograph shapes. Longer periods of record were estimated by simple linear regressions with East Fork Lobster Creek daily streamflow. Streamflow predictions were made for a daily time step, since finer resolution would be too speculative. Streamflow records (NBL_Final_WY1992-2015) include 10 minute, daily, monthly and annual values.

RECOMMENDATIONS

1. A common and readily accessible database needs to be built and maintained. All data need to be uploaded shortly after collection. A common naming/labeling system needs to be implemented. Similarly, field notes, anecdotal observations, and pictures can be included.

2. Standard non-recording rain gauges (SRG) should be placed in and around the study watersheds for additional precipitation data collection and to validate existing tipping bucket rain gauges. Alter shields are less important than additional rain gauges.

3. Stream gauging stations all should have 'outside' staff gauges (rather than depth to water minus bench mark elevation calculations), including NBH and NBU. The weirs and the flumes are not self-maintaining with respect to organic debris or sediment accumulation. Routine maintenance will include removing said debris; however stage measurements should include 'before and after' readings to allow better estimation of stage before debris accumulation. Other than prevention of back-waters impeding the downstream flume discharge, downstream channel maintenance efforts are generally not needed.

4. Gauging stations at NBL, DCG, and FCG (all originally built by the USGS) have inside stage gauges located in their stilling well. These stage readings should be included in the routine maintenance of the gauging station. This confirms the stage reading and a responsive hydraulic connection between the stilling well and inlet pipes (stream level). See proposed discharge measurement form in Appendix VI (p. 1.23).

5. More frequent site visits to gauging stations and/or increased recording of stage during site visits. Stage values are rarely corrected or adjusted, but stage shifts are recognized at all streamflow gauging stations. Stage notes can be collected on the proposed discharge form in Appendix VI (p. 1.23).

6. All weirs and flumes are subject to leakage. It is advised that a small amount of fluorescein dye be injected into the upstream channel, especially during low flows, to identify structure leakage. Maintenance can include caulking, mortar, or water proof epoxy.

7. More frequent discharge measurements should be made to build better rating curves for all stations. The rating curve (stage-discharge relationship) should not be considered constant. All stations are subject to channel shape changes which will affect the rating curve, specifically, the low flow portion of the rating curve. Offsets are rarely addressed in the streamflow reduction. We advise that each discharge measurement be plotted to assess rating curve functionality and consistency. A point to the left of the curve will show backwater conditions, conversely a point to the right of the curve may show a steeper energy slope - as on a rising limb. Each gauging station has a zero-flow stage that needs to be included in the rating curve. Units are often problematic, i.e., streamflow may be measured as m/s and then incorrectly converted to ft/s. See proposed discharge measurement form in Appendix VI (p. 1.23).

METHODOLOGY

1. A rating curve was constructed using historic peak flow data from USGS and discharge measurements made at lower flows.
   a. The LUT for NBL matched the low flows. The peak flows from USGS were fit with a polynomial equation when the stage was >2.4 feet:

Equation 1: High Flow Equation (If stage height is greater than 2.4 feet)

$$NBL\ Q[cfs] = 10.07(Stage\ ht.[ft])^2 - 22.88(Stage\ ht.[ft]) + 12.20$$

$$R^2 = 0.99$$

   b. When the 10-minute stage data were available it was converted to a discharge value using Equation 1 and the LUT. The 10-minute data were averaged to get a mean daily discharge value and labeled as raw NBL discharge.
2. When raw NBL discharge was missing, it was predicted.
   a. Hydrograph comparison was used except in the cases outlined in (2b) and (2c).

b. Linear regressions were used when there was a precipitation event during the section of missing data or when the section of missing data did not exceed 7 days.

c. If the section of missing data were greater than 7 days, the entire month was set at a constant discharge value, based on the monthly water yield efficiency.

3. The mean daily discharge data were converted to a runoff (RO) value using the equation.

Equation 2:

$$Raw\ NBL\ RO[in] = \frac{12 * 86400 * Q[cfs]}{Area[ft^2]}$$

4. The raw NBL RO was summed by month to determine a monthly RO value.

5. On a monthly time-step, raw NBL RO data were compared to RO data from East Fork of Lobster Creek (EFLC) and a linear regression was developed to relate the two parameters.

Equation 3:

$$NBL\ RO[in] = 1.07(EFLC\ RO[in]) + 0.91$$

$$R^2 = 0.83$$

6. NBL RO was then predicted with Equation 3 and the difference between the predicted NBL RO and raw NBL RO was analyzed.

7. If the value of the difference between the predicted RO and the raw RO was greater than two inches/month, the RO was corrected. If the value of the difference between the predicted RO and the raw RO was less than two inches/month then it was assumed that the raw RO value was correct.

8. Once the corrected monthly NBL RO value had been obtained, this value was divided by the raw NBL RO value to come up with a 'correction factor' for that month. If no correction was needed, the correction factor was 1.00. If correction was needed, the factor was scaled to the corrected monthly RO value.

LITERATURE CITED

Rantz, S.E. et al. 1982. *Measurement and Computation of Streamflow* (two volumes). USGS Water Supply Paper 2175. Washington DC: US Geological Survey.

TABLES AND FIGURES

Table 1. Summary of Stage Data Collected by Year at NBL

NBL Missing Data by Year			
Water Year	**Number of Days in Year**	**Number of Days Recorded**	**Percent Missing**
1992	366	366	
1993	365	365	
1994	365	365	
1995	365	365	
1996	366	366	
1997	365	365	
1998	365	365	
1999	365	365	
2000	366	0	100
2001	365	365	
2002	365	365	
2003	365	365	
2004	366	354	3.3
2005	365	365	
2006	365	277	24
2007	365	365	
2008	366	366	
2009	365	365	
2010	365	365	
2011	365	365	
2012	366	366	
2013	365	365	
2014	365	362	0.8
2015	365	365	
Total	8766	8297	5.4

Table 2. Summary of NBL Daily Streamflow Predictions

NBL Daily Flow Predictions	Number of Days	Total Number of Days	Percent
Observed Q value assumed correct	5791	8766	66.06
Observed Q value was adjusted with EFLC	2578	8766	29.41
Data are missing and daily values were not predicted	397	8766	4.53

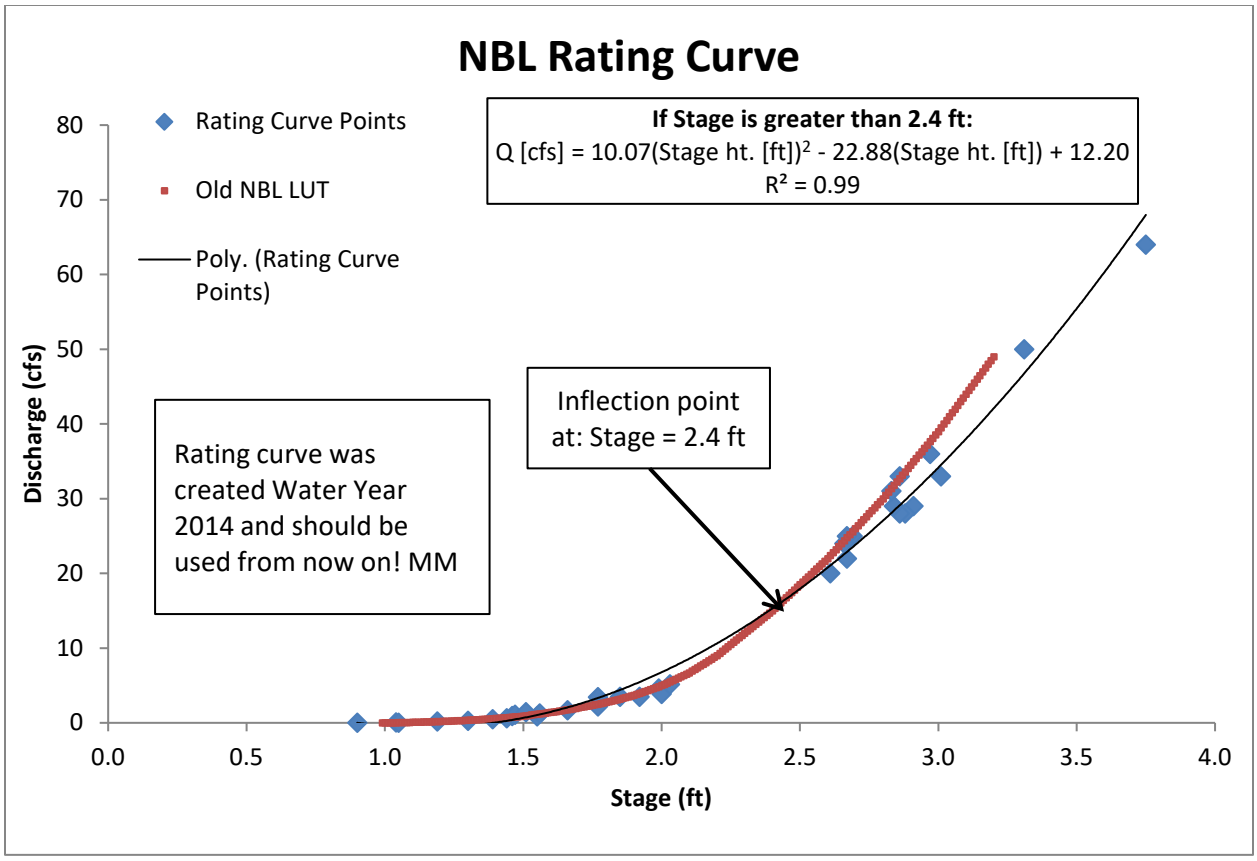


Figure 1. NBL Rating Curve

Table 3. NBL Lookup Table to be Used to Estimate Streamflows

2015 NBL LUT			
Stage (h) (ft)	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**
0.94	0.01	1.31	0.38
0.95	0.01	1.32	0.40
0.96	0.01	1.33	0.42
0.97	0.01	1.34	0.44
0.98	0.01	1.35	0.47
0.99	0.02	1.36	0.49
1.00	0.02	1.37	0.52
1.01	0.02	1.38	0.54
1.02	0.02	1.39	0.57
1.03	0.03	1.40	0.60
1.04	0.03	1.41	0.63
1.05	0.04	1.42	0.65
1.06	0.04	1.43	0.68
1.07	0.05	1.44	0.71
1.08	0.06	1.45	0.74
1.09	0.07	1.46	0.78
1.10	0.08	1.47	0.81
1.11	0.08	1.48	0.84
1.12	0.09	1.49	0.88
1.13	0.10	1.50	0.92
1.14	0.12	1.51	0.96
1.15	0.13	1.52	1.01
1.16	0.14	1.53	1.06
1.17	0.16	1.54	1.11
1.18	0.17	1.55	1.16
1.19	0.19	1.56	1.21
1.20	0.20	1.57	1.26
1.21	0.21	1.58	1.31
1.22	0.22	1.59	1.36
1.23	0.24	1.60	1.41
1.24	0.26	1.61	1.47
1.25	0.27	1.62	1.53
1.26	0.29	1.63	1.59
1.27	0.31	1.64	1.65
1.28	0.32	1.65	1.71
1.29	0.34	1.66	1.77
1.30	0.36	1.67	1.83

2015 NBL LUT			
Stage (h) (ft)	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**
1.68	1.89	2.05	5.85
1.69	1.95	2.06	6.02
1.70	2.02	2.07	6.19
1.71	2.09	2.08	6.36
1.72	2.16	2.09	6.53
1.73	2.23	2.10	6.70
1.74	2.30	2.11	6.93
1.75	2.37	2.12	7.16
1.76	2.44	2.13	7.39
1.77	2.51	2.14	7.62
1.78	2.59	2.15	7.85
1.79	2.67	2.16	8.08
1.80	2.75	2.17	8.31
1.81	2.84	2.18	8.54
1.82	2.93	2.19	8.77
1.83	3.02	2.20	9.00
1.84	3.11	2.21	9.30
1.85	3.20	2.22	9.60
1.86	3.30	2.23	9.90
1.87	3.40	2.24	10.20
1.88	3.50	2.25	10.50
1.89	3.60	2.26	10.80
1.90	3.70	2.27	11.10
1.91	3.83	2.28	11.40
1.92	3.96	2.29	11.70
1.93	4.09	2.30	12.00
1.94	4.22	2.31	12.30
1.95	4.35	2.32	12.60
1.96	4.48	2.33	12.90
1.97	4.61	2.34	13.20
1.98	4.74	2.35	13.50
1.99	4.87	2.36	13.80
2.00	5.00	2.37	14.10
2.01	5.17	2.38	14.40
2.02	5.34	2.39	14.70
2.03	5.51	2.4>	$Q = 10.07h^2 - 22.88h + 12.20$
2.04	5.68		

Table 4. Annual NBL Runoff Values were Assessed for Water Yield Efficiency (NBL runoff/AFH precipitation). Streamflow Corrections Made When Values were Considered Out of Range.

Water Year	AFH (in)	NBL RO (in)	NBL/AFH
1992	63.79	49.50	0.78
1993	83.43	60.66	0.73
1994	59.54	50.09	0.84
1995	112.05	86.58	0.77
1996	125.78	109.31	0.87
1997	124.18	106.00	0.85
1998	93.00	83.99	0.90
1999	113.97	81.05	0.71
2000	94.50	68.98	0.73
2001	51.67	29.55	0.57
2002	93.04	77.90	0.84
2003	75.93	59.24	0.78
2004	88.80	56.32	0.63
2005	68.92	43.71	0.63
2006	102.50	73.86	0.72
2007	98.26	74.18	0.75
2008	92.93	81.92	0.88
2009	79.52	58.56	0.74
2010	94.40	74.92	0.79
2011	103.22	89.86	0.87
2012	97.98	87.69	0.90
2013	100.02	84.59	0.85
2014	76.13	72.25	0.95
2015	78.91	70.90	0.90

Key
One or more months have been predicted
Missing data --all values are predicted (no stage record for year)

MONTHLY WATER YIELD

Key
Observed Q value assumed correct
Observed Q value was adjusted with EFLC
Data are missing and daily values were not predicted

Table 5. Monthly NBL Runoff Values were Assessed for Water Yield Efficiency (NBL runoff/AFH precipitation). Streamflow Corrections Made when Values were Considered Out of Range.

Water Year	Month	AFH (in)	NBL RO (in)	Correction Factor	Water Year	Month	AFH (in)	NBL RO (in)	Correction Factor
1992	October	3.30	1.19	1.00	1994	October	1.91	0.24	1.00
	November	12.08	6.01	0.44		November	2.45	1.20	0.35
	December	9.01	8.73	1.00		December	14.13	7.60	0.58
	January	13.80	8.24	0.67		January	9.20	9.58	1.00
	February	7.99	9.70	1.00		February	12.12	9.09	4.03
	March	2.17	3.38	0.34		March	6.53	9.13	0.70
	April	10.13	7.87	0.74		April	5.11	7.12	0.52
	May	0.18	2.25	0.40		May	2.78	2.20	0.34
	June	0.54	1.32	1.00		June	3.14	2.27	0.46
	July	0.71	0.37	1.00		July	0.10	1.14	1.00
	August	0.73	0.22	1.00		August	0.12	0.21	1.00
	September	3.15	0.04	1.00		September	1.96	0.14	1.00
1993	October	7.00	0.06	1.00	1995	October	9.32	2.52	8.80
	November	10.54	5.41	1.00		November	20.85	11.78	8.04
	December	14.45	9.91	1.00		December	14.63	15.97	2.14
	January	9.62	8.98	1.00		January	21.23	19.48	2.05
	February	3.59	3.52	0.38		February	8.51	13.24	1.00
	March	9.63	11.02	5.75		March	15.37	10.23	1.69
	April	14.62	11.27	1.70		April	10.26	7.18	1.74
	May	7.08	5.61	2.47		May	2.87	3.78	2.17
	June	4.54	4.48	10.62		June	3.48	1.85	1.00
	July	1.65	0.14	1.00		July	0.24	0.09	1.00
	August	0.70	0.03	1.00		August	1.32	0.08	1.00
	September	0.00	0.02	1.00		September	3.96	0.08	1.00

Water Year	Month	AFH (in)	NBL RO (in)	Correction Factor	Water Year	Month	AFH (in)	NBL RO (in)	Correction Factor
1996	October	7.63	1.35	1.00	1999	October	6.87	6.69	1.00
	November	21.81	12.89	1.22		November	22.51	8.87	1.00
	December	19.83	20.48	1.24		December	23.93	9.75	1.00
	January	20.46	18.37	1.17		January	18.73	20.56	1.00
	February	27.10	28.91	2.27		February	17.29	14.38	1.00
	March	5.84	8.82	1.00		March	11.62	11.67	1.00
	April	10.93	10.80	2.11		April	3.20	3.57	1.00
	May	6.05	6.16	4.96		May	6.88	3.00	1.00
	June	1.11	0.42	1.00		June	0.97	1.34	1.00
	July	1.68	0.28	1.00		July	0.21	0.53	1.00
	August	0.53	0.19	1.00		August	1.18	0.18	1.00
	September	2.80	0.28	1.00		September	0.57	0.23	1.00
1997	October	9.69	3.15	0.45	2000	October	5.30		N/A
	November	18.87	12.72	0.18		November	24.75	8.65	N/A
	December	33.97	30.57	0.34		December	14.98	16.53	N/A
	January	17.95	16.24	0.44		January	17.40	15.19	N/A
	February	5.51	10.34	0.17		February	9.22	11.67	N/A
	March	13.41	17.59	1.44		March	6.07	6.81	N/A
	April	7.89	6.50	0.18		April	3.74	2.42	N/A
	May	3.83	3.55	0.25		May	5.39	4.58	N/A
	June	3.18	2.31	1.00		June	3.76	2.89	N/A
	July	1.00	1.74	1.00		July	0.25		N/A
	August	1.66	0.26	1.00		August	0.09		N/A
	September	7.22	0.67	1.00		September	3.55		N/A
1998	October	13.67	7.92	3.61	2001	October	6.15	0.23	1.00
	November	10.93	10.70	1.00		November	4.58	1.58	0.10
	December	9.42	8.87	0.33		December	10.02	6.18	0.26
	January	17.97	19.02	1.37		January	5.21	2.82	0.17
	February	16.19	12.39	1.45		February	4.09	3.52	0.33
	March	11.11	11.16	0.74		March	6.30	3.82	0.58
	April	3.44	5.17	1.00		April	6.41	3.80	2.27
	May	5.85	4.89	1.86		May	3.15	5.13	1.00
	June	1.29	1.37	1.00		June	3.42	1.74	0.38
	July	0.25	0.85	1.00		July	0.51	0.46	1.00
	August	0.03	0.25	1.00		August	1.24	0.08	1.00
	September	2.84	1.12	1.00		September	0.59	0.08	1.00

Water Year	Month	AFH (in)	NBL RO (in)	Correction Factor	Water Year	Month	AFH (in)	NBL RO (in)	Correction Factor
2002	October	7.18	0.52	1.00	2005	October	9.04	2.55	7.91
	November	18.06	9.95	12.01		November	4.26	3.56	1.00
	December	17.33	19.69	3.02		December	10.78	7.40	0.36
	January	21.44	16.54	3.04		January	9.57	6.05	0.33
	February	3.88	8.87	2.42		February	2.00	2.74	0.29
	March	11.01	11.43	2.43		March	10.12	6.32	1.00
	April	6.48	5.55	1.00		April	5.85	6.54	1.68
	May	1.65	3.47	1.00		May	7.75	4.17	2.35
	June	3.18	0.66	1.00		June	6.97	2.50	1.00
	July	0.03	0.55	1.00		July	0.47	0.51	1.00
	August	0.62	0.25	1.00		August	0.09	0.36	1.00
	September	2.19	0.15	1.00		September	2.01	0.87	1.00
2003	October	0.58	0.76	1.00	2006	October	9.11	0.75	1.00
	November	8.21	2.04	0.19		November	12.55	6.95	0.70
	December	19.31	12.84	0.55		December	23.30	15.65	1.00
	January	10.09	10.75	0.52		January	27.28	26.42	1.00
	February	5.66	8.73	1.00		February	5.20	6.72	1.00
	March	15.86	13.06	1.00		March	11.66	9.69	1.00
	April	9.62	8.16	1.55		April	4.54	4.39	1.00
	May	2.96	1.30	1.00		May	3.69	1.26	1.00
	June	0.23	0.66	1.00		June	2.72	1.04	1.00
	July	0.17	0.56	1.00		July	0.22	0.41	1.00
	August	0.26	0.12	1.00		August	0.04	0.30	1.00
	September	2.98	0.06	1.00		September	2.18	0.28	1.00
2004	October	4.09	0.13	1.00	2007	October	1.89	0.12	1.00
	November	12.29	4.17	5.42		November	30.78	19.74	1.00
	December	19.80	13.40	1.00		December	16.16	17.49	1.17
	January	16.05	13.60	1.00		January	10.40	10.93	0.81
	February	9.51	9.47	0.72		February	19.12	9.47	0.72
	March	5.63	5.71	0.27		March	6.52	8.75	1.00
	April	4.49	4.50	0.57		April	6.27	5.44	1.00
	May	3.77	2.50	1.00		May	2.01	1.42	1.00
	June	2.36	2.55	5.57		June	1.31	0.52	1.00
	July	0.10	0.06	N/A		July	0.49	0.16	1.00
	August	4.95	0.01	1.00		August	0.65	0.09	1.00
	September	5.75	0.02	1.00		September	2.65	0.05	1.00

Water Year	Month	AFH (in)	NBL RO (in)	Correction Factor	Water Year	Month	AFH (in)	NBL RO (in)	Correction Factor
2008	October	6.63	0.73	1.00	2011	October	9.00	2.57	1.00
	November	9.26	2.99	1.00		November	13.05	7.81	0.55
	December	21.18	23.03	1.31		December	19.55	22.32	1.00
	January	19.68	23.01	1.37		January	11.51	12.24	0.78
	February	8.65	12.07	1.00		February	11.57	6.28	1.00
	March	10.98	7.73	1.00		March	19.06	19.69	1.00
	April	9.56	6.61	1.00		April	11.89	10.71	0.80
	May	1.17	1.79	1.00		May	3.91	4.81	1.00
	June	3.40	2.94	1.00		June	1.43	2.05	1.00
	July	0.06	0.48	1.00		July	1.35	0.83	1.00
	August	2.03	0.36	1.00		August	0.01	0.32	1.00
	September	0.33	0.16	1.00		September	0.89	0.22	1.00
2009	October	4.67	0.54	1.00	2012	October	6.16	0.78	1.00
	November	14.69	4.95	0.68		November	13.13	6.42	0.73
	December	14.20	10.69	0.81		December	11.00	11.18	1.00
	January	11.42	13.95	0.85		January	18.20	20.28	0.75
	February	7.00	3.58	1.00		February	9.33	9.39	1.00
	March	11.30	10.79	1.00		March	22.57	20.65	0.75
	April	5.47	6.13	1.00		April	7.73	8.05	0.75
	May	6.62	6.31	1.00		May	5.02	6.77	1.00
	June	1.45	1.01	1.00		June	4.02	2.50	1.00
	July	0.59	0.33	1.00		July	0.77	1.02	1.00
	August	0.43	0.14	1.00		August	0.02	0.38	1.00
	September	1.68	0.15	1.00		September	0.04	0.27	1.00
2010	October	7.64	1.14	1.00	2013	October	13.73	4.65	1.00
	November	13.32	5.20	0.41		November	18.29	12.06	0.68
	December	12.22	10.82	1.32		December	20.44	24.56	1.00
	January	11.29	12.95	0.80		January	8.25	9.44	1.00
	February	9.33	6.82	1.00		February	6.28	7.10	1.00
	March	13.97	11.80	0.82		March	5.91	6.53	1.00
	April	11.30	11.56	1.00		April	6.36	5.21	1.00
	May	5.73	6.60	1.00		May	6.43	4.30	1.00
	June	5.38	6.30	0.72		June	1.80	2.49	1.00
	July	0.22	0.93	1.00		July	0.01	0.64	1.00
	August	1.34	0.31	1.00		August	0.96	0.40	1.00
	September	2.66	0.49	1.00		September	11.55	7.20	2.18

Water Year	Month	AFH (in)	NBL RO (in)	Correction Factor	Water Year	Month	AFH (in)	NBL RO (in)	Correction Factor
2014	October	2.07	3.57	1.00	2015	October	11.69	2.19	1.00
	November	7.50	5.35	1.00		November	13.27	11.66	1.00
	December	5.22	3.20	0.49		December	19.85	21.86	1.00
	January	8.00	6.89	1.00		January	5.76	7.81	1.00
	February	16.61	18.65	1.00		February	12.49	12.47	1.00
	March	17.82	18.04	1.21		March	8.13	7.33	1.00
	April	6.22	7.91	1.00		April	4.53	4.91	1.00
	May	6.83	6.40	1.00		May	1.56	1.46	1.00
	June	2.76	1.19	1.00		June	0.40	0.66	1.00
	July	1.13	0.68	1.00		July	0.06	0.24	1.00
	August	0.23	0.22	1.00		August	1.16	0.14	1.00
	September	1.74	0.15	1.00		September	0.00	0.17	1.00

SUMMARY TABLES

Table 6. Summary Tables of Mean Daily Streamflow Values have been Compiled for Each Water Year. Along the Base of the Table, Monthly and Annual Statistics can be Found for that Water Year.

Key
Observed Q value assumed correct
Observed Q value was adjusted with EFLC
Data are missing and daily values were not predicted

Needle Branch Lower, Alsea Watershed Study												
Water Year 1992												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.01	0.39	5.00	0.81	0.53	0.81	0.55	0.23	0.53	0.15	0.05	0.03
2	0.01	0.27	5.00	0.74	1.70	1.39	0.65	0.21	0.49	0.14	0.06	0.02
3	0.01	0.35	4.00	0.66	2.60	1.83	1.92	0.20	0.46	0.14	0.06	0.02
4	0.02	0.75	3.60	0.60	2.90	1.72	11.06	0.21	0.45	0.12	0.07	0.02
5	0.09	0.89	3.10	0.52	4.00	1.76	5.83	0.21	0.44	0.11	0.09	0.02
6	0.04	0.75	2.60	0.54	3.40	1.52	3.76	0.60	0.41	0.11	0.08	0.01
7	0.04	0.62	2.10	1.21	2.60	1.18	3.47	1.33	0.39	0.10	0.07	0.01
8	0.04	0.53	1.80	1.75	2.00	0.98	5.46	1.17	0.36	0.12	0.09	0.01
9	0.03	0.49	1.70	1.68	1.60	0.81	4.42	0.93	0.35	0.09	0.11	0.01
10	0.05	0.44	2.00	4.03	1.40	0.95	3.39	0.81	0.34	0.09	0.07	0.01
11	0.05	0.37	2.10	5.04	1.20	1.76	2.65	0.69	0.33	0.08	0.06	0.01
12	0.08	0.38	2.00	7.39	1.90	1.49	2.06	0.60	0.33	0.10	0.05	0.01
13	0.06	3.06	2.00	5.71	4.80	1.22	1.70	0.52	0.31	0.09	0.05	0.01
14	0.08	2.75	1.80	4.84	4.20	0.95	1.33	0.44	0.32	0.09	0.05	0.01
15	0.39	1.82	1.60	7.39	3.30	0.74	1.11	0.40	0.38	0.10	0.03	0.01
16	0.19	1.33	1.40	4.64	2.60	0.61	0.96	0.69	0.30	0.09	0.01	0.01
17	0.13	1.24	1.40	3.09	2.20	0.47	0.81	0.89	0.27	0.07	0.02	0.01
18	0.55	0.98	1.90	2.15	2.20	0.41	0.71	1.01	0.29	0.06	0.02	0.01
19	0.21	1.02	2.00	1.48	2.70	0.37	0.65	0.85	0.32	0.05	0.01	0.01
20	0.13	1.24	1.80	1.14	4.40	0.37	0.56	0.69	0.32	0.04	0.01	0.01
21	0.87	1.64	1.50	0.87	4.80	0.34	0.49	0.60	0.28	0.05	0.01	0.01
22	0.39	1.64	1.40	0.67	3.70	0.33	0.50	0.48	0.26	0.06	0.01	0.01
23	0.22	1.60	1.20	0.60	2.80	0.37	0.53	0.44	0.26	0.08	0.01	0.01
24	0.16	1.69	1.00	0.51	2.10	0.41	0.58	0.40	0.25	0.11	0.02	0.00
25	0.34	6.21	0.99	0.45	1.60	0.41	0.54	0.35	0.24	0.08	0.02	0.00
26	0.39	3.55	1.00	0.42	1.30	0.37	0.50	0.31	0.23	0.07	0.02	0.00
27	0.32	2.66	1.60	0.39	1.10	0.33	0.51	0.28	0.25	0.07	0.10	0.00
28	0.53	2.13	2.00	0.38	0.95	0.30	0.49	0.33	0.22	0.07	0.21	0.00
29	0.64	1.77	1.80	0.36	0.98	0.28	0.47	0.29	0.20	0.06	0.05	0.00
30	1.40	1.82	1.60	0.34		0.25	0.44	0.24	0.17	0.05	0.08	0.00
31	1.30		1.40	0.40		0.22		0.23		0.06	0.05	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.01	0.27	0.99	0.34	0.53	0.22	0.44	0.20	0.17	0.04	0.01	0.00
Max Q (cfs)	1.40	6.21	5.00	7.39	4.80	1.83	11.06	1.33	0.53	0.15	0.21	0.03
Mean Monthly Q (cfs)	0.28	1.48	2.08	1.96	2.47	0.80	1.94	0.54	0.33	0.09	0.05	0.01
Cumulative Q (cfs)	8.77	44.37	64.39	60.82	71.56	24.94	58.09	16.63	9.75	2.70	1.64	0.29
Annual Water Yield (in)		49.50				**Mean Annual Q (cfs)**			0.99			

Needle Branch Lower, Alsea Watershed Study												
Water Year 1993												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.00	0.02	2.48	1.23	1.03	4.31	0.88	5.04	2.02	0.06	0.02	0.00
2	0.00	0.02	2.09	1.13	0.85	3.85	0.85	3.85	1.70	0.05	0.02	0.00
3	0.00	0.06	1.69	1.58	0.68	3.62	0.87	3.16	1.49	0.05	0.02	0.00
4	0.00	0.73	1.50	1.68	0.56	3.62	1.32	2.67	1.49	0.05	0.02	0.00
5	0.00	0.23	7.40	1.38	0.48	3.45	1.48	2.20	1.49	0.06	0.01	0.00
6	0.00	0.15	8.41	1.21	0.42	3.16	1.38	1.78	1.38	0.06	0.02	0.00
7	0.00	0.08	4.65	1.09	0.38	2.93	2.04	1.63	1.17	0.05	0.02	0.00
8	0.00	0.07	3.25	0.96	0.30	2.82	2.21	1.56	1.27	0.04	0.01	0.00
9	0.00	0.06	2.34	1.37	0.26	2.64	2.46	1.46	1.49	0.04	0.01	0.00
10	0.00	0.20	1.93	2.51	0.24	2.53	2.38	1.46	1.38	0.04	0.01	0.00
11	0.00	0.25	2.10	2.44	0.23	2.41	2.14	1.31	1.27	0.04	0.01	0.00
12	0.00	0.42	2.03	1.94	0.22	2.30	2.22	1.21	1.17	0.04	0.01	0.00
13	0.00	0.36	1.74	1.59	0.21	2.24	2.51	1.14	1.59	0.04	0.01	0.00
14	0.00	0.23	1.39	1.36	0.20	2.18	2.38	1.06	1.91	0.04	0.01	0.00
15	0.00	0.39	1.19	1.80	0.19	2.18	2.09	1.01	1.27	0.04	0.00	0.00
16	0.00	0.52	1.07	1.80	0.27	2.70	2.58	0.96	1.49	0.03	0.00	0.00
17	0.00	0.62	2.17	1.61	0.89	3.05	10.38	0.91	1.27	0.03	0.00	0.00
18	0.00	1.20	3.48	1.36	2.12	2.53	9.39	0.86	0.86	0.03	0.00	0.00
19	0.00	4.00	2.75	1.24	5.59	2.60	6.45	0.82	0.79	0.03	0.00	0.00
20	0.00	2.48	2.67	1.24	3.37	2.59	4.70	0.79	0.70	0.03	0.00	0.00
21	0.00	1.62	3.03	1.06	2.04	2.53	3.58	0.74	0.63	0.03	0.00	0.00
22	0.00	1.00	2.70	1.03	1.53	2.41	2.92	0.69	0.53	0.03	0.00	0.00
23	0.06	2.74	2.19	1.41	1.12	2.36	2.34	0.64	0.41	0.02	0.00	0.00
24	0.09	4.95	1.56	2.16	0.84	2.24	1.99	0.62	0.42	0.02	0.00	0.00
25	0.03	5.24	1.47	2.14	0.64	2.18	1.72	0.62	0.42	0.02	0.00	0.07
26	0.05	4.19	1.27	3.57	0.52	2.07	1.49	0.64	0.48	0.02	0.00	0.02
27	0.05	2.82	1.11	7.64	0.45	2.01	1.56	0.59	0.53	0.02	0.00	0.02
28	0.06	1.88	0.55	5.28	0.39	1.90	1.21	0.57	0.66	0.02	0.00	0.01
29	0.04	1.39	1.66	4.29		1.84	1.70	0.52	0.99	0.02	0.00	0.01
30	0.03	2.02	0.64	3.89		2.18	3.91	0.47	0.81	0.02	0.00	0.01
31	0.03		0.61	3.26		1.84		0.42		0.02	0.00	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.00	0.02	0.55	0.96	0.19	1.84	0.85	0.42	0.41	0.02	0.00	0.00
Max Q (cfs)	0.09	5.24	8.41	7.64	5.59	4.31	10.38	5.04	2.02	0.06	0.02	0.07
Mean Monthly Q (cfs)	0.02	1.33	2.36	2.14	0.93	2.62	2.77	1.34	1.10	0.03	0.01	0.00
Cumulative Q (cfs)	0.47	39.94	73.12	66.25	25.99	81.27	83.13	41.41	33.08	1.05	0.19	0.14
Annual Water Yield (in)		60.66				**Mean Annual Q (cfs)**			1.22			

Needle Branch Lower, Alsea Watershed Study												
Water Year 1994												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.03	0.18	1.50	2.41	4.47	0.84	0.61	1.14	0.79	0.4	0.12	0.03
2	0.04	0.11	2.00	1.97	3.99	1.12	1.05	0.95	0.88	0.4	0.11	0.04
3	0.04	0.05	1.41	2.04	3.66	1.24	2.85	1.01	0.76	0.37	0.09	0.04
4	0.04	0.06	0.96	3.22	2.78	1.87	2.40	0.95	0.66	0.35	0.07	0.04
5	0.03	0.04	0.75	3.32	2.62	3.78	1.77	0.86	0.88	0.34	0.07	0.04
6	0.03	0.02	0.65	2.93	2.42	2.81	1.46	0.80	0.97	0.32	0.06	0.04
7	0.03	0.17	0.58	2.41	2.34	2.06	1.16	0.83	1.00	0.3	0.05	0.04
8	0.03	0.14	0.93	1.97	2.26	1.58	1.16	1.04	0.97	0.3	0.04	0.04
9	0.03	0.14	1.27	1.6	2.17	1.20	1.24	1.01	0.94	0.28	0.04	0.04
10	0.03	0.09	6.86	1.33	2.17	1.08	2.47	0.83	0.79	0.26	0.04	0.04
11	0.03	0.08	3.62	1.15	2.17	0.90	3.11	0.68	0.85	0.26	0.04	0.04
12	0.03	0.11	2.13	1.02	2.01	0.81	2.54	0.57	0.74	0.26	0.04	0.05
13	0.03	0.09	1.41	0.95	1.93	0.70	1.94	0.49	0.69	0.26	0.04	0.05
14	0.03	0.06	1.07	0.88	1.85	0.70	1.51	0.44	0.66	0.26	0.05	0.05
15	0.03	0.05	0.83	0.69	1.77	1.29	1.28	0.38	0.61	0.26	0.05	0.05
16	0.03	0.04	0.83	0.65	1.77	1.99	1.09	0.34	0.53	0.26	0.06	0.04
17	0.03	0.06	1.23	0.6	1.69	3.36	1.33	0.30	0.47	0.28	0.05	0.04
18	0.03	0.08	1.61	0.58	1.69	5.29	1.77	0.24	0.44	0.21	0.04	0.04
19	0.03	0.18	1.41	1.15	1.93	3.67	1.66	0.30	0.41	0.19	0.05	0.04
20	0.21	0.24	2.34	6.74	1.85	2.81	1.42	0.22	0.32	0.23	0.05	0.03
21	0.12	1.24	2.96	4.93	2.09	2.19	1.20	0.24	0.30	0.25	0.05	0.02
22	0.05	1.88	2.56	5.38	2.34	2.73	1.24	0.21	0.32	0.46	0.04	0.03
23	0.04	0.90	1.94	4.51	2.62	8.51	1.61	0.19	0.27	0.32	0.05	0.02
24	0.04	0.48	1.45	3.76	2.62	4.61	2.19	0.19	0.25	0.26	0.04	0.02
25	0.04	0.32	1.11	3.32	2.50	2.99	2.33	0.24	0.24	0.23	0.04	0.02
26	0.04	0.22	0.93	2.75	2.42	2.06	2.33	0.22	0.23	0.19	0.03	0.02
27	0.04	0.37	1.36	2.25	2.42	1.48	2.26	0.23	0.23	0.18	0.03	0.02
28	0.05	0.42	3.42	1.97	2.50	1.12	1.88	0.24	0.21	0.19	0.03	0.02
29	0.06	0.37	2.88	1.6		0.93	1.83	0.30	0.19	0.21	0.03	0.03
30	0.21	0.66	2.27	1.38		0.87	1.83	0.34	0.18	0.18	0.03	0.03
31	0.25		1.82	1.24		0.78		0.43		0.14	0.02	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.03	0.02	0.58	0.58	1.69	0.70	0.61	0.19	0.18	0.14	0.02	0.02
Max Q (cfs)	0.25	1.88	6.86	6.74	4.47	8.51	3.11	1.14	1.00	0.46	0.12	0.05
Mean Monthly Q (cfs)	0.06	0.29	1.81	2.28	2.39	2.17	1.75	0.52	0.56	0.27	0.05	0.04
Cumulative Q (cfs)	1.75	8.83	56.10	70.70	67.06	67.36	52.53	16.20	16.76	8.40	1.55	1.05
Annual Water Yield (in)		50.09				**Mean Annual Q (cfs)**			1.01			

Needle Branch Lower, Alsea Watershed Study												
Water Year 1995												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.18	0.40	5.77	2.87	0.39	3.89	2.26	0.30	0.25	0.19	0.00	0.00
2	0.18	0.40	1.88	6.35	0.38	4.06	1.20	0.78	0.24	0.11	0.00	0.00
3	0.35	0.80	1.67	16.17	0.36	3.55	0.66	4.12	0.24	0.06	0.09	0.00
4	1.14	0.72	3.20	14.95	0.35	3.05	0.37	3.47	0.25	0.03	0.05	0.00
5	0.44	0.32	1.67	12.69	0.34	2.54	2.61	1.91	0.26	0.02	0.12	0.00
6	0.44	0.24	1.22	9.83	0.34	2.20	4.17	0.56	1.90	0.01	0.07	0.00
7	0.35	0.08	8.33	6.96	0.33	1.86	5.22	0.61	1.80	0.01	0.04	0.00
8	0.35	0.08	10.89	5.53	0.32	1.68	7.13	0.58	1.00	0.00	0.02	0.00
9	0.26	0.08	7.48	5.53	0.37	1.54	8.52	0.56	0.55	0.00	0.01	0.02
10	0.26	0.56	12.60	6.76	0.33	0.44	4.70	0.50	0.30	0.00	0.01	0.03
11	0.35	0.72	17.51	9.21	0.32	0.24	2.61	0.54	0.17	0.00	0.00	0.03
12	0.88	0.72	11.11	8.19	0.33	0.14	2.78	0.52	0.56	0.00	0.00	0.01
13	0.70	0.80	6.41	5.73	1.00	0.07	1.50	0.52	1.30	0.00	0.00	0.00
14	0.97	0.80	4.27	4.30	0.84	0.03	0.82	0.52	1.80	0.00	0.00	0.02
15	1.23	1.05	3.20	3.28	0.79	1.69	0.45	1.26	1.20	0.00	0.00	0.01
16	1.06	1.13	2.56	2.66	1.40	1.69	0.24	1.32	0.64	0.00	0.00	0.00
17	0.79	0.80	2.14	2.25	1.50	3.38	0.14	0.87	0.35	0.00	0.00	0.01
18	0.70	0.48	1.88	1.95	3.10	6.94	0.24	0.78	0.19	0.00	0.00	0.01
19	0.62	0.24	1.67	1.72	1.60	4.23	0.14	0.76	0.11	0.00	0.00	0.02
20	0.53	0.16	1.47	1.54	1.70	4.57	0.07	0.74	0.06	0.00	0.00	0.03
21	0.53	15.29	1.35	1.47	4.00	4.57	0.52	0.69	0.03	0.00	0.00	0.03
22	0.53	18.50	1.24	1.66	4.30	4.57	0.30	0.65	0.02	0.00	0.09	0.03
23	0.97	11.26	0.85	1.72	4.60	4.91	0.97	0.61	0.01	0.00	0.05	0.04
24	0.97	6.36	0.83	1.66	5.20	2.88	1.20	0.58	0.01	0.09	0.03	0.05
25	0.79	3.46	0.81	1.56	19.00	1.57	1.30	0.58	0.19	0.05	0.02	0.05
26	0.62	2.65	0.77	1.47	27.00	0.86	0.89	0.56	0.11	0.03	0.01	0.05
27	0.53	2.25	0.75	1.35	14.00	0.47	0.49	0.56	0.06	0.02	0.00	0.05
28	0.53	2.74	0.73	1.27	3.50	0.25	0.26	0.65	0.03	0.01	0.00	0.02
29	0.44	11.26	0.70	1.19		0.46	0.80	0.67	0.02	0.00	0.00	0.03
30	0.44	2.49	1.35	1.13		3.22	0.43	0.56	0.01	0.00	0.00	0.03
31	0.44		1.54	0.82		3.89		0.56		0.00	0.00	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.18	0.08	0.70	0.82	0.32	0.03	0.07	0.30	0.01	0.00	0.00	0.00
Max Q (cfs)	1.23	18.50	17.51	16.17	27.00	6.94	8.52	4.12	1.90	0.19	0.12	0.05
Mean Monthly Q (cfs)	0.60	2.90	3.80	4.64	3.49	2.43	1.77	0.90	0.46	0.02	0.02	0.02
Cumulative Q (cfs)	18.56	86.89	117.84	143.75	97.69	75.45	52.99	27.90	13.66	0.63	0.61	0.57
Annual Water Yield (in)		86.58				**Mean Annual Q (cfs)**			1.74			

Needle Branch Lower, Alsea Watershed Study												
Water Year 1996												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.04	9.00	12.38	2.22	15.23	0.47	1.04	3.62	0.10	0.09	0.04	0.04
2	0.04	2.55	8.67	1.75	11.36	0.43	0.95	3.52	0.09	0.11	0.04	0.05
3	0.04	1.95	6.31	1.40	7.95	0.51	0.91	2.93	0.10	0.10	0.04	0.05
4	0.04	4.13	4.33	1.28	5.45	0.47	0.82	2.53	0.12	0.09	0.04	0.05
5	0.04	2.80	3.10	1.13	3.86	0.39	0.82	2.23	0.14	0.09	0.06	0.05
6	0.04	1.70	2.35	1.09	2.73	0.37	1.61	2.03	0.10	0.08	0.09	0.05
7	0.04	1.22	1.98	1.17	2.20	0.51	5.28	1.83	0.09	0.08	0.06	0.04
8	0.04	3.40	1.98	1.09	1.80	1.80	7.19	1.79	0.09	0.09	0.04	0.04
9	0.04	5.47	2.35	5.49	1.52	3.70	5.28	1.69	0.11	0.08	0.04	0.04
10	0.04	3.65	2.35	6.19	1.32	3.40	4.02	2.18	0.09	0.07	0.04	0.04
11	0.04	2.67	2.48	4.67	1.32	3.20	4.44	1.98	0.09	0.07	0.04	0.04
12	0.04	1.82	2.85	6.42	1.73	4.20	6.34	1.79	0.10	0.07	0.04	0.04
13	0.03	1.46	2.48	15.17	1.57	4.50	5.92	1.59	0.13	0.07	0.04	0.04
14	0.04	1.22	2.23	16.34	1.45	3.60	4.65	1.49	0.14	0.06	0.04	0.04
15	0.04	1.34	2.10	14.01	2.95	2.70	3.38	1.44	0.11	0.06	0.05	0.04
16	0.04	1.82	3.34	9.45	5.00	2.00	2.75	1.29	0.12	0.06	0.10	0.04
17	0.04	2.67	9.66	5.95	22.73	1.70	2.33	1.14	0.16	0.05	0.06	0.04
18	0.04	2.55	6.93	7.00	31.82	1.70	2.11	1.09	0.14	0.05	0.04	0.04
19	0.04	2.55	5.20	6.19	43.18	4.10	2.33	0.99	0.13	0.06	0.04	0.04
20	0.06	4.50	4.95	4.32	18.41	5.50	2.11	0.94	0.11	0.06	0.04	0.04
21	0.08	3.40	5.57	3.03	9.32	5.10	2.33	0.89	0.10	0.07	0.04	0.04
22	0.06	2.55	4.33	2.10	5.91	3.60	1.88	0.84	0.09	0.07	0.04	0.04
23	0.05	2.43	3.34	1.52	3.86	2.80	1.67	0.79	0.08	0.06	0.04	0.04
24	0.05	2.31	2.35	1.28	2.73	2.00	1.42	0.74	0.08	0.06	0.04	0.05
25	0.09	3.53	1.98	1.00	2.20	1.50	1.29	0.69	0.07	0.06	0.04	0.06
26	1.60	3.53	5.57	0.89	1.80	1.20	1.23	0.64	0.07	0.05	0.04	0.21
27	2.00	3.89	17.33	0.75	1.52	0.97	1.73	0.60	0.07	0.05	0.04	0.16
28	0.49	3.40	9.41	1.00	1.20	0.79	1.42	0.60	0.09	0.05	0.05	0.15
29	0.26	3.40	5.94	1.04	1.16	0.69	1.23	0.55	0.09	0.05	0.04	0.14
30	0.21	8.15	4.21	2.22		0.61	1.20	0.50	0.09	0.05	0.04	0.29
31	4.23		2.97	8.40		0.56		0.50		0.04	0.04	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.03	1.22	1.98	0.75	1.16	0.37	0.82	0.50	0.07	0.04	0.04	0.04
Max Q (cfs)	4.23	9.00	17.33	16.34	43.18	5.50	7.19	3.62	0.16	0.11	0.10	0.29
Mean Monthly Q (cfs)	0.32	3.17	4.87	4.37	7.35	2.10	2.66	1.47	0.10	0.07	0.05	0.07
Cumulative Q (cfs)	9.93	95.07	151.06	135.56	213.28	65.07	79.67	45.42	3.09	2.10	1.43	2.03
Annual Water Yield (in)		109.31				**Mean Annual Q (cfs)**			2.20			

Needle Branch Lower, Alsea Watershed Study												
Water Year 1997												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.11	0.15	17.23	3.20	0.68	6.30	0.25	1.19	1.53	0.51	0.11	0.00
2	0.38	0.13	12.06	2.88	0.68	5.25	0.26	1.01	1.20	0.40	0.11	0.00
3	0.24	0.13	8.24	2.72	0.58	10.49	0.24	0.84	0.98	0.36	0.11	0.00
4	0.15	0.15	6.15	2.56	1.42	13.12	0.24	0.68	0.80	0.40	0.11	0.07
5	0.13	0.21	5.54	2.40	3.95	12.59	0.22	0.65	0.62	0.33	0.11	0.04
6	0.11	0.28	3.69	5.11	6.17	9.97	0.21	0.51	0.51	0.26	0.11	0.04
7	0.10	2.69	2.95	4.31	8.02	8.92	0.20	0.49	0.40	0.22	0.11	0.04
8	0.08	4.30	2.71	3.99	6.17	7.34	0.18	0.38	0.33	0.18	0.11	0.04
9	0.52	2.15	3.69	3.36	5.06	6.30	0.17	0.31	0.26	0.15	0.11	0.04
10	4.73	6.52	9.11	2.72	4.01	5.25	0.19	0.25	0.22	0.11	0.11	0.04
11	2.45	6.72	7.87	2.24	3.21	4.41	0.40	0.19	0.18	0.07	0.15	0.04
12	1.55	5.18	18.46	1.76	2.59	3.51	1.29	0.59	0.15	0.07	0.15	0.04
13	0.93	3.77	12.30	1.92	2.04	2.78	1.80	0.75	0.11	0.04	0.11	0.33
14	0.67	2.49	17.23	3.84	1.67	2.20	1.29	0.63	0.07	0.04	0.07	3.00
15	0.51	1.68	16.00	3.52	1.48	1.99	0.84	0.77	0.07	0.04	0.07	0.77
16	0.72	1.34	12.30	3.36	1.85	1.57	0.96	0.68	0.04	0.04	0.04	0.44
17	0.73	1.08	10.83	3.99	2.34	1.26	0.96	1.37	0.36	2.37	0.04	0.04
18	0.62	0.87	8.86	3.84	2.10	1.00	1.41	1.83	0.33	2.74	0.04	0.00
19	0.64	0.74	7.51	5.11	3.08	1.05	1.99	1.46	0.26	0.77	0.04	0.00
20	0.54	0.62	6.15	4.79	2.78	0.89	2.25	1.19	0.22	0.51	0.04	0.00
21	0.47	0.55	4.92	5.11	2.65	1.05	2.12	1.37	0.18	0.44	0.00	0.00
22	0.42	0.53	3.94	5.91	3.08	3.20	2.83	1.74	0.15	0.36	0.00	0.00
23	0.38	1.34	3.08	6.23	2.90	2.62	7.07	1.46	0.91	0.36	0.00	0.00
24	0.51	1.48	2.46	5.75	2.34	3.20	7.07	1.19	1.57	0.33	0.00	0.00
25	1.26	2.15	1.97	5.11	1.85	2.52	4.11	0.92	1.28	0.33	0.00	0.00
26	1.08	3.83	1.85	5.75	1.48	2.05	2.96	0.73	1.02	0.29	0.00	0.00
27	0.91	5.72	3.20	5.27	1.17	1.63	2.25	0.59	0.88	0.29	0.00	0.00
28	0.77	10.09	4.68	4.47	0.93	1.78	1.74	0.57	0.98	0.26	0.00	0.00
29	0.62	14.12	4.18	3.52		1.78	1.41	0.75	0.80	0.26	0.00	0.00
30	0.51	12.78	3.57	2.88		1.73	1.03	0.60	0.62	0.18	0.04	0.00
31	0.42		2.83	2.24		2.05		0.49		0.15	0.04	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.08	0.13	1.85	1.76	0.58	0.89	0.17	0.19	0.04	0.04	0.00	0.00
Max Q (cfs)	4.73	14.12	18.46	6.23	8.02	13.12	7.07	1.83	1.57	2.74	0.15	3.00
Mean Monthly Q (cfs)	0.75	3.13	7.28	3.87	2.72	4.19	1.60	0.84	0.57	0.41	0.06	0.16
Cumulative Q (cfs)	23.23	93.81	225.54	119.85	76.28	129.79	47.94	26.19	17.04	12.84	1.90	4.93
Annual Water Yield (in)		106.00				**Mean Annual Q (cfs)**			2.14			

Needle Branch Lower, Alsea Watershed Study												
Water Year 1998												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.53	0.35	1.54	20.15	14.57	3.16	0.83	2.64	0.71	0.17	0.10	0.03
2	0.53	0.33	1.70	16.75	8.54	4.89	0.83	2.55	0.54	0.17	0.06	0.02
3	0.53	0.33	2.00	10.45	5.50	3.36	0.69	2.38	0.57	0.19	0.06	0.04
4	0.55	0.43	2.46	6.36	4.37	2.58	0.64	2.21	0.57	0.19	0.07	0.04
5	0.60	0.49	3.99	4.79	3.51	2.11	0.60	1.96	0.49	0.20	0.05	0.04
6	0.65	0.45	2.00	3.53	2.98	3.23	0.50	1.79	0.47	0.22	0.04	0.04
7	0.65	0.45	2.15	2.71	2.78	4.99	0.50	1.62	0.44	0.19	0.04	0.04
8	0.58	0.41	3.38	2.33	2.32	3.57	0.50	1.45	0.38	0.21	0.03	0.04
9	0.56	0.39	2.46	1.95	2.05	2.72	0.45	1.28	0.36	0.38	0.03	0.04
10	0.53	0.34	1.70	1.70	1.86	6.22	0.43	1.19	0.34	0.57	0.03	0.06
11	0.51	0.34	1.54	1.57	1.79	7.17	0.40	1.11	0.38	0.32	0.14	0.05
12	0.66	0.32	1.47	1.45	2.12	4.89	0.38	1.02	0.40	0.29	0.14	0.07
13	2.15	0.55	2.00	1.32	2.05	3.67	0.45	0.93	0.22	0.22	0.08	0.09
14	1.34	0.96	1.24	1.20	2.05	2.72	0.78	0.86	0.24	0.22	0.08	0.08
15	1.24	0.96	1.01	1.07	1.99	2.55	0.87	0.78	0.21	0.21	0.02	0.47
16	1.08	1.33	0.78	1.01	1.86	4.08	0.78	0.72	0.20	0.20	0.02	0.36
17	0.81	1.88	0.70	3.46	1.72	3.87	0.69	0.71	0.26	0.21	0.02	1.41
18	2.15	4.63	0.63	6.11	1.66	2.82	0.60	0.66	0.21	0.20	0.03	1.53
19	3.14	27.53	0.55	3.27	4.44	2.21	1.37	0.61	0.19	0.17	0.02	0.71
20	1.98	6.73	0.50	2.71	4.44	1.84	5.63	0.60	0.17	0.17	0.03	0.42
21	1.32	3.80	0.69	3.02	3.38	1.53	2.79	0.55	0.40	0.17	0.05	0.31
22	1.98	4.31	0.78	2.77	3.05	1.26	2.43	0.55	0.40	0.17	0.03	0.27
23	2.48	2.70	0.93	2.33	2.65	1.09	3.12	0.45	0.31	0.16	0.02	0.24
24	5.95	2.57	1.39	2.02	2.25	0.95	2.61	0.74	0.26	0.16	0.07	0.21
25	8.09	2.79	2.89	2.39	1.99	0.82	2.06	0.63	0.24	0.14	0.09	0.27
26	7.43	2.24	5.79	2.77	1.92	0.75	1.70	0.58	0.22	0.14	0.07	0.27
27	3.80	1.97	3.68	2.46	1.86	0.71	1.42	0.63	0.24	0.13	0.21	0.22
28	1.74	3.48	2.31	3.90	1.72	0.71	1.33	1.06	0.21	0.12	0.08	0.20
29	1.82	3.02	4.60	3.09		0.61	1.37	0.74	0.26	0.13	0.07	0.26
30	1.60	2.79	4.17	4.22		0.61	1.37	0.67	0.22	0.13	0.04	0.42
31	1.41		4.38	17.50		0.61		2.43		0.12	0.04	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.51	0.32	0.50	1.01	1.66	0.61	0.38	0.45	0.17	0.12	0.02	0.02
Max Q (cfs)	8.09	27.53	5.79	20.15	14.57	7.17	5.63	2.64	0.71	0.57	0.21	1.53
Mean Monthly Q (cfs)	1.88	2.63	2.11	4.53	3.26	2.65	1.27	1.16	0.34	0.20	0.06	0.28
Cumulative Q (cfs)	58.40	78.91	65.41	140.35	91.42	82.30	38.12	36.11	10.11	6.27	1.86	8.25
Annual Water Yield (in)		83.99				**Mean Annual Q (cfs)**			1.69			

Needle Branch Lower, Alsea Watershed Study												
Water Year 1999												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.68	3.83	1.65	1.83	1.95	5.85	1.31	0.40	0.54	0.24	0.08	0.02
2	0.92	2.51	1.47	2.37	2.02	4.87	1.16	0.42	0.49	0.24	0.08	0.02
3	1.83	1.89	1.31	2.59	1.95	5.17	1.01	0.32	0.47	0.24	0.08	0.02
4	2.93	1.59	1.16	3.40	2.04	5.00	0.88	0.31	0.47	0.22	0.07	0.02
5	2.44	1.31	0.92	5.85	2.44	4.09	0.81	0.31	0.42	0.20	0.06	0.02
6	1.71	1.41	0.84	7.16	2.67	3.02	0.78	0.27	0.38	0.17	0.05	0.01
7	1.16	1.26	1.47	5.68	2.51	2.44	0.74	0.27	0.38	0.17	0.04	0.01
8	2.16	1.06	1.95	4.35	3.30	2.02	0.65	0.27	0.34	0.16	0.04	0.01
9	3.20	0.74	3.30	3.11	3.96	1.65	0.63	0.26	0.34	0.14	0.04	0.01
10	3.40	0.65	5.51	2.44	3.96	1.41	0.74	0.26	0.44	0.14	0.03	0.01
11	2.93	0.63	3.50	4.48	4.22	1.26	1.89	0.24	0.34	0.14	0.03	0.01
12	2.51	0.60	2.59	6.02	5.17	1.59	1.65	0.29	0.31	0.14	0.03	0.01
13	2.16	0.54	2.02	7.85	6.36	2.04	1.53	0.32	0.29	0.13	0.04	0.01
14	1.65	0.52	1.89	9.90	6.02	1.89	1.47	0.49	0.29	0.13	0.04	0.01
15	1.31	0.49	1.89	9.30	5.00	1.65	1.31	0.49	0.29	0.12	0.05	0.01
16	1.06	0.47	2.30	6.53	4.09	1.41	1.21	0.49	0.29	0.10	0.08	0.01
17	0.88	0.88	9.30	6.02	3.20	1.21	1.06	0.49	0.27	0.10	0.08	0.01
18	0.78	0.68	4.22	5.68	2.84	1.06	0.92	0.47	0.26	0.10	0.05	0.12
19	0.68	1.41	4.22	6.02	2.67	0.92	0.81	0.54	0.26	0.10	0.05	0.17
20	0.60	7.16	3.60	6.93	3.20	0.84	0.71	1.36	0.24	0.09	0.03	0.06
21	0.54	6.02	2.44	5.34	8.54	1.53	0.68	3.11	0.24	0.09	0.02	0.03
22	0.49	3.02	2.04	4.48	7.85	4.48	0.63	2.30	0.22	0.09	0.02	0.02
23	0.47	3.83	1.89	4.87	5.51	6.70	0.60	1.59	0.22	0.09	0.03	0.02
24	0.42	5.85	1.77	6.70	3.70	5.85	0.60	1.31	0.32	0.08	0.04	0.02
25	0.40	4.61	1.59	6.93	2.84	4.09	0.52	1.11	0.31	0.07	0.04	0.07
26	0.38	3.60	1.41	4.74	2.16	3.30	0.47	0.92	0.42	0.07	0.03	0.07
27	0.38	2.75	1.36	3.20	1.71	2.84	0.44	0.81	0.29	0.06	0.02	0.07
28	0.36	2.23	1.21	2.37	4.22	2.44	0.40	0.74	0.27	0.06	0.02	0.70
29	1.11	2.02	1.11	2.16		2.04	0.38	0.74	0.26	0.06	0.02	0.06
30	2.44	1.89	1.01	1.83		1.83	0.38	0.65	0.26	0.08	0.02	0.06
31	7.39		0.96	1.53		1.59		0.57		0.08	0.02	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.36	0.47	0.84	1.53	1.71	0.84	0.38	0.24	0.22	0.06	0.02	0.01
Max Q (cfs)	7.39	7.16	9.30	9.90	8.54	6.70	1.89	3.11	0.54	0.24	0.08	0.70
Mean Monthly Q (cfs)	1.59	2.18	2.32	4.89	3.79	2.78	0.88	0.71	0.33	0.13	0.04	0.06
Cumulative Q (cfs)	49.37	65.45	71.90	151.66	106.10	86.08	26.37	22.12	9.92	3.90	1.33	1.69
Annual Water Yield (in)		81.05				**Mean Annual Q (cfs)**			1.63			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2000												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
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27												
28												
29												
30												
31												
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.00	2.13	3.93	3.62	2.97	1.62	0.60	1.09	0.71	0.00	0.00	0.00
Max Q (cfs)	0.00	2.13	3.93	3.62	2.97	1.62	0.60	1.09	0.71	0.00	0.00	0.00
Mean Monthly Q (cfs)	0.00	2.13	3.93	3.62	2.97	1.62	0.60	1.09	0.71	0.00	0.00	0.00
Cumulative Q (cfs)	0.00	63.85	121.92	112.08	86.06	50.27	17.85	33.82	21.35	0.00	0.00	0.00
Annual Water Yield (in)		68.98				**Mean Annual Q (cfs)**			1.39			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2001												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.01	0.01	0.53	0.14	1.82	2.58	1.43	0.47	0.13	0.26	0.03	0.02
2	0.01	0.01	1.87	0.17	1.99	1.96	1.29	0.47	0.12	0.22	0.03	0.03
3	0.01	0.01	1.35	0.24	1.39	1.54	1.22	0.44	0.12	0.21	0.02	0.04
4	0.01	0.01	0.97	0.92	0.91	1.25	1.11	0.44	0.11	0.19	0.02	0.04
5	0.01	0.03	0.77	0.75	0.67	1.06	1.07	0.42	0.10	0.17	0.02	0.03
6	0.01	0.04	1.24	0.50	0.52	0.88	1.00	0.42	0.10	0.16	0.02	0.02
7	0.01	0.02	2.35	0.40	0.46	0.76	0.95	0.38	0.11	0.14	0.02	0.02
8	0.01	0.03	2.11	0.47	1.35	0.67	0.91	0.36	0.14	0.14	0.02	0.02
9	0.02	0.08	1.81	1.60	1.35	0.58	0.82	0.36	0.12	0.16	0.02	0.04
10	0.01	0.23	1.81	1.60	0.94	0.51	0.73	0.81	0.12	0.14	0.02	0.04
11	0.01	0.15	1.53	1.39	0.80	0.55	0.66	4.09	0.16	0.14	0.02	0.04
12	0.01	0.50	1.62	1.27	0.78	0.51	0.73	8.54	0.97	0.13	0.02	0.04
13	0.01	0.32	1.87	2.12	0.88	0.47	0.73	5.00	3.72	0.13	0.02	0.03
14	0.01	0.16	3.68	1.55	1.43	1.06	0.91	2.75	1.83	0.12	0.02	0.02
15	0.01	0.11	4.56	1.10	1.61	1.25	0.86	2.16	1.10	0.10	0.01	0.02
16	0.01	0.09	5.47	0.89	1.22	1.09	1.11	1.71	0.76	0.09	0.01	0.02
17	0.01	0.07	3.29	0.73	0.85	1.12	0.91	1.21	0.55	0.08	0.01	0.02
18	0.01	0.06	2.59	0.52	0.64	1.06	0.82	1.01	0.42	0.08	0.01	0.01
19	0.01	0.09	1.71	0.41	0.50	1.09	0.77	0.84	0.33	0.08	0.02	0.01
20	0.01	0.12	1.14	0.35	0.40	1.18	0.73	0.74	0.28	0.07	0.02	0.01
21	0.01	0.21	0.74	0.35	0.35	1.18	0.70	0.65	0.24	0.07	0.02	0.01
22	0.01	0.23	0.53	0.32	0.58	1.06	0.70	0.57	0.21	0.07	0.01	0.01
23	0.01	0.25	0.40	0.28	0.54	0.92	0.82	0.52	0.18	0.06	0.01	0.01
24	0.02	0.47	0.33	0.33	0.48	0.78	1.00	0.49	0.18	0.06	0.01	0.01
25	0.08	3.37	0.26	0.50	0.46	0.67	0.91	0.44	0.16	0.06	0.02	0.01
26	0.07	3.09	0.23	0.47	0.91	0.53	1.00	0.42	0.14	0.05	0.02	0.01
27	0.27	0.89	0.20	0.40	1.12	0.45	0.91	0.49	0.13	0.05	0.03	0.01
28	0.60	0.47	0.18	0.34	1.00	0.39	0.95	0.47	0.12	0.05	0.02	0.01
29	0.13	0.30	0.16	0.27		0.33	1.22	0.44	0.12	0.04	0.02	0.01
30	0.09	0.21	0.15	0.23		0.31	1.11	0.38	0.10	0.04	0.02	0.01
31	0.20		0.14	0.22		0.39		0.38		0.04	0.02	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.01	0.01	0.14	0.14	0.35	0.31	0.66	0.36	0.10	0.04	0.01	0.01
Max Q (cfs)	0.60	3.37	5.47	2.12	1.99	2.58	1.43	8.54	3.72	0.26	0.03	0.04
Mean Monthly Q (cfs)	0.05	0.39	1.47	0.67	0.93	0.91	0.93	1.22	0.43	0.11	0.02	0.02
Cumulative Q (cfs)	1.70	11.65	45.58	20.81	25.98	28.15	28.03	37.87	12.87	3.40	0.58	0.62
Annual Water Yield (in)		29.55				**Mean Annual Q (cfs)**			0.60			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2002												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.01	0.84	1.33	2.56	1.79	1.58	1.59	1.71	0.36	0.14	0.08	0.04
2	0.20	1.92	1.72	2.25	1.79	1.72	1.47	1.21	0.32	0.14	0.06	0.04
3	0.07	1.92	1.57	2.07	1.89	1.89	1.59	1.01	0.47	0.14	0.06	0.04
4	0.04	1.68	1.33	1.98	1.89	1.58	1.59	0.88	0.14	0.14	0.07	0.04
5	0.04	1.68	1.21	1.98	2.13	1.53	1.47	0.81	0.14	0.14	0.06	0.05
6	0.03	1.56	1.09	2.07	3.42	1.46	1.53	0.74	0.14	0.14	0.05	0.07
7	0.03	1.68	1.03	1.74	3.42	1.38	1.83	0.68	0.14	0.14	0.04	0.06
8	0.03	1.44	0.97	1.64	3.05	1.31	1.83	0.63	0.14	0.14	0.04	0.05
9	0.03	3.24	0.94	1.74	2.69	1.80	1.77	0.57	0.14	0.14	0.04	0.04
10	0.26	3.48	0.87	2.25	2.81	2.69	1.59	0.54	0.14	0.14	0.04	0.03
11	0.12	2.64	0.81	2.47	2.69	2.57	2.02	0.52	0.14	0.14	0.04	0.03
12	0.08	2.28	1.03	2.37	2.57	2.33	2.84	0.47	0.14	0.14	0.05	0.03
13	0.06	1.92	0.94	2.37	2.33	2.14	2.51	0.44	0.14	0.14	0.04	0.03
14	0.07	1.92	2.53	8.37	2.23	1.97	2.23	0.44	0.14	0.14	0.05	0.03
15	0.08	1.68	5.34	17.29	2.13	1.89	1.95	1.65	0.14	0.14	0.04	0.03
16	0.05	1.44	8.57	12.45	2.04	2.04	1.71	1.83	0.14	0.14	0.05	0.03
17	0.07	1.44	6.94	8.37	1.96	1.80	1.47	1.83	0.14	0.14	0.05	0.04
18	0.09	1.20	6.94	6.21	2.23	1.89	1.26	1.36	0.14	0.14	0.05	0.04
19	0.12	1.20	5.52	5.21	2.45	3.42	1.16	1.01	0.14	0.14	0.05	0.04
20	0.08	1.08	4.25	4.47	2.45	6.09	1.01	0.78	0.14	0.13	0.05	0.03
21	0.44	1.08	3.50	3.68	2.45	4.95	0.88	0.65	0.14	0.14	0.05	0.03
22	0.29	1.08	4.98	3.84	2.45	4.01	0.81	0.74	0.14	0.14	0.08	0.03
23	0.19	1.08	24.37	3.38	2.45	3.30	0.74	0.78	0.14	0.14	0.24	0.03
24	0.12	3.48	16.62	3.07	2.33	2.82	0.68	0.68	0.14	0.12	0.14	0.03
25	0.09	2.28	11.55	2.92	2.23	2.57	0.65	0.63	0.14	0.13	0.07	0.03
26	0.08	2.52	8.30	2.92	1.96	2.69	0.60	0.57	0.14	0.13	0.05	0.03
27	0.08	5.65	6.15	2.56	1.89	2.33	0.54	0.54	0.14	0.14	0.04	0.07
28	0.12	6.85	4.80	2.47	1.72	3.57	0.52	0.49	0.14	0.04	0.04	0.04
29	0.47	5.29	3.95	2.37		5.92	0.54	0.57	0.14	0.07	0.04	0.03
30	0.32	7.81	3.35	2.56		4.95	0.54	0.44	0.14	0.12	0.04	0.03
31	0.10		2.78	2.37		4.15		0.40		0.16	0.04	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.01	0.84	0.81	1.64	1.72	1.31	0.52	0.40	0.14	0.04	0.04	0.03
Max Q (cfs)	0.47	7.81	24.37	17.29	3.42	6.09	2.84	1.83	0.47	0.16	0.24	0.07
Mean Monthly Q (cfs)	0.12	2.45	4.69	3.94	2.34	2.72	1.36	0.83	0.16	0.13	0.06	0.04
Cumulative Q (cfs)	3.86	73.41	145.24	122.01	65.46	84.36	40.92	25.60	4.84	4.05	1.84	1.14
Annual Water Yield (in)		77.90				**Mean Annual Q (cfs)**			1.57			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2003												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.02	0.35	4.20	0.53	3.70	0.52	0.81	0.47	0.21	0.52	0.04	0.01
2	0.02	0.34	8.84	0.63	4.61	0.49	0.73	0.42	0.21	0.29	0.02	0.01
3	0.02	0.33	4.96	0.71	3.70	0.47	0.68	0.40	0.21	0.26	0.01	0.01
4	0.02	0.32	3.04	0.69	3.20	0.44	0.62	0.38	0.20	0.22	0.01	0.01
5	0.02	0.31	4.07	0.66	2.84	0.42	0.59	0.36	0.19	0.21	0.02	0.01
6	0.02	0.30	7.11	0.69	2.59	0.84	0.62	0.42	0.17	0.20	0.04	0.01
7	0.02	0.29	6.61	2.14	2.51	1.59	0.56	0.40	0.19	0.19	0.06	0.01
8	0.01	0.28	4.07	5.50	7.62	1.31	0.53	0.32	0.16	0.16	0.06	0.01
9	0.02	0.28	2.61	5.66	8.31	1.11	0.48	0.31	0.14	0.16	0.04	0.01
10	0.02	0.27	2.25	3.07	5.17	1.11	0.93	0.31	0.20	0.16	0.05	0.01
11	0.10	0.26	2.40	2.14	3.83	1.89	0.98	0.32	0.16	0.13	0.08	0.01
12	0.14	0.25	2.75	1.40	2.44	4.35	1.15	0.34	0.14	0.12	0.04	0.01
13	0.08	0.24	2.85	1.44	1.89	6.93	1.57	0.31	0.13	0.10	0.03	0.01
14	0.08	0.23	4.96	1.24	1.47	5.51	4.14	0.32	0.12	0.10	0.03	0.01
15	0.08	0.22	6.45	1.13	1.21	4.87	8.80	0.29	0.10	0.09	0.02	0.01
16	0.08	0.21	3.82	0.93	1.01	3.83	6.14	0.27	0.10	0.09	0.03	0.01
17	0.07	0.18	3.69	0.93	0.88	3.02	5.42	0.27	0.10	0.08	0.03	0.01
18	0.06	0.15	4.07	0.80	0.81	2.75	4.96	0.29	0.10	0.09	0.03	0.02
19	0.04	0.12	3.04	0.83	0.81	30.40	3.67	0.26	0.31	0.09	0.03	0.05
20	0.03	0.13	2.68	1.63	0.74	6.36	3.16	0.27	0.26	0.09	0.04	0.03
21	0.02	0.13	2.18	7.54	0.68	5.00	2.56	0.27	0.20	0.09	0.03	0.03
22	0.06	0.20	1.61	7.54	0.65	3.30	2.03	0.26	0.16	0.08	0.03	0.02
23	0.63	2.56	1.34	4.35	0.68	2.30	1.64	0.31	0.14	0.07	0.02	0.02
24	0.29	1.49	0.98	3.15	0.65	1.71	1.36	0.24	0.14	0.07	0.02	0.02
25	0.17	0.87	0.81	2.42	0.63	1.31	1.21	0.22	0.13	0.07	0.02	0.01
26	0.12	0.61	0.67	7.54	0.63	1.06	1.05	0.21	0.12	0.07	0.02	0.01
27	0.10	0.52	0.56	5.66	0.60	0.84	1.26	0.20	0.10	0.08	0.02	0.01
28	0.16	0.46	0.58	3.24	0.54	0.74	0.98	0.24	0.09	0.08	0.02	0.01
29	0.16	1.21	0.51	2.28		0.68	0.84	0.31	0.10	0.06	0.01	0.01
30	1.06	1.94	0.48	1.58		0.60	0.76	0.34	0.32	0.05	0.01	0.01
31	1.89		0.51	1.24		0.57		0.24		0.04	0.01	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.01	0.12	0.48	0.53	0.54	0.42	0.48	0.20	0.09	0.04	0.01	0.01
Max Q (cfs)	1.89	2.56	8.84	7.54	8.31	30.40	8.80	0.47	0.32	0.52	0.08	0.05
Mean Monthly Q (cfs)	0.18	0.50	3.05	2.56	2.30	3.11	2.01	0.31	0.16	0.13	0.03	0.01
Cumulative Q (cfs)	5.61	15.06	94.70	79.31	64.40	96.32	60.21	9.57	4.90	4.11	0.92	0.42
Annual Water Yield (in)		59.24				**Mean Annual Q (cfs)**			1.19			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2004												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.01	0.22	0.08	11.70	17.30	0.26	1.05	0.68	1.17		0.01	0.00
2	0.01	0.27	0.08	6.70	10.16	0.25	1.24	0.63	1.17		0.01	0.00
3	0.01	0.32	0.08	4.48	5.66	0.23	1.89	0.78	1.11		0.01	0.00
4	0.03	0.32	0.08	3.40	3.85	0.21	2.64	1.47	0.95		0.01	0.00
5	0.04	0.38	0.16	3.70	2.76	0.34	2.64	1.41	0.89		0.01	0.00
6	0.03	0.38	0.13	4.61	1.87	1.80	3.97	1.31	0.78		0.00	0.00
7	0.04	0.27	0.10	3.40	1.41	6.98	3.06	1.11	0.78		0.00	0.00
8	0.04	1.30	0.09	2.51	1.10	3.87	2.27	0.96	0.72		0.00	0.00
9	0.03	1.68	0.08	2.02	0.91	1.92	1.53	0.88	0.72		0.01	0.00
10	0.03	2.55	0.13	1.59	0.76	1.31	1.17	0.78	0.72		0.01	0.00
11	0.03	1.30	0.49	1.31	0.66	0.86	0.98	0.71	0.67		0.01	0.00
12	0.03	1.08	1.21	1.16	0.58	0.81	0.84	0.65	0.67		0.01	0.00
13	0.03	1.57	2.02	2.02	0.53	0.81	0.78	0.60	0.95		0.01	0.00
14	0.03	1.41	2.51	3.40	0.49	1.17	0.72	0.57	0.67		0.01	0.00
15	0.02	1.41	6.70	2.93	0.45	1.24	0.64	0.54	0.56		0.00	0.00
16	0.03	1.14	10.50	2.44	0.51	0.91	0.58	0.54	0.50		0.00	0.01
17	0.04	1.30	15.00	2.02	0.61	0.70	0.58	0.49	0.50		0.00	0.01
18	0.04	1.19	6.36	1.71	1.46	0.54	0.53	0.44	0.56		0.00	0.01
19	0.03	1.57	6.02	1.41	1.98	0.52	0.50	0.40	0.50		0.00	0.01
20	0.03	2.55	4.35	1.21	1.46	0.64	0.46	0.38	0.50		0.00	0.01
21	0.04	1.41	3.30	1.06	1.32	3.55	0.45	0.36	0.50		0.00	0.01
22	0.04	1.30	4.35	0.92	2.24	3.87	0.41	0.34	0.50		0.00	0.01
23	0.03	1.08	3.60	1.16	3.13	2.11	0.61	0.31	0.45		0.00	0.01
24	0.03	0.92	2.75	0.81	2.45	1.48	0.55	0.32	0.45		0.00	0.01
25	0.03	0.92	2.75	1.06	1.81	1.13	0.58	0.31	0.39		0.00	0.01
26	0.04	0.87	2.37	1.11	1.46	1.17	0.61	0.29	0.33		0.00	0.01
27	0.04	0.54	2.75	2.37	1.15	0.99	0.55	0.26	0.28		0.00	0.01
28	0.04	0.54	4.09	3.40	0.94	0.81	0.53	0.24	0.22		0.00	0.01
29	0.04	0.49	4.22	2.51	0.84	0.66	0.46	0.24	0.22		0.00	0.01
30	0.04	0.49	4.22	7.85		0.52	0.45	0.22	0.39		0.00	0.01
31	0.04		8.31	14.40		0.46		0.21			0.00	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.01	0.22	0.08	0.81	0.45	0.21	0.41	0.21	0.22	0.01	0.00	0.00
Max Q (cfs)	0.04	2.55	15.00	14.40	17.30	6.98	3.97	1.47	1.17	0.01	0.01	0.01
Mean Monthly Q (cfs)	0.03	1.03	3.19	3.24	2.41	1.36	1.11	0.59	0.63	0.01	0.00	0.00
Cumulative Q (cfs)	0.99	30.77	98.88	100.37	69.84	42.12	33.23	18.43	18.83	0.41	0.08	0.15
Annual Water Yield (in)		56.32				**Mean Annual Q (cfs)**			1.13			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2005												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.08	0.05	0.86	1.64	1.67	3.70	1.41	1.71	0.63	0.22	0.04	0.07
2	0.08	0.08	0.79	1.75	1.28	2.75	1.31	1.51	0.57	0.24	0.04	0.07
3	0.08	0.08	0.81	1.70	0.86	2.04	1.24	1.31	0.52	0.20	0.03	0.07
4	0.08	0.10	0.86	1.64	0.68	1.95	1.14	1.11	0.47	0.20	0.03	0.06
5	0.08	0.08	1.17	1.39	0.56	2.44	1.06	1.11	0.42	0.19	0.04	0.05
6	0.08	0.07	2.07	1.39	0.60	3.70	1.01	1.03	0.49	0.17	0.04	0.04
7	0.71	0.08	1.78	1.64	0.60	3.96	0.87	0.94	0.81	0.17	0.05	0.04
8	0.55	0.08	1.82	1.75	0.56	2.84	0.87	0.85	1.01	0.17	0.08	0.03
9	0.79	0.08	1.54	1.47	0.49	2.30	0.82	1.11	1.01	0.16	0.05	0.03
10	0.63	0.12	1.35	1.05	0.42	1.83	0.74	0.99	1.06	0.16	0.03	0.03
11	0.63	0.22	1.07	0.85	0.37	1.47	0.60	1.11	1.16	0.16	0.03	0.04
12	0.95	0.10	1.17	0.73	0.31	1.26	0.52	1.22	1.11	0.14	0.03	0.21
13	0.63	0.07	6.11	0.60	0.28	1.06	0.45	0.85	0.96	0.13	0.02	0.14
14	0.47	0.05	4.49	0.54	0.30	0.92	1.01	0.75	1.01	0.12	0.02	0.24
15	0.63	0.34	2.44	0.46	0.25	0.81	1.01	0.73	0.81	0.12	0.02	0.17
16	0.79	0.92	1.68	0.43	0.50	0.71	0.87	0.73	0.71	0.12	0.02	0.29
17	0.63	0.40	1.10	0.38	0.74	0.65	0.82	0.73	0.65	0.12	0.02	0.19
18	0.63	0.31	0.84	0.43	1.17	0.63	0.79	0.63	0.57	0.10	0.02	0.60
19	1.50	1.01	0.69	0.46	1.09	0.68	0.67	0.75	0.54	0.10	0.02	0.92
20	1.90	0.78	0.56	0.46	0.89	0.57	1.36	0.63	0.49	0.09	0.02	0.74
21	1.66	0.57	0.48	0.46	0.70	0.52	3.74	0.56	0.44	0.08	0.02	0.47
22	1.50	0.42	0.41	0.41	0.57	0.47	7.74	0.61	0.42	0.08	0.02	0.34
23	0.63	0.44	0.41	0.73	0.47	0.44	4.35	0.75	0.42	0.08	0.14	0.27
24	0.40	0.60	0.74	1.51	0.50	0.54	3.07	0.63	0.40	0.07	0.21	0.22
25	0.24	2.16	1.07	1.56	0.57	0.49	2.47	0.56	0.38	0.06	0.32	0.21
26	0.24	1.89	1.00	1.39	0.81	0.81	1.95	0.52	0.32	0.06	0.47	0.20
27	0.24	1.21	2.44	1.12	1.52	1.71	1.80	0.56	0.31	0.05	0.36	0.19
28	0.32	2.02	5.25	1.92	1.44	1.83	1.66	1.22	0.29	0.05	0.19	0.17
29	0.63	8.08	4.93	6.65		1.41	1.51	2.07	0.26	0.04	0.13	0.16
30	0.63	3.83	2.70	5.39		1.16	1.37	1.83	0.24	0.04	0.09	0.14
31	0.40		1.95	2.66		0.96		1.67		0.04	0.08	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.08	0.05	0.41	0.38	0.25	0.44	0.45	0.52	0.24	0.04	0.02	0.03
Max Q (cfs)	1.90	8.08	6.11	6.65	1.67	3.96	7.74	2.07	1.16	0.24	0.47	0.92
Mean Monthly Q (cfs)	0.61	0.87	1.76	1.44	0.72	1.50	1.61	0.99	0.62	0.12	0.09	0.21
Cumulative Q (cfs)	18.82	26.24	54.59	44.60	20.20	46.61	48.26	30.80	18.48	3.73	2.68	6.40
Annual Water Yield (in)		43.71				**Mean Annual Q (cfs)**			0.88			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2006												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.18	2.29	2.75	8.54	8.31	1.16	1.21	0.47	0.34	0.09	0.10	0.07
2	0.23	1.36	2.84	5.68	5.68	1.21	1.16	0.44	0.49	0.09	0.10	0.07
3	0.34	2.29	4.09	4.61	4.35	1.16	1.11	0.40	0.40	0.09	0.07	0.07
4	0.19	2.66	3.83	3.96	4.35	1.06	1.01	0.38	0.47	0.09	0.07	0.07
5	0.10	2.75	3.20	3.20	4.09	1.06	0.92	0.36	0.42	0.09	0.07	0.07
6	0.13	3.71	2.51	3.30	3.30	1.21	0.84	0.36	0.38	0.09	0.07	0.07
7	0.04	2.36	2.02	5.34	2.59	2.37	0.81	0.38	0.36	0.08	0.07	0.07
8	0.05	1.55	1.59	6.19	2.02	3.20	0.74	0.34	0.34	0.06	0.07	0.07
9	0.09	1.15	1.26	5.68	1.65	5.00	0.71	0.31	0.31	0.05	0.07	0.07
10	0.06	0.91	1.06	16.58	1.36	4.61	0.68	0.29	0.29	0.06	0.07	0.07
11	0.04	0.84	0.92	14.40	1.11	4.09	0.68	0.27	0.27	0.15	0.07	0.07
12	0.03	1.11	0.81	8.54	0.96	3.40	0.65	0.26	0.27	0.12	0.07	0.07
13	0.04	3.20	0.71	5.85	0.84	2.84	0.57	0.26	0.27	0.12	0.07	0.07
14	0.06	3.11	0.65	4.48	0.81	2.44	0.71	0.22	0.27	0.10	0.07	0.07
15	0.40	2.29	0.60	3.70	0.71	2.09	1.95	0.21	0.27	0.13	0.07	0.10
16	0.20	1.70	0.57	3.60	0.65	2.67	3.11	0.20	0.29	0.13	0.07	0.08
17	0.10	1.27	0.52	11.10	0.60	3.60	2.59	0.20	0.24	0.11	0.07	0.08
18	0.08	0.95	0.49	9.30	0.54	3.96	2.02	0.19	0.21	0.11	0.07	0.08
19	0.19	0.77	0.74	6.02	0.52	3.40	1.65	0.19	0.20	0.09	0.07	0.11
20	0.22	0.64	0.81	8.08	0.49	2.75	1.41	0.19	0.19	0.11	0.07	0.10
21	0.14	0.54	2.51	6.93	0.47	2.23	1.26	0.17	0.19	0.11	0.07	0.12
22	0.09	0.47	8.54	5.00	0.47	1.77	1.06	0.20	0.17	0.11	0.07	0.11
23	0.08	0.44	6.53	3.83	0.47	1.53	0.92	0.27	0.16	0.09	0.07	0.10
24	0.08	0.49	4.09	2.93	0.44	1.71	0.84	0.21	0.14	0.08	0.07	0.07
25	0.10	1.65	3.20	2.37	0.40	1.65	0.74	0.20	0.14	0.10	0.07	0.05
26	0.21	2.75	3.50	2.51	0.44	1.71	0.68	0.49	0.13	0.10	0.07	0.05
27	0.14	2.04	3.83	4.09	0.71	1.65	0.63	0.44	0.12	0.10	0.07	0.02
28	0.38	1.80	13.20	6.02	1.06	1.59	0.57	0.47	0.12	0.10	0.07	0.02
29	0.36	1.91	8.08	7.39		1.47	0.54	0.34	0.12	0.10	0.07	0.02
30	0.27	2.10	14.40	8.31		1.36	0.49	0.29	0.10	0.10	0.07	0.01
31	0.88		15.22	6.70		1.26		0.29		0.10	0.07	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.03	0.44	0.49	2.37	0.40	1.06	0.49	0.17	0.10	0.05	0.07	0.01
Max Q (cfs)	0.88	3.71	15.22	16.58	8.31	5.00	3.11	0.49	0.49	0.15	0.10	0.12
Mean Monthly Q (cfs)	0.18	1.70	3.71	6.27	1.76	2.30	1.08	0.30	0.26	0.10	0.07	0.07
Cumulative Q (cfs)	5.50	51.11	115.07	194.23	49.39	71.21	32.26	9.29	7.67	3.03	2.19	2.06
Annual Water Yield (in)		73.86				**Mean Annual Q (cfs)**			1.49			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2007												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.01	0.04	3.13	1.29	0.34	5.51	1.16	0.63	0.16	0.07	0.02	0.02
2	0.01	0.31	2.62	1.70	0.31	6.93	1.01	0.68	0.14	0.06	0.02	0.02
3	0.01	0.57	2.15	11.45	0.30	7.85	0.92	0.65	0.14	0.05	0.02	0.01
4	0.01	0.81	1.72	8.77	0.29	5.00	0.81	0.54	0.16	0.05	0.01	0.01
5	0.01	4.09	1.48	6.19	0.29	3.50	0.74	0.52	0.17	0.04	0.02	0.01
6	0.01	3.70	1.24	9.99	0.27	2.51	0.68	0.49	0.17	0.04	0.02	0.01
7	0.01	29.11	1.08	6.56	0.29	1.95	0.68	0.47	0.14	0.04	0.02	0.01
8	0.01	9.30	0.99	6.56	0.27	1.53	0.71	0.42	0.13	0.04	0.02	0.01
9	0.01	4.35	0.99	4.48	0.27	1.41	0.84	0.40	0.20	0.03	0.02	0.01
10	0.01	3.83	1.30	3.43	0.30	1.21	0.74	0.38	0.27	0.03	0.02	0.01
11	0.01	6.53	1.60	2.76	0.35	1.21	0.96	0.36	0.19	0.03	0.02	0.01
12	0.01	4.48	2.01	2.23	0.39	1.31	3.40	0.34	0.14	0.03	0.02	0.01
13	0.01	4.74	7.66	1.81	0.34	1.31	3.11	0.32	0.14	0.03	0.02	0.01
14	0.01	4.87	16.19	1.49	0.39	1.26	2.51	0.31	0.12	0.03	0.02	0.01
15	0.01	3.96	16.89	1.24	3.48	1.11	2.09	0.29	0.14	0.03	0.02	0.01
16	0.16	3.40	8.40	1.10	7.73	1.01	1.89	0.27	0.12	0.03	0.02	0.01
17	0.04	2.67	4.95	0.94	4.19	0.92	1.83	0.27	0.12	0.04	0.02	0.01
18	0.03	2.09	3.33	0.82	2.83	0.84	1.95	0.26	0.10	0.05	0.02	0.01
19	0.10	2.44	2.45	0.78	2.16	0.84	2.02	0.27	0.09	0.04	0.02	0.01
20	0.08	3.02	1.94	0.78	4.31	1.01	1.83	0.31	0.09	0.04	0.04	0.01
21	0.04	3.40	2.08	0.71	4.06	0.88	1.65	0.27	0.08	0.07	0.05	0.01
22	0.03	5.85	2.01	0.68	2.93	0.84	1.41	0.24	0.08	0.05	0.03	0.01
23	0.02	6.36	2.53	0.66	2.36	0.81	1.26	0.22	0.08	0.05	0.03	0.01
24	0.02	6.36	2.94	0.60	3.94	0.88	1.11	0.21	0.10	0.03	0.02	0.01
25	0.02	6.02	6.46	0.58	7.30	2.23	0.96	0.21	0.08	0.02	0.02	0.01
26	0.02	5.51	6.46	0.53	8.37	2.16	0.88	0.21	0.08	0.02	0.02	0.01
27	0.02	5.85	8.13	0.51	6.27	2.02	0.81	0.21	0.07	0.02	0.02	0.01
28	0.02	4.74	6.06	0.46	5.29	1.83	0.74	0.19	0.12	0.02	0.02	0.01
29	0.03	3.60	4.34	0.44		1.71	0.68	0.17	0.12	0.03	0.02	0.01
30	0.04	3.11	3.13	0.42		1.47	0.63	0.17	0.08	0.02	0.02	0.08
31	0.04		2.37	0.40		1.31		0.16		0.02	0.02	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.01	0.04	0.99	0.40	0.27	0.81	0.63	0.16	0.07	0.02	0.01	0.01
Max Q (cfs)	0.16	29.11	16.89	11.45	8.37	7.85	3.40	0.68	0.27	0.07	0.05	0.08
Mean Monthly Q (cfs)	0.03	4.84	4.15	2.59	2.49	2.08	1.33	0.34	0.13	0.04	0.02	0.01
Cumulative Q (cfs)	0.86	145.11	128.60	80.40	69.60	64.36	40.01	10.44	3.82	1.15	0.68	0.39
Annual Water Yield (in)		74.18				**Mean Annual Q (cfs)**			1.49			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2008												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.13	0.08	1.71	4.15	10.20	0.52	1.89	0.96	0.22	0.21	0.08	0.05
2	0.12	0.08	3.60	4.27	12.90	0.44	1.53	0.88	0.21	0.20	0.08	0.04
3	0.21	0.08	21.08	5.08	12.00	0.44	1.26	0.81	0.52	0.19	0.06	0.04
4	0.12	0.08	11.47	7.81	6.02	0.47	1.31	0.74	0.47	0.19	0.05	0.04
5	0.07	0.08	5.69	9.84	4.09	0.44	1.41	0.65	0.47	0.20	0.04	0.03
6	0.05	0.08	3.95	7.81	3.70	0.42	2.16	0.63	1.53	0.17	0.04	0.03
7	0.07	0.07	3.01	6.51	7.16	0.47	3.02	0.57	3.30	0.16	0.05	0.03
8	0.09	0.09	2.55	10.47	6.02	0.63	3.30	0.52	2.09	0.14	0.06	0.04
9	0.09	0.08	2.16	14.84	4.74	0.60	2.75	0.49	1.47	0.13	0.04	0.04
10	0.21	0.26	1.92	8.97	3.70	0.60	2.23	0.47	1.31	0.13	0.04	0.06
11	0.13	0.13	1.65	8.97	2.84	0.57	1.83	0.47	1.11	0.12	0.03	0.08
12	0.08	0.24	1.39	7.57	2.30	0.54	1.47	0.40	0.96	0.10	0.03	0.05
13	0.07	0.29	1.20	5.98	1.83	0.96	1.21	0.38	0.88	0.10	0.02	0.03
14	0.07	0.21	1.10	4.95	1.47	2.37	1.06	0.36	0.78	0.09	0.02	0.03
15	0.08	0.26	1.20	4.95	1.26	4.22	0.92	0.32	0.68	0.09	0.02	0.03
16	0.12	1.36	1.10	4.27	1.06	3.70	0.81	0.31	0.63	0.09	0.02	0.02
17	0.21	2.23	1.32	3.45	0.92	3.02	0.74	0.27	0.57	0.09	0.02	0.02
18	0.29	2.23	3.01	2.87	0.81	4.09	0.68	0.26	0.52	0.09	0.04	0.03
19	0.96	2.75	6.54	2.35	0.74	4.09	0.68	0.24	0.47	0.09	0.04	0.02
20	0.54	2.30	14.90	2.10	0.65	3.30	0.68	0.31	0.42	0.08	0.68	0.02
21	0.36	1.53	7.43	1.73	0.60	2.67	0.68	0.44	0.40	0.08	0.34	0.02
22	0.26	1.06	5.35	1.46	0.60	2.30	0.78	0.38	0.38	0.08	0.16	0.04
23	0.20	0.78	7.87	1.32	0.52	2.16	2.16	0.32	0.34	0.08	0.09	0.04
24	0.17	0.65	15.69	1.21	0.49	2.09	3.96	0.29	0.32	0.08	0.09	0.04
25	0.14	0.54	8.09	1.07	0.44	1.89	2.75	0.26	0.31	0.08	0.13	0.12
26	0.12	0.57	5.52	1.53	0.42	1.95	2.09	0.27	0.29	0.08	0.09	0.08
27	0.10	0.63	4.84	3.67	0.40	2.02	1.59	0.24	0.26	0.08	0.08	0.04
28	0.09	0.60	5.86	3.35	0.38	2.37	1.31	0.24	0.24	0.07	0.07	0.03
29	0.09	1.21	6.98	5.44	0.49	2.67	1.26	0.24	0.22	0.08	0.06	0.03
30	0.08	1.47	6.20	7.57		2.59	1.11	0.22	0.22	0.09	0.05	0.03
31	0.08		5.01	13.61		2.23		0.21		0.07	0.05	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.05	0.07	1.10	1.07	0.38	0.42	0.68	0.21	0.21	0.07	0.02	0.02
Max Q (cfs)	0.96	2.75	21.08	14.84	12.90	4.22	3.96	0.96	3.30	0.21	0.68	0.12
Mean Monthly Q (cfs)	0.17	0.73	5.46	5.46	3.06	1.83	1.62	0.42	0.72	0.11	0.09	0.04
Cumulative Q (cfs)	5.40	22.02	169.35	169.19	88.75	56.83	48.63	13.15	21.59	3.53	2.67	1.20
Annual Water Yield (in)		81.92				**Mean Annual Q (cfs)**			1.65			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2009												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.03	0.06	0.42	8.20	0.54	2.02	2.30	0.52	0.36	0.12	0.04	0.03
2	0.05	0.18	0.63	17.07	0.52	2.75	4.35	0.68	0.34	0.10	0.03	0.03
3	0.12	0.28	0.53	7.10	0.52	2.51	5.00	0.63	0.32	0.10	0.03	0.03
4	0.63	0.82	0.51	4.16	0.49	2.16	4.22	1.26	0.34	0.09	0.03	0.04
5	0.19	0.41	0.49	5.14	0.47	2.75	3.30	2.51	0.34	0.09	0.03	0.10
6	0.19	0.78	0.46	7.10	0.57	3.50	2.44	3.60	0.34	0.10	0.04	0.12
7	0.22	0.65	0.46	8.97	0.47	3.11	1.89	4.35	0.31	0.12	0.06	0.07
8	0.16	0.68	0.46	13.25	0.49	2.67	1.53	3.02	0.27	0.10	0.04	0.05
9	0.16	0.72	0.42	7.94	0.52	2.30	1.31	2.23	0.27	0.10	0.04	0.03
10	0.19	0.68	0.40	4.56	0.54	1.95	1.11	1.77	0.26	0.09	0.04	0.02
11	0.14	1.46	0.38	3.08	0.63	1.77	0.96	1.47	0.26	0.10	0.04	0.02
12	0.13	5.62	0.53	2.21	0.65	1.53	1.16	1.36	0.24	0.16	0.06	0.02
13	0.12	9.33	0.78	1.67	0.68	1.36	1.31	1.47	0.34	0.16	0.04	0.02
14	0.10	3.50	1.07	1.41	0.65	1.53	1.36	3.60	0.26	0.09	0.03	0.04
15	0.10	2.16	1.11	1.16	0.65	3.70	1.36	3.11	0.22	0.08	0.03	0.04
16	0.09	1.41	0.98	0.99	0.63	4.48	1.26	2.37	0.21	0.07	0.03	0.03
17	0.09	0.99	0.98	0.86	0.57	3.70	1.16	1.83	0.20	0.06	0.03	0.03
18	0.08	0.78	1.44	0.75	0.54	3.30	1.01	1.53	0.20	0.06	0.02	0.02
19	0.08	0.65	1.59	0.69	0.52	2.67	0.92	1.36	0.31	0.06	0.02	0.03
20	0.12	0.68	1.70	0.63	0.49	2.23	0.84	1.11	0.24	0.05	0.02	0.03
21	0.14	0.59	3.65	0.58	0.47	1.83	0.78	0.96	0.26	0.06	0.03	0.02
22	0.12	0.55	5.45	0.54	0.54	1.83	0.71	0.84	0.21	0.08	0.03	0.02
23	0.10	0.53	4.48	0.51	0.71	1.65	0.68	0.74	0.19	0.06	0.02	0.02
24	0.09	0.48	3.54	0.46	0.88	1.71	0.63	0.68	0.19	0.05	0.02	0.02
25	0.08	0.46	3.65	0.51	2.16	2.59	0.60	0.63	0.20	0.04	0.02	0.02
26	0.08	0.44	3.33	0.42	4.74	3.40	0.57	0.57	0.17	0.04	0.02	0.02
27	0.07	0.41	6.39	0.54	3.30	2.75	0.54	0.52	0.16	0.04	0.02	0.02
28	0.07	0.39	14.88	0.56	2.37	2.67	0.52	0.47	0.14	0.03	0.04	0.02
29	0.07	0.37	8.79	0.51		3.20	0.65	0.44	0.13	0.03	0.05	0.03
30	0.08	0.35	5.45	0.49		3.11	0.57	0.40	0.13	0.03	0.03	0.08
31	0.09		3.65	0.49		2.59		0.38		0.03	0.03	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.03	0.06	0.38	0.42	0.47	1.36	0.52	0.38	0.13	0.03	0.02	0.02
Max Q (cfs)	0.63	9.33	14.88	17.07	4.74	4.48	5.00	4.35	0.36	0.16	0.06	0.12
Mean Monthly Q (cfs)	0.13	1.21	2.54	3.31	0.94	2.56	1.50	1.50	0.25	0.08	0.03	0.04
Cumulative Q (cfs)	3.98	36.42	78.62	102.56	26.31	79.32	45.04	46.41	7.41	2.39	1.01	1.07
Annual Water Yield (in)		58.56				**Mean Annual Q (cfs)**			1.18			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2010												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.04	0.47	2.41	6.44	1.11	2.48	5.34	3.40	0.69	0.40	0.13	0.32
2	0.03	0.34	1.94	4.80	1.06	1.95	4.61	2.59	3.41	0.42	0.12	0.10
3	0.03	0.28	1.60	3.47	1.11	1.66	5.51	4.09	4.57	0.36	0.13	0.07
4	0.04	0.23	1.40	2.71	1.21	1.35	5.51	4.61	4.45	0.34	0.10	0.05
5	0.03	0.25	1.16	3.05	1.26	1.21	4.61	3.83	3.84	0.32	0.09	0.05
6	0.03	0.56	1.07	4.93	1.31	1.08	5.00	2.93	2.85	0.31	0.09	0.05
7	0.03	1.88	0.98	4.12	1.26	0.95	4.61	1.77	2.17	0.27	0.09	0.08
8	0.03	2.25	0.90	3.26	1.16	0.87	4.35	1.31	1.65	0.27	0.09	0.07
9	0.03	1.78	0.83	2.55	1.11	0.79	3.83	1.06	1.81	0.26	0.09	0.07
10	0.03	1.57	0.75	2.19	1.06	0.87	3.11	0.96	3.22	0.24	0.09	0.06
11	0.03	1.23	0.71	1.83	1.31	1.16	2.59	0.84	3.03	0.24	0.08	0.05
12	0.03	1.39	0.71	2.79	2.37	7.20	2.16	0.84	2.37	0.22	0.08	0.04
13	0.07	1.47	0.69	4.66	2.67	5.36	1.83	0.84	1.81	0.22	0.07	0.04
14	0.27	1.23	0.71	4.93	2.44	4.00	1.59	0.81	1.45	0.21	0.06	0.04
15	0.09	0.94	3.31	4.39	2.16	2.87	1.41	0.74	1.19	0.21	0.06	0.09
16	0.07	0.75	5.74	5.89	2.09	2.13	1.26	0.68	1.01	0.20	0.06	0.14
17	0.19	2.32	5.05	4.53	1.89	1.66	1.11	0.63	0.87	0.20	0.07	0.16
18	0.17	1.99	3.86	5.07	1.71	1.35	0.96	0.60	0.73	0.20	0.07	0.22
19	0.12	1.47	2.94	4.12	1.47	1.12	0.92	0.60	0.69	0.19	0.08	0.31
20	0.09	1.57	2.66	3.26	1.31	0.95	0.92	0.65	0.60	0.19	0.06	0.34
21	0.19	1.67	5.74	2.55	1.16	1.03	0.81	1.16	0.53	0.17	0.06	0.19
22	0.14	1.78	7.27	2.00	1.01	0.99	0.74	1.83	0.49	0.17	0.05	0.14
23	0.38	1.67	5.74	1.55	1.11	0.95	0.71	1.71	0.45	0.16	0.04	0.14
24	0.36	1.27	4.35	1.41	1.59	0.91	0.74	1.41	0.41	0.14	0.03	0.12
25	0.27	0.94	3.31	1.61	1.65	1.89	0.68	1.36	0.39	0.13	0.03	0.10
26	0.71	1.06	2.57	1.55	3.30	7.64	1.01	1.31	0.35	0.14	0.04	0.14
27	1.06	1.99	2.10	1.36	5.17	4.66	4.22	1.31	0.34	0.13	0.04	0.12
28	0.74	1.67	1.73	1.22	4.09	3.57	5.34	1.31	0.34	0.14	0.04	0.12
29	0.78	1.27	1.60	1.04		7.20	5.17	1.21	0.30	0.13	0.04	0.10
30	0.88	0.97	1.73	1.00		9.85	4.35	1.11	0.29	0.13	0.13	0.09
31	1.41		3.98	0.88		7.01		1.06		0.14	0.08	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.03	0.23	0.69	0.88	1.01	0.79	0.68	0.60	0.29	0.13	0.03	0.04
Max Q (cfs)	1.41	2.32	7.27	6.44	5.17	9.85	5.51	4.61	4.57	0.42	0.13	0.34
Mean Monthly Q (cfs)	0.27	1.28	2.57	3.07	1.79	2.80	2.83	1.57	1.54	0.22	0.07	0.12
Cumulative Q (cfs)	8.37	38.26	79.52	95.18	50.15	86.73	85.00	48.56	46.31	6.85	2.29	3.61
Annual Water Yield (in)		74.92				**Mean Annual Q (cfs)**			1.51			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2011												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.09	1.00	9.00	2.74	0.68	18.03	3.18	3.50	0.92	0.26	0.12	0.04
2	0.08	2.46	6.70	2.03	0.65	10.80	3.08	2.67	0.92	0.26	0.10	0.04
3	0.09	1.51	4.61	1.58	0.60	6.93	2.89	2.09	0.84	0.26	0.10	0.04
4	0.09	1.00	3.20	1.29	0.60	5.85	2.65	1.71	0.78	0.24	0.10	0.04
5	0.09	0.75	2.37	1.10	0.57	5.17	2.97	1.41	0.74	0.22	0.09	0.04
6	0.08	0.75	1.89	0.95	0.54	4.09	3.50	1.26	0.71	0.22	0.09	0.04
7	0.08	1.38	1.59	0.83	0.65	3.11	3.71	1.21	0.68	0.22	0.09	0.03
8	0.09	1.30	1.77	0.75	0.71	2.84	3.08	1.31	0.65	0.21	0.09	0.03
9	0.22	1.38	2.84	0.79	0.71	2.67	2.43	1.16	0.60	0.21	0.08	0.03
10	0.42	2.84	5.68	0.72	0.68	4.35	1.91	1.11	0.57	0.20	0.08	0.03
11	0.26	2.03	5.00	0.69	0.65	4.61	2.02	1.16	0.54	0.20	0.08	0.03
12	0.21	1.42	5.51	0.87	0.74	3.60	1.85	1.01	0.54	0.21	0.08	0.03
13	0.20	1.07	10.80	2.59	1.01	3.30	1.74	0.96	0.54	0.24	0.08	0.04
14	0.19	0.91	10.20	3.61	1.53	4.74	1.91	0.92	0.47	0.21	0.08	0.06
15	0.17	0.77	7.16	6.33	3.70	4.74	3.08	0.88	0.44	0.20	0.08	0.06
16	0.16	0.81	5.17	21.76	3.83	6.02	4.57	0.88	0.42	0.26	0.07	0.05
17	0.16	0.97	3.96	12.89	3.11	6.53	3.60	0.81	0.40	0.21	0.06	0.05
18	0.16	4.56	3.60	6.33	2.75	4.87	2.81	0.78	0.42	0.21	0.06	0.04
19	0.14	3.59	3.40	4.98	2.44	3.60	2.15	0.71	0.40	0.20	0.06	0.04
20	0.14	3.93	4.22	3.71	2.23	2.84	1.68	0.68	0.38	0.20	0.06	0.04
21	0.14	2.93	4.87	2.82	1.89	2.37	1.37	0.65	0.34	0.19	0.05	0.03
22	0.16	2.67	3.96	2.09	1.77	2.09	1.13	0.63	0.34	0.19	0.05	0.03
23	0.22	3.21	3.02	1.64	1.65	1.89	0.97	0.60	0.32	0.17	0.05	0.03
24	1.36	2.46	2.37	1.34	1.77	1.83	0.97	0.57	0.31	0.16	0.05	0.04
25	2.93	1.87	2.09	1.10	1.83	1.59	2.21	0.65	0.31	0.16	0.06	0.05
26	2.93	1.61	2.93	0.99	1.65	1.89	3.60	0.63	0.29	0.16	0.08	0.07
27	2.09	1.87	4.74	0.83	1.71	3.60	3.29	0.88	0.31	0.14	0.08	0.14
28	1.77	2.03	13.20	0.75	5.51	5.34	2.97	1.16	0.32	0.13	0.08	0.17
29	1.53	1.98	16.00	0.69		4.74	3.81	1.21	0.29	0.13	0.07	0.14
30	1.26	2.39	7.39	0.63		5.85	3.60	1.11	0.29	0.13	0.06	0.13
31	1.41		4.87	0.58		4.87		1.06		0.12	0.05	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.08	0.75	1.59	0.58	0.54	1.59	0.97	0.57	0.29	0.12	0.05	0.03
Max Q (cfs)	2.93	4.56	16.00	21.76	5.51	18.03	4.57	3.50	0.92	0.26	0.12	0.17
Mean Monthly Q (cfs)	0.61	1.92	5.29	2.90	1.65	4.67	2.62	1.14	0.50	0.20	0.08	0.05
Cumulative Q (cfs)	18.92	57.45	164.11	90.03	46.16	144.75	78.75	35.37	15.08	6.12	2.33	1.63
Annual Water Yield (in)		89.86				**Mean Annual Q (cfs)**			1.81			

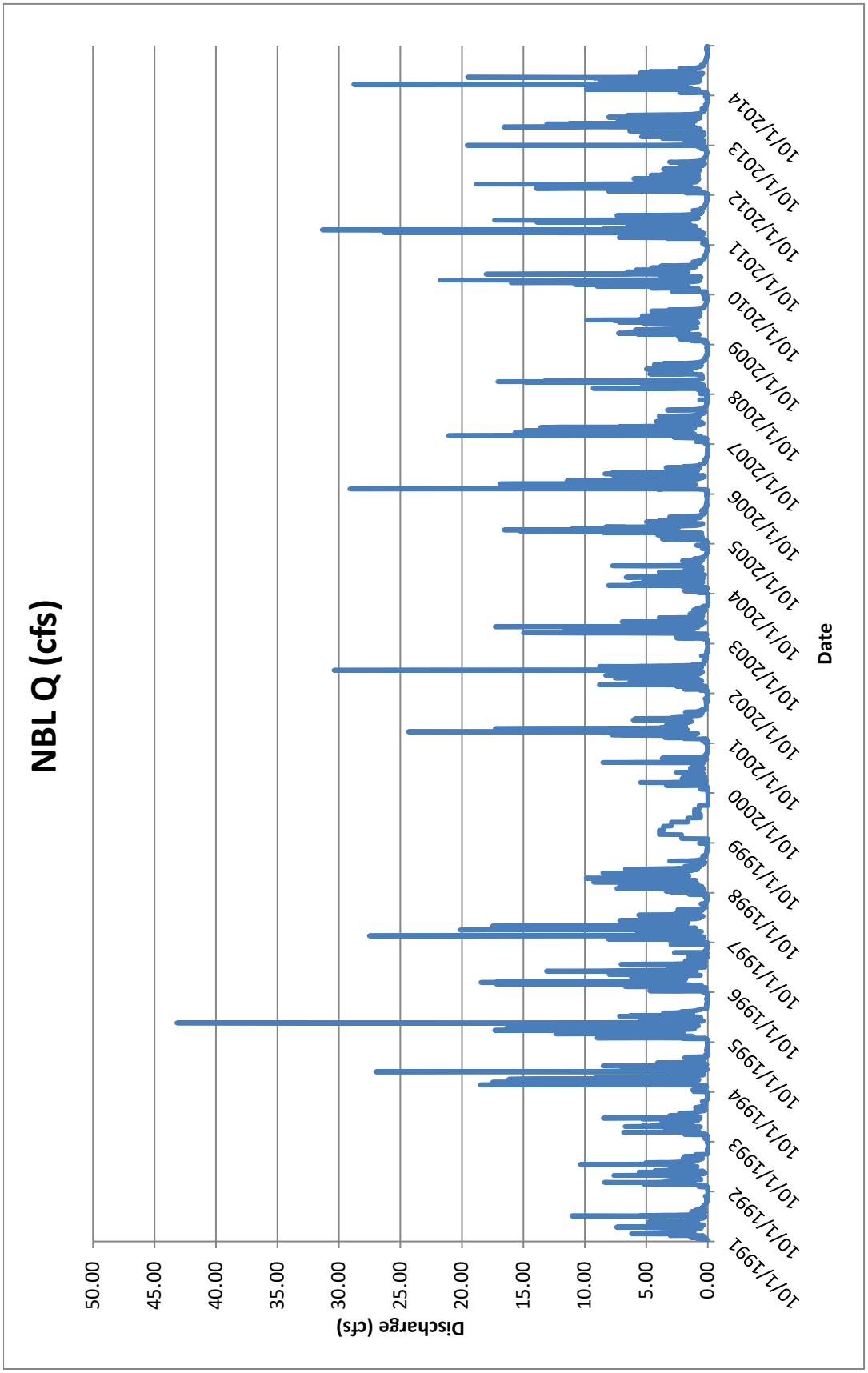
Needle Branch Lower, Alsea Watershed Study												
Water Year 2012												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.12	0.15	1.59	4.26	3.40	4.52	8.33	2.09	0.49	0.38	0.14	0.06
2	0.13	0.16	1.41	2.78	2.75	4.26	5.37	2.30	0.49	0.34	0.13	0.06
3	0.13	0.41	1.26	1.94	2.30	3.46	3.65	5.17	0.44	0.40	0.13	0.06
4	0.17	0.36	1.06	1.67	1.95	2.87	2.78	7.39	0.63	0.32	0.12	0.06
5	0.32	0.36	0.96	1.78	1.65	2.63	2.40	5.68	0.63	0.31	0.12	0.05
6	0.20	0.38	0.84	1.67	1.41	2.78	2.27	4.09	0.52	0.31	0.10	0.05
7	0.19	0.36	0.78	1.42	1.21	2.55	1.88	3.02	0.68	0.29	0.12	0.05
8	0.17	0.36	0.74	1.24	1.26	2.13	1.57	2.30	0.88	0.27	0.10	0.06
9	0.17	0.28	0.68	1.10	1.11	1.73	1.33	1.77	1.21	0.27	0.10	0.08
10	0.32	0.20	0.63	0.98	1.01	1.52	1.15	1.47	1.11	0.26	0.10	0.08
11	0.44	0.21	0.60	0.87	0.96	2.00	0.98	1.21	0.96	0.26	0.09	0.08
12	0.26	0.26	0.54	0.76	0.96	3.65	0.95	1.06	0.84	0.26	0.09	0.07
13	0.20	0.38	0.52	0.69	0.96	6.98	0.95	0.88	0.78	0.24	0.09	0.06
14	0.19	0.36	0.49	0.69	1.01	6.58	0.80	0.81	0.71	0.24	0.08	0.06
15	0.19	0.34	0.49	0.69	1.01	13.91	0.76	0.74	0.65	0.24	0.08	0.06
16	0.19	0.67	0.44	0.63	1.06	9.68	1.78	0.68	0.60	0.24	0.08	0.06
17	0.17	3.26	0.44	2.33	1.11	7.43	2.00	0.63	0.57	0.24	0.07	0.06
18	0.17	3.26	0.42	22.08	1.36	5.37	1.62	0.57	0.63	0.24	0.08	0.05
19	0.16	2.98	0.38	31.37	1.89	3.88	1.67	0.54	0.57	0.22	0.08	0.05
20	0.14	2.26	0.38	13.07	2.16	3.46	2.27	0.52	0.49	0.24	0.08	0.06
21	0.14	1.72	0.36	11.59	2.84	5.03	2.27	0.65	0.44	0.21	0.08	0.08
22	0.14	3.64	0.36	6.41	6.53	4.52	1.83	0.60	0.54	0.20	0.08	0.09
23	0.13	7.20	0.34	4.39	6.19	4.01	1.52	0.57	0.54	0.19	0.07	0.09
24	0.13	4.75	0.32	5.89	4.48	3.56	1.28	0.84	0.47	0.19	0.07	0.08
25	0.13	3.45	0.42	8.55	4.48	2.78	1.24	0.71	0.47	0.17	0.07	0.08
26	0.12	2.47	0.36	4.77	4.09	2.20	1.19	0.68	0.44	0.17	0.07	0.07
27	0.10	2.00	0.68	3.46	3.30	1.94	1.37	0.63	0.40	0.19	0.08	0.07
28	0.14	1.88	11.10	2.55	2.93	2.06	1.37	0.60	0.40	0.17	0.07	0.06
29	0.22	1.67	15.59	2.55	3.70	4.90	1.24	0.57	0.38	0.17	0.07	0.06
30	0.24	1.42	26.32	3.88		17.34	1.42	0.52	0.40	0.16	0.07	0.05
31	0.22		11.70	3.07		12.18		0.49		0.14	0.07	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.10	0.15	0.32	0.63	0.96	1.52	0.76	0.49	0.38	0.14	0.07	0.05
Max Q (cfs)	0.44	7.20	26.32	31.37	6.53	17.34	8.33	7.39	1.21	0.40	0.14	0.09
Mean Monthly Q (cfs)	0.19	1.57	2.65	4.81	2.38	4.90	1.97	1.61	0.61	0.24	0.09	0.07
Cumulative Q (cfs)	5.74	47.19	82.20	149.11	69.07	151.84	59.20	49.78	18.36	7.53	2.78	1.95
Annual Water Yield (in)		87.69				**Mean Annual Q (cfs)**			1.76			

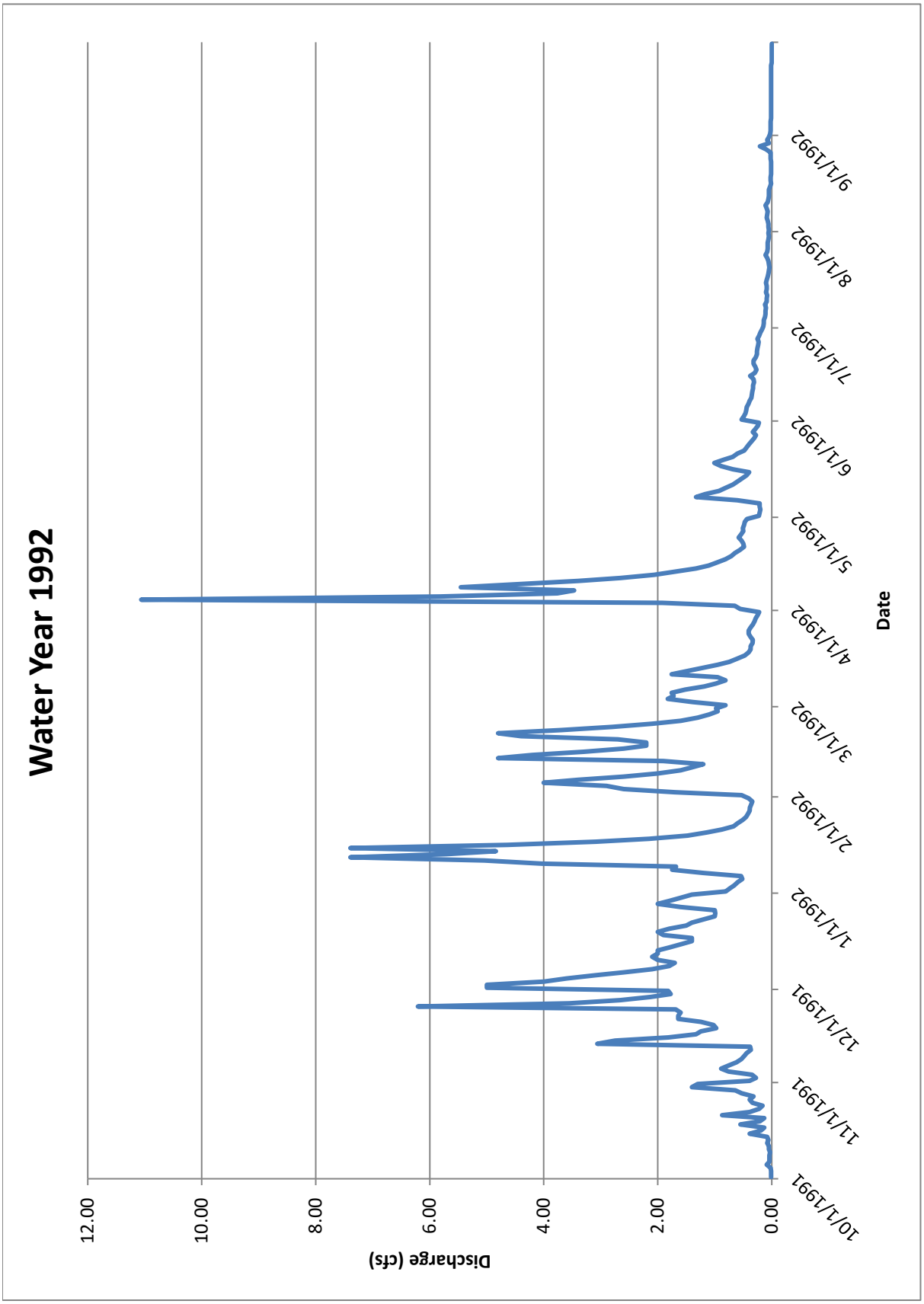
Needle Branch Lower, Alsea Watershed Study												
Water Year 2013												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.04	5.53	7.16	1.71	3.60	3.70	0.74	0.60	2.09	0.24	0.09	0.26
2	0.04	4.35	11.10	1.41	2.84	3.30	0.68	0.54	1.65	0.22	0.09	0.22
3	0.04	2.89	7.85	1.21	2.23	2.75	0.63	0.52	1.36	0.22	0.09	0.20
4	0.03	2.13	8.54	1.11	1.83	2.23	0.68	0.47	1.16	0.21	0.09	0.17
5	0.03	1.62	11.10	0.96	1.59	1.95	0.74	0.42	0.96	0.21	0.08	0.37
6	0.03	1.29	6.19	0.88	1.41	1.83	1.11	0.42	0.84	0.21	0.08	0.57
7	0.03	1.05	4.48	1.21	1.53	1.65	2.84	0.40	0.78	0.20	0.07	0.44
8	0.03	0.93	3.83	1.53	1.41	1.53	3.60	0.38	0.68	0.19	0.07	0.37
9	0.03	0.79	3.30	3.50	1.31	1.41	2.67	0.36	0.65	0.19	0.07	0.35
10	0.03	0.66	2.67	5.00	1.21	1.26	2.16	0.34	0.60	0.17	0.07	0.28
11	0.03	0.63	2.67	4.74	1.11	1.11	1.77	0.32	0.54	0.17	0.08	0.26
12	0.10	1.38	3.50	3.96	1.01	1.01	1.53	0.32	0.52	0.17	0.08	0.20
13	0.27	1.62	3.50	3.20	0.96	0.92	1.47	0.32	0.57	0.17	0.08	0.20
14	0.22	1.29	3.02	2.44	0.88	0.84	1.41	0.31	0.47	0.16	0.07	0.20
15	1.26	1.09	2.93	1.95	0.84	0.81	1.36	0.31	0.44	0.14	0.08	0.17
16	1.77	0.93	4.22	1.65	0.84	0.88	1.31	0.31	0.40	0.14	0.08	0.17
17	0.54	1.01	6.02	1.36	0.78	0.81	1.21	0.27	0.38	0.14	0.08	0.17
18	0.36	3.88	5.17	1.21	0.78	0.74	1.11	0.29	0.38	0.14	0.08	0.17
19	0.49	13.96	4.87	1.06	0.81	0.78	1.21	0.27	0.36	0.13	0.08	0.17
20	0.47	11.21	18.84	0.92	0.78	2.23	1.21	0.26	0.38	0.13	0.08	0.17
21	0.78	6.77	11.10	0.84	1.01	2.75	1.21	0.60	0.32	0.13	0.08	0.17
22	0.96	4.23	8.08	0.78	2.30	2.30	1.16	1.26	0.31	0.13	0.08	0.35
23	0.84	3.24	6.36	0.84	4.61	1.89	1.06	2.30	0.34	0.12	0.08	0.59
24	0.81	4.23	5.68	0.74	4.09	1.71	0.96	2.37	0.36	0.10	0.08	0.87
25	0.71	3.33	5.00	0.84	3.50	1.47	0.88	1.95	0.38	0.10	0.10	0.91
26	0.63	2.46	5.17	1.16	3.20	1.31	0.81	1.59	0.34	0.09	0.14	0.67
27	1.36	1.83	5.68	2.37	2.75	1.16	0.74	2.37	0.29	0.09	0.21	0.63
28	6.02	1.43	4.48	5.00	3.02	1.06	0.71	3.02	0.27	0.09	0.17	5.46
29	8.08	1.33	3.40	6.02		0.96	0.71	3.02	0.26	0.09	0.16	18.58
30	4.48	1.62	2.59	5.34		0.88	0.63	3.11	0.24	0.09	0.14	19.59
31	3.70		2.09	4.48		0.78		2.59		0.09	0.13	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.03	0.63	2.09	0.74	0.78	0.74	0.63	0.26	0.24	0.09	0.07	0.17
Max Q (cfs)	8.08	13.96	18.84	6.02	4.61	3.70	3.60	3.11	2.09	0.24	0.21	19.59
Mean Monthly Q (cfs)	1.10	2.96	5.83	2.24	1.87	1.55	1.28	1.02	0.61	0.15	0.10	1.76
Cumulative Q (cfs)	34.21	88.70	180.59	69.42	52.23	48.01	38.31	31.61	18.32	4.67	2.96	52.94
Annual Water Yield (in)		84.59				**Mean Annual Q (cfs)**			1.70			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2014												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	4.74	0.29	0.49	0.60	1.77	1.29	2.84	1.59	0.40	0.22	0.10	0.04
2	3.40	0.54	5.39	0.57	1.47	1.47	2.23	1.36	0.38	0.22	0.09	0.03
3	2.16	0.54	2.76	0.57	1.31	2.88	1.89	1.26	0.38	0.21	0.08	0.03
4	1.53	0.57	1.92	0.54	1.21	3.34	1.59	1.36	0.36	0.21	0.08	0.03
5	1.21	0.81	1.38	0.52	1.06	7.31	1.59	1.65	0.34	0.21	0.08	0.02
6	0.96	1.01	1.05	0.49	1.01	13.11	2.09	1.53	0.32	0.20	0.08	0.03
7	0.88	1.53	0.80	0.54	0.92	10.64	2.30	1.36	0.31	0.19	0.07	0.03
8	0.88	1.89	0.66	0.81	1.21	7.10	1.95	1.71	0.29	0.19	0.07	0.02
9	0.78	1.47	0.56	1.59	2.84	11.29	1.65	4.09	0.29	0.17	0.06	0.02
10	0.71	1.21	0.49	1.95	3.40	9.25	1.41	6.53	0.27	0.16	0.05	0.02
11	0.71	1.01	0.43	2.84	8.77	7.10	1.21	4.61	0.27	0.16	0.03	0.02
12	0.65	0.96	0.43	4.87	16.60	5.28	1.06	3.30	0.29	0.16	0.04	0.02
13	0.63	0.84	0.43	6.36	11.40	3.77	0.92	2.44	0.42	0.14	0.04	0.02
14	0.57	0.81	0.38	4.22	11.10	2.96	0.84	1.83	0.29	0.14	0.05	0.02
15	0.52	0.81	0.34	3.02	9.60	2.29	0.78	1.47	0.27	0.14	0.05	0.02
16	0.49	1.36	0.33	2.30	9.90	2.08	0.71	1.21	0.26	0.13	0.04	0.02
17	0.47	1.71	0.32	1.77	7.16	2.37	0.81	1.01	0.29	0.13	0.03	0.03
18	0.44	1.95	0.32	1.47	7.62	2.15	0.68	1.01	0.26	0.12	0.03	0.02
19	0.42	3.70	0.29	1.21	8.31	1.93	0.65	0.96	0.24	0.10	0.03	0.02
20	0.42	3.70	0.33	1.06	7.16	1.71	0.60	0.78	0.24	0.10	0.04	0.02
21	0.40	2.67	0.45	0.92	6.36	1.47	0.60	0.71	0.22	0.10	0.04	0.02
22	0.38	1.95	0.45	0.84	4.61	1.29	0.65	0.65	0.22	0.09	0.04	0.02
23	0.36	1.59	0.47	0.74	3.40	1.17	1.47	0.63	0.21	0.19	0.04	0.03
24	0.34	1.26	0.45	0.71	2.59	1.07	8.08	0.57	0.21	0.22	0.04	0.22
25	0.34	1.11	0.45	0.65	2.02	1.02	5.17	0.54	0.20	0.20	0.05	0.07
26	0.32	0.96	0.43	0.60	1.65	1.41	3.83	0.54	0.21	0.19	0.03	0.05
27	0.34	0.88	0.39	0.60	1.47	2.96	3.40	0.52	0.49	0.17	0.02	0.04
28	0.31	0.78	0.36	0.68	1.21	5.60	2.84	0.54	0.34	0.16	0.02	0.04
29	0.29	0.71	0.34	2.44		7.31	2.37	0.47	0.27	0.14	0.03	0.06
30	0.29	0.68	0.33	2.93		5.60	1.95	0.44	0.24	0.13	0.08	0.07
31	0.29		0.31	2.23		4.49		0.42		0.12	0.07	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.29	0.29	0.29	0.49	0.92	1.02	0.60	0.42	0.20	0.09	0.02	0.02
Max Q (cfs)	4.74	3.70	5.39	6.36	16.60	13.11	8.08	6.53	0.49	0.22	0.10	0.22
Mean Monthly Q (cfs)	0.85	1.31	0.76	1.63	4.90	4.28	1.94	1.52	0.29	0.16	0.05	0.04
Cumulative Q (cfs)	26.23	39.30	23.52	50.64	137.13	132.67	58.16	47.09	8.78	5.01	1.60	1.10
Annual Water Yield (in)		72.25				**Mean Annual Q (cfs)**			1.46			

Needle Branch Lower, Alsea Watershed Study												
Water Year 2015												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.06	1.31	3.70	1.89	0.68	0.57	1.53	0.49	0.26	0.08	0.02	0.05
2	0.05	1.11	2.75	1.65	0.78	0.57	1.53	0.47	0.26	0.08	0.03	0.06
3	0.05	1.06	2.16	1.41	0.71	0.54	1.59	0.44	0.26	0.08	0.05	0.05
4	0.04	1.41	2.30	1.31	0.68	0.52	1.41	0.42	0.22	0.08	0.04	0.05
5	0.04	1.65	2.51	1.11	0.92	0.49	1.36	0.40	0.21	0.08	0.03	0.05
6	0.04	1.53	3.40	0.96	8.54	0.49	1.31	0.40	0.20	0.08	0.02	0.08
7	0.04	1.31	3.50	0.88	9.30	0.47	1.21	0.38	0.20	0.08	0.02	0.04
8	0.04	1.21	2.84	0.81	8.08	0.47	1.16	0.36	0.19	0.07	0.02	0.03
9	0.04	1.11	2.44	0.78	12.30	0.44	1.11	0.34	0.17	0.08	0.02	0.03
10	0.05	0.96	3.60	0.74	19.54	0.42	1.06	0.32	0.19	0.08	0.03	0.03
11	0.08	0.84	6.70	0.71	7.62	0.42	1.36	0.32	0.17	0.08	0.03	0.03
12	0.08	0.74	7.16	0.78	4.48	0.42	1.26	0.54	0.17	0.08	0.02	0.02
13	0.06	5.85	5.17	0.68	3.11	0.40	1.41	0.42	0.17	0.07	0.02	0.03
14	0.16	9.90	3.70	0.68	2.30	1.59	2.09	0.36	0.16	0.06	0.04	0.03
15	0.27	5.34	2.75	0.74	1.77	5.51	2.30	0.36	0.17	0.05	0.04	0.02
16	0.12	3.60	2.16	1.95	1.47	4.74	1.95	0.36	0.17	0.05	0.03	0.04
17	0.08	2.51	1.83	5.00	1.26	3.40	1.65	0.34	0.14	0.04	0.03	0.12
18	0.21	1.89	1.71	8.77	1.06	2.44	1.41	0.32	0.16	0.04	0.03	0.04
19	0.12	1.53	3.70	5.85	0.92	1.89	1.26	0.32	0.14	0.03	0.03	0.04
20	0.09	1.31	21.01	4.48	0.84	1.65	1.11	0.31	0.14	0.04	0.03	0.03
21	0.08	1.77	28.79	3.40	0.78	1.47	0.96	0.34	0.14	0.04	0.03	0.04
22	1.26	5.17	12.00	2.51	0.71	1.26	0.88	0.32	0.14	0.04	0.03	0.04
23	2.30	3.96	6.19	2.02	0.65	2.44	0.81	0.32	0.13	0.04	0.03	0.04
24	1.06	3.11	5.00	1.65	0.63	4.74	0.74	0.29	0.12	0.04	0.03	0.04
25	1.01	3.20	5.00	1.36	0.60	3.83	0.71	0.29	0.10	0.04	0.03	0.05
26	1.77	3.50	4.22	1.16	0.57	3.02	0.65	0.27	0.10	0.04	0.03	0.06
27	1.31	2.93	3.50	1.01	0.78	2.44	0.63	0.26	0.09	0.04	0.03	0.04
28	1.06	4.22	3.11	0.88	0.60	2.16	0.57	0.26	0.10	0.03	0.03	0.04
29	1.53	6.70	3.02	0.81		1.83	0.54	0.26	0.10	0.04	0.03	0.04
30	1.53	5.00	2.59	0.74		1.59	0.52	0.24	0.09	0.03	0.14	0.04
31	1.47		2.23	0.68		1.65		0.22		0.02	0.06	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.04	0.74	1.71	0.68	0.57	0.40	0.52	0.22	0.09	0.02	0.02	0.02
Max Q (cfs)	2.30	9.90	28.79	8.77	19.54	5.51	2.30	0.54	0.26	0.08	0.14	0.12
Mean Monthly Q (cfs)	0.52	2.86	5.19	1.85	3.27	1.74	1.20	0.35	0.16	0.06	0.03	0.04
Cumulative Q (cfs)	16.10	85.73	160.74	57.40	91.68	53.87	36.08	10.74	4.86	1.73	1.05	1.30
Annual Water Yield (in)		70.90				**Mean Annual Q (cfs)**			1.43			

HYDROGRAPHS

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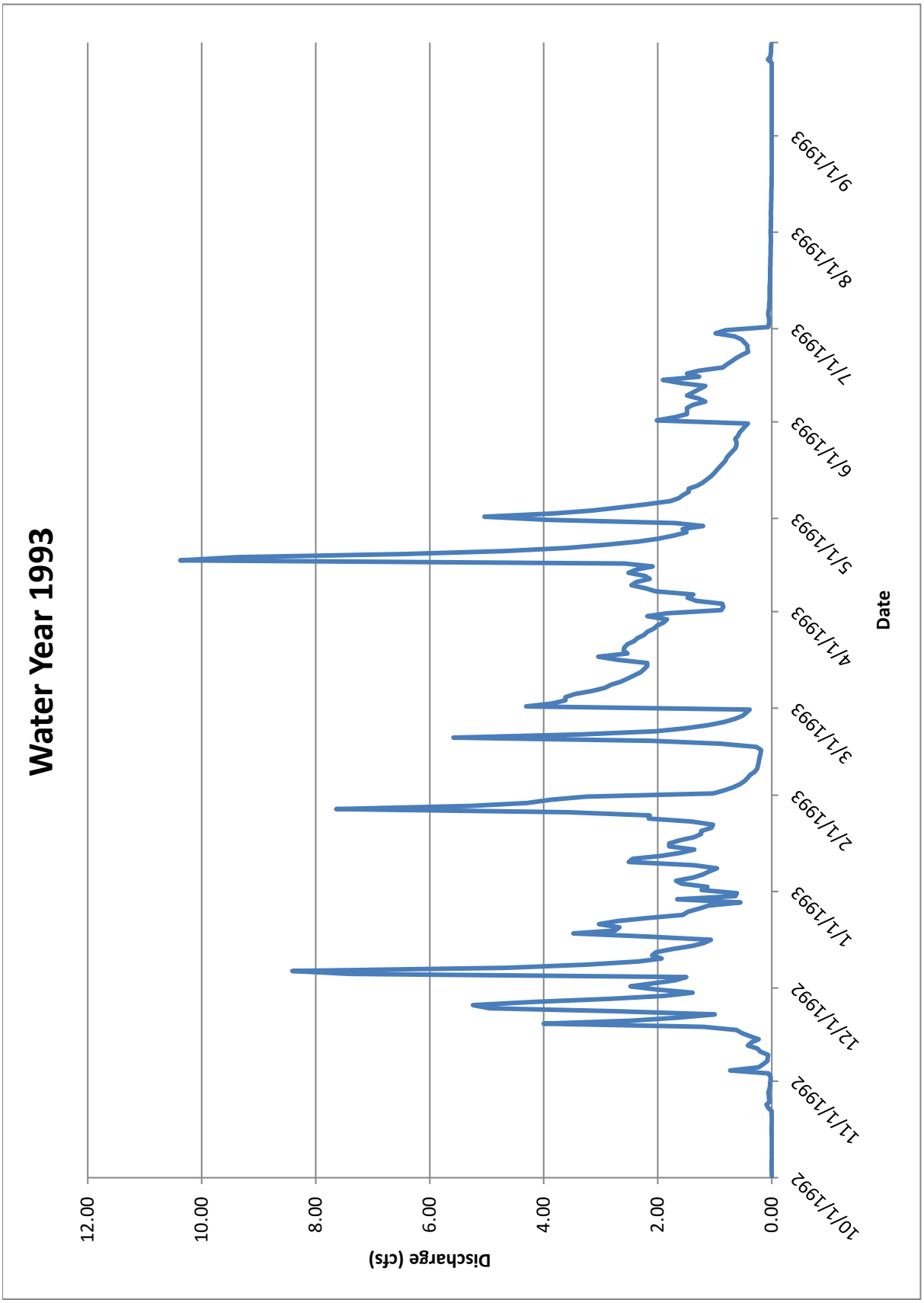
8.00
6.00
4.00
2.00
0.00
10/1/1991
11/1/1991
12/1/1991
1/1/1992
2/1/1992
3/1/1992
4/1/1992
5/1/1992
6/1/1992
7/1/1992
8/1/1992
9/1/1992
Date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Discharge (cfs)
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10.00
8.00
6.00
4.00
2.00
0.00
10/1/1992
11/1/1992
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1/1/1993
2/1/1993
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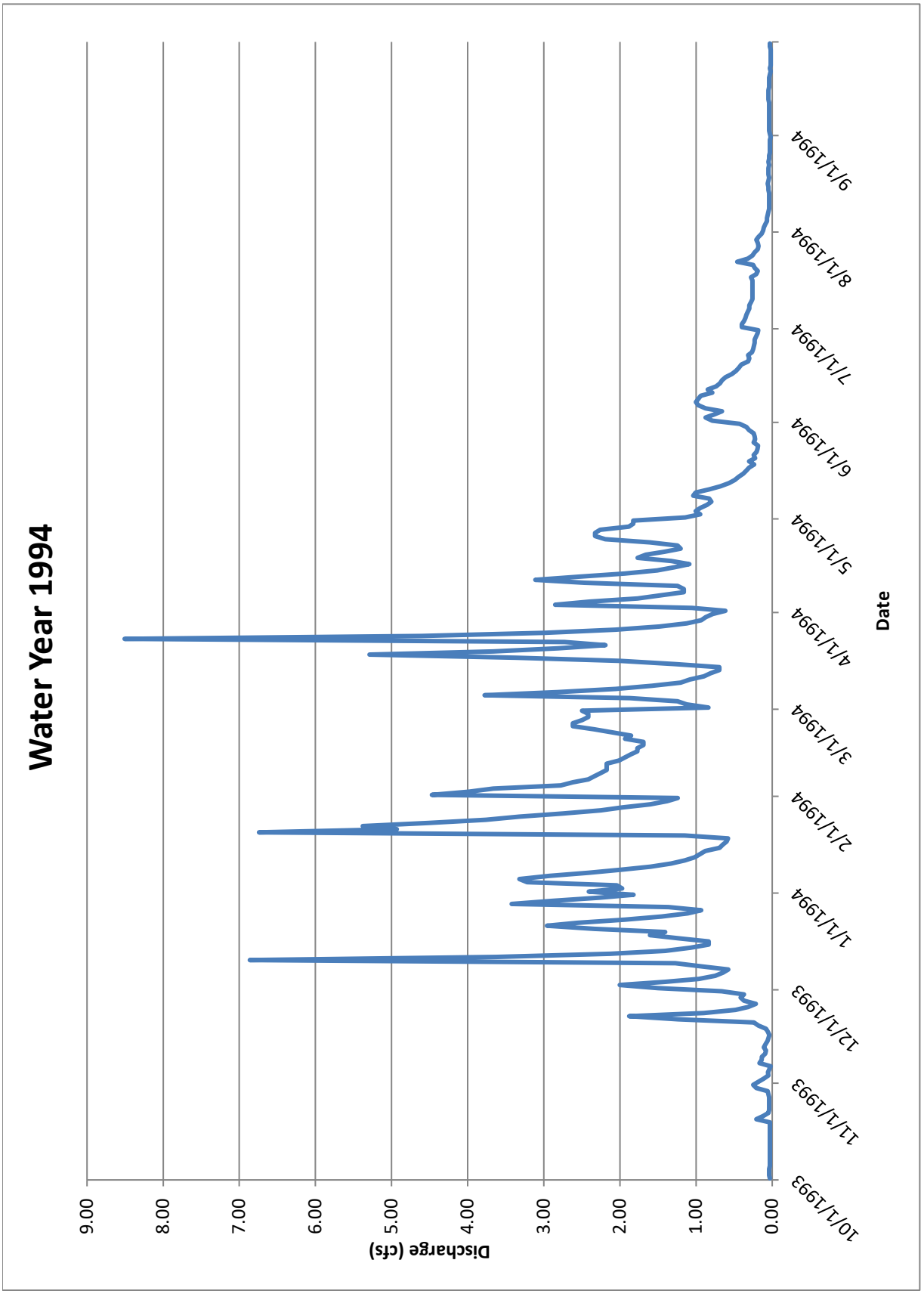
4/1/1993
5/1/1993
6/1/1993
7/1/1993
8/1/1993
9/1/1993
Date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Discharge (cfs)
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5.00
6.00
7.00
8.00
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10/1/1993
11/1/1993
12/1/1993
1/1/1994
2/1/1994
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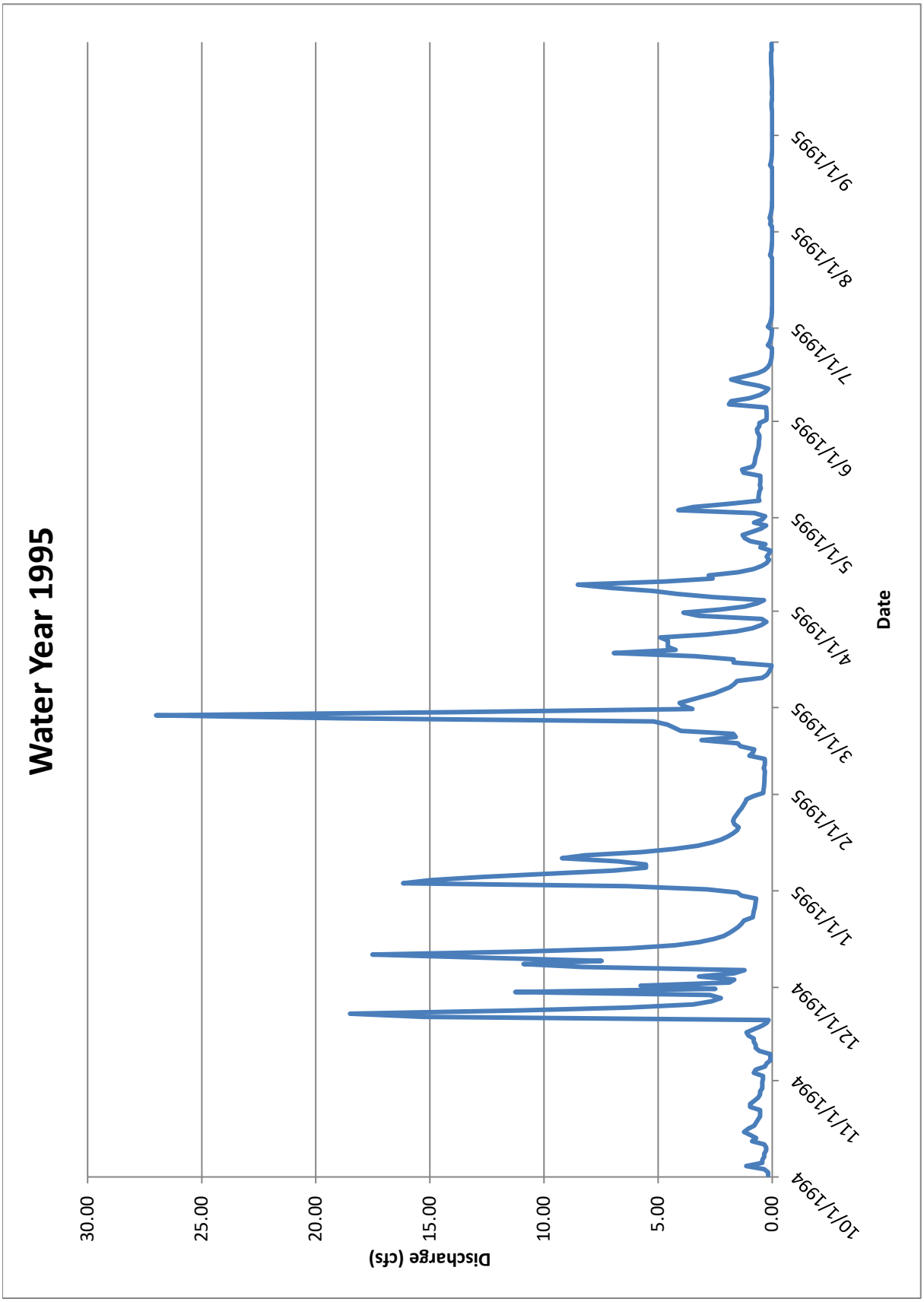
4/1/1994
5/1/1994
6/1/1994
7/1/1994
8/1/1994
9/1/1994
Date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Discharge (cfs)
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20.00
15.00
10.00
5.00
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11/1/1994
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1/1/1995
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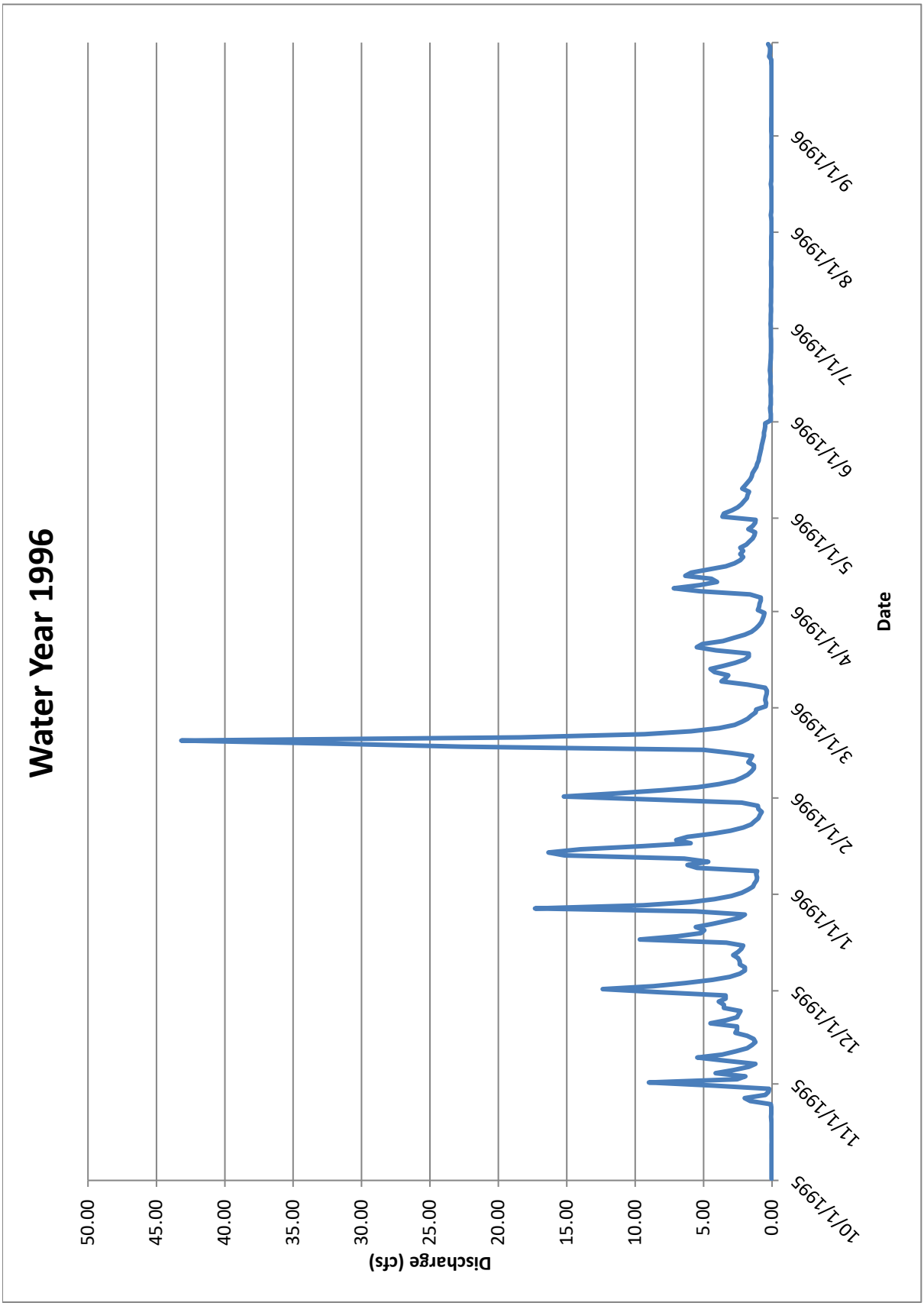
6/1/1995
7/1/1995
8/1/1995
9/1/1995
Date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25.00
20.00
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5.00
0.00
10/1/1995
11/1/1995
12/1/1995
1/1/1996
2/1/1996
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6/1/1996
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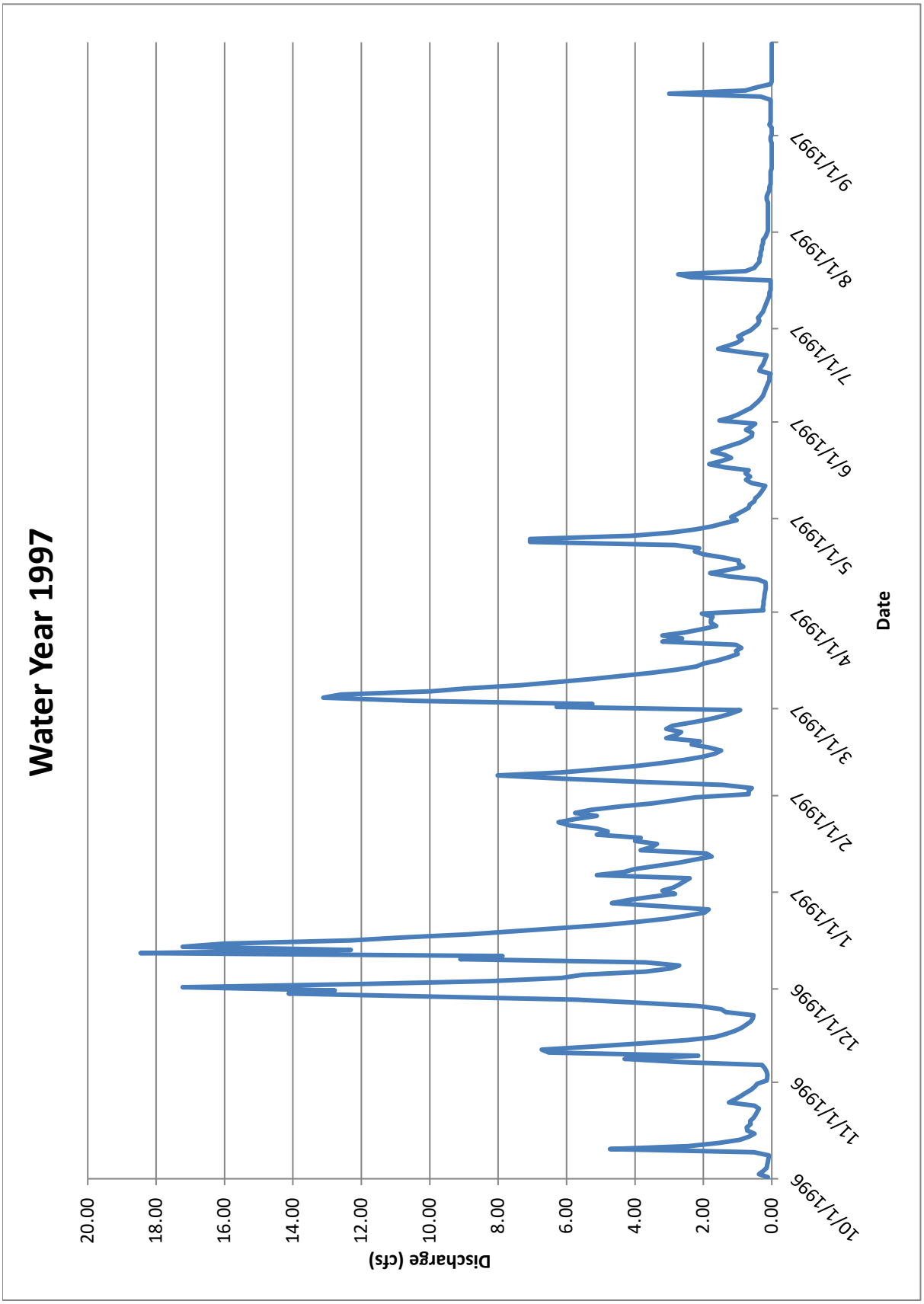
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12.00
10.00
8.00
6.00
4.00
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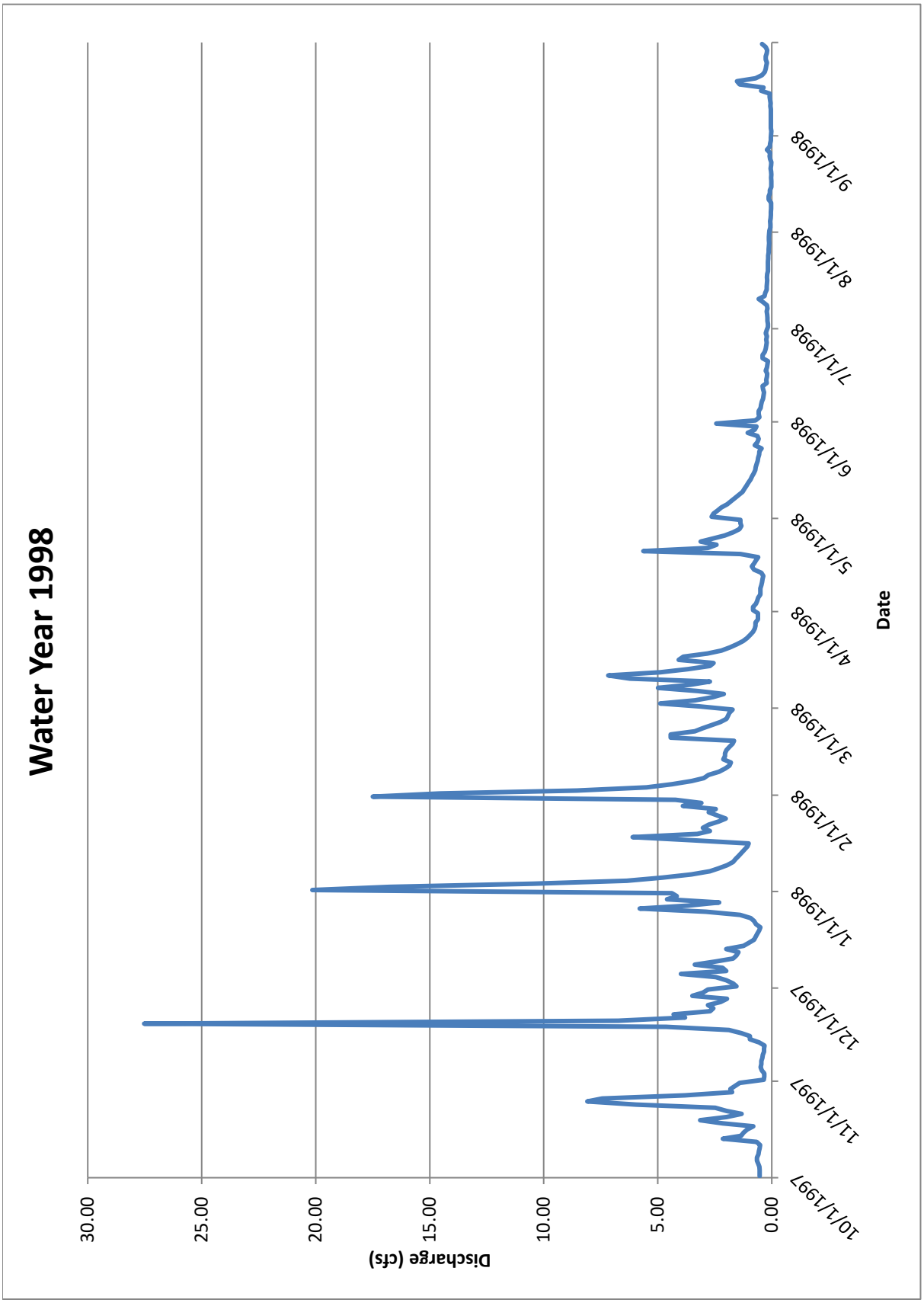
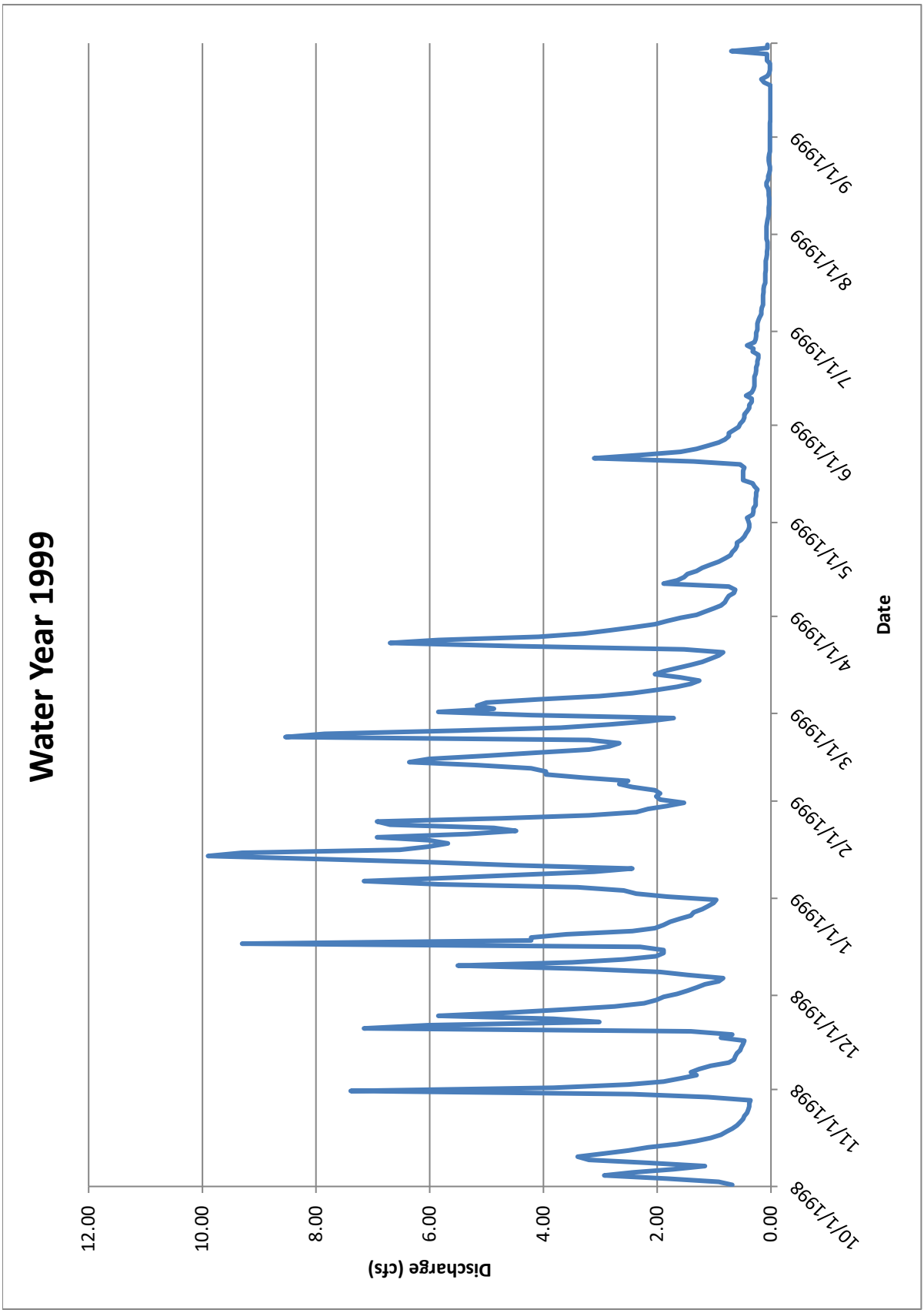
0.00
10/1/1996
11/1/1996
12/1/1996
1/1/1997
2/1/1997
3/1/1997
4/1/1997
5/1/1997
6/1/1997
7/1/1997
8/1/1997
9/1/1997
Date


Water Year 1998
Discharge (cfs)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
10/1/1997
11/1/1997
12/1/1997
1/1/1998
2/1/1998
3/1/1998
4/1/1998
5/1/1998
6/1/1998
7/1/1998
8/1/1998
9/1/1998
Date


Water Year 1999
Discharge (cfs)
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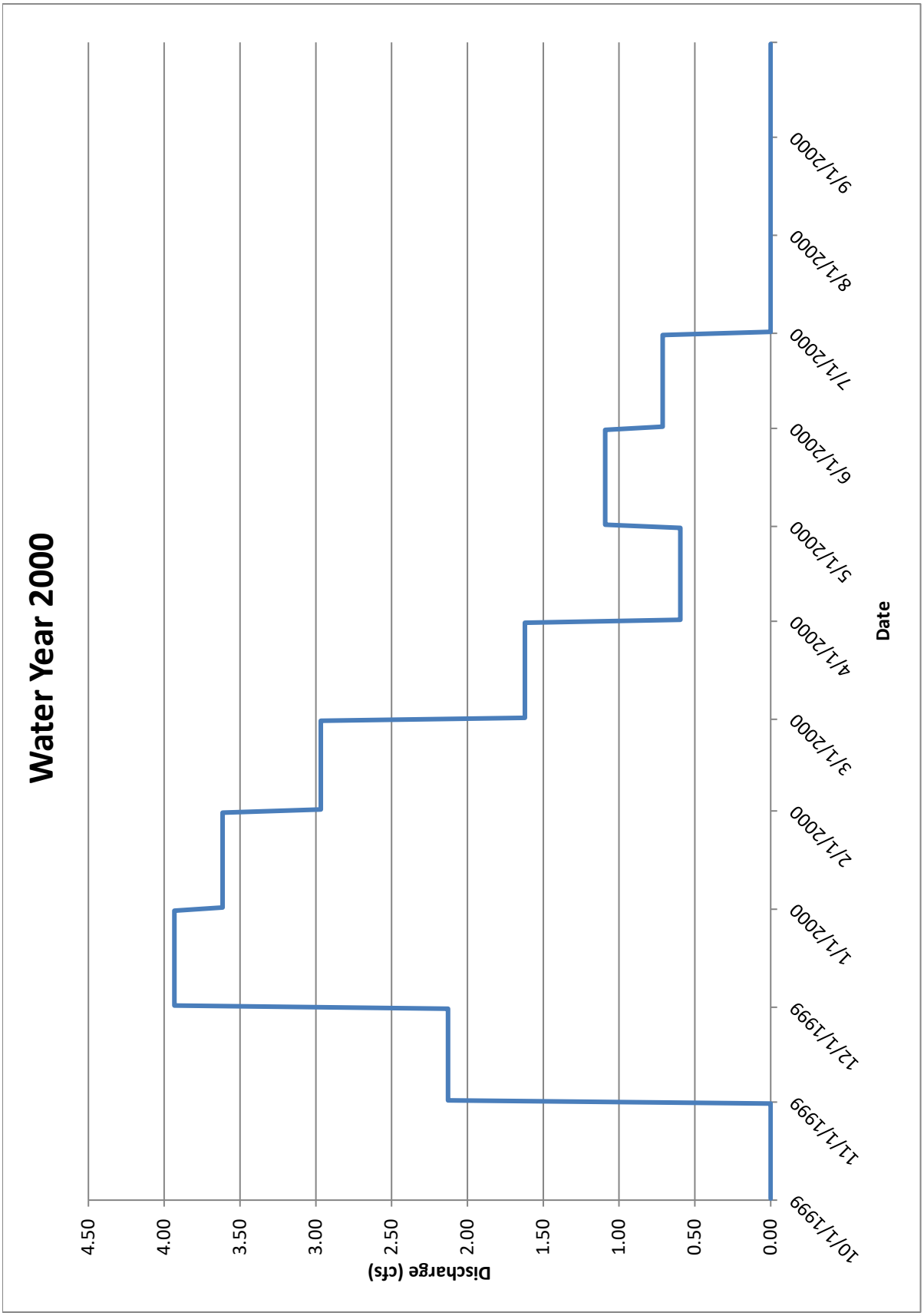
10.00
8.00
6.00
4.00
2.00
0.00
10/1/1998
11/1/1998
12/1/1998
1/1/1999
2/1/1999
3/1/1999
4/1/1999
5/1/1999
6/1/1999
7/1/1999
8/1/1999
9/1/1999
Date


Water Year 2000
Discharge (cfs)
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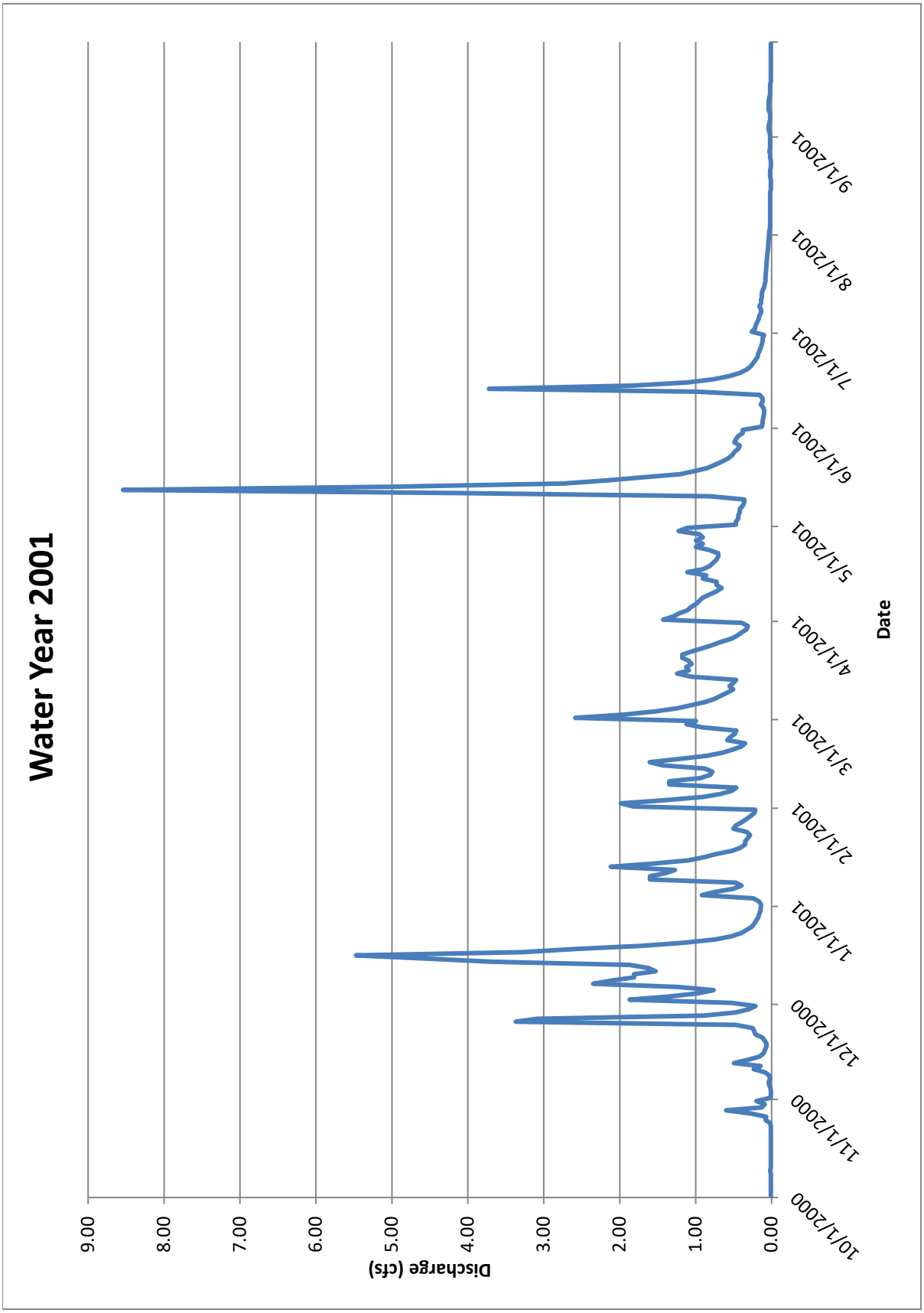
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
10/1/1999
11/1/1999
12/1/1999
1/1/2000
2/1/2000
3/1/2000
4/1/2000
5/1/2000
6/1/2000
7/1/2000
8/1/2000
9/1/2000
Date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Discharge (cfs)
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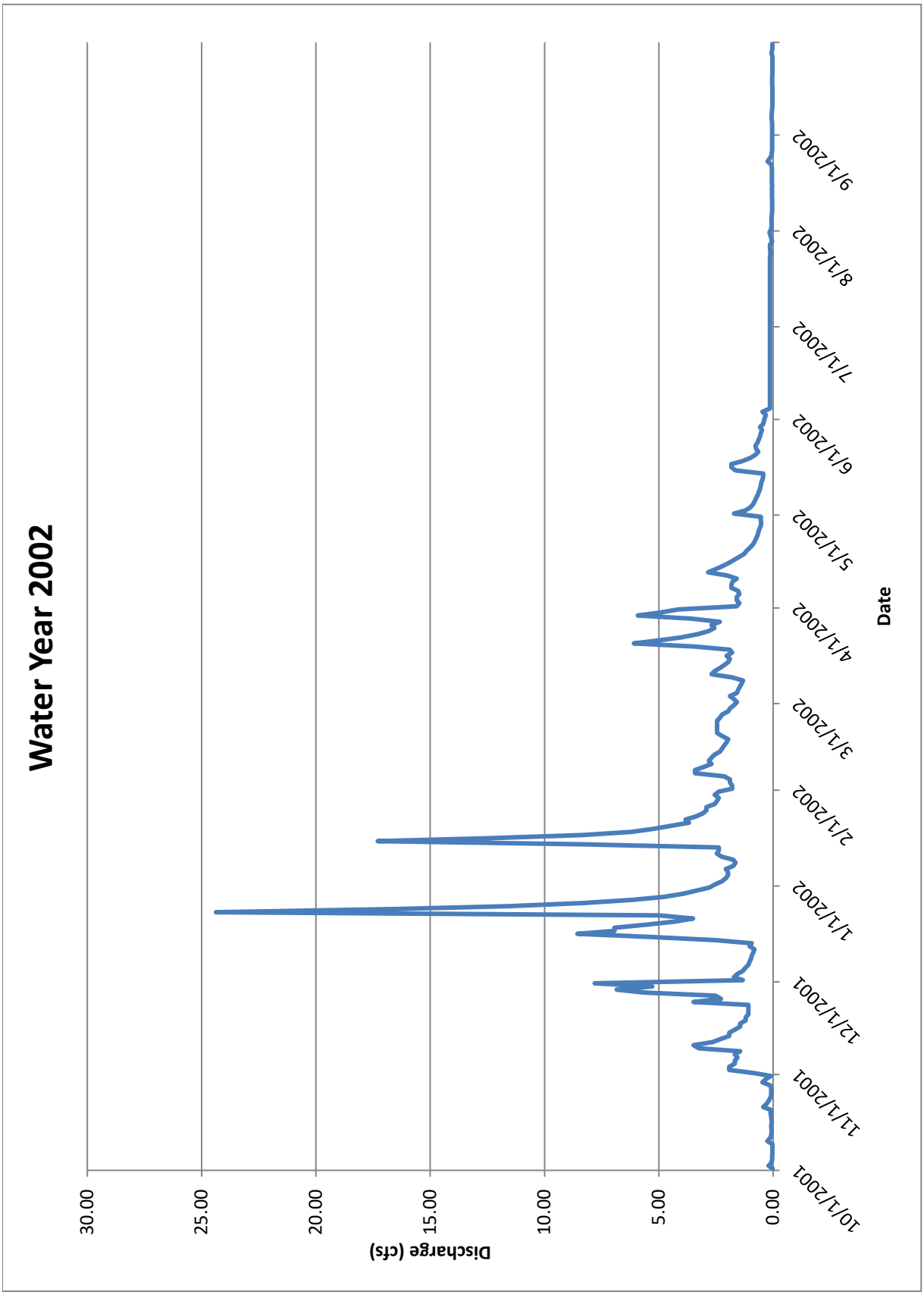
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10/1/2000
11/1/2000
12/1/2000
1/1/2001
2/1/2001
3/1/2001
4/1/2001
5/1/2001
6/1/2001
7/1/2001
8/1/2001
9/1/2001
Date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Discharge (cfs)
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25.00
20.00
15.00
10.00
5.00
0.00
10/1/2001
11/1/2001
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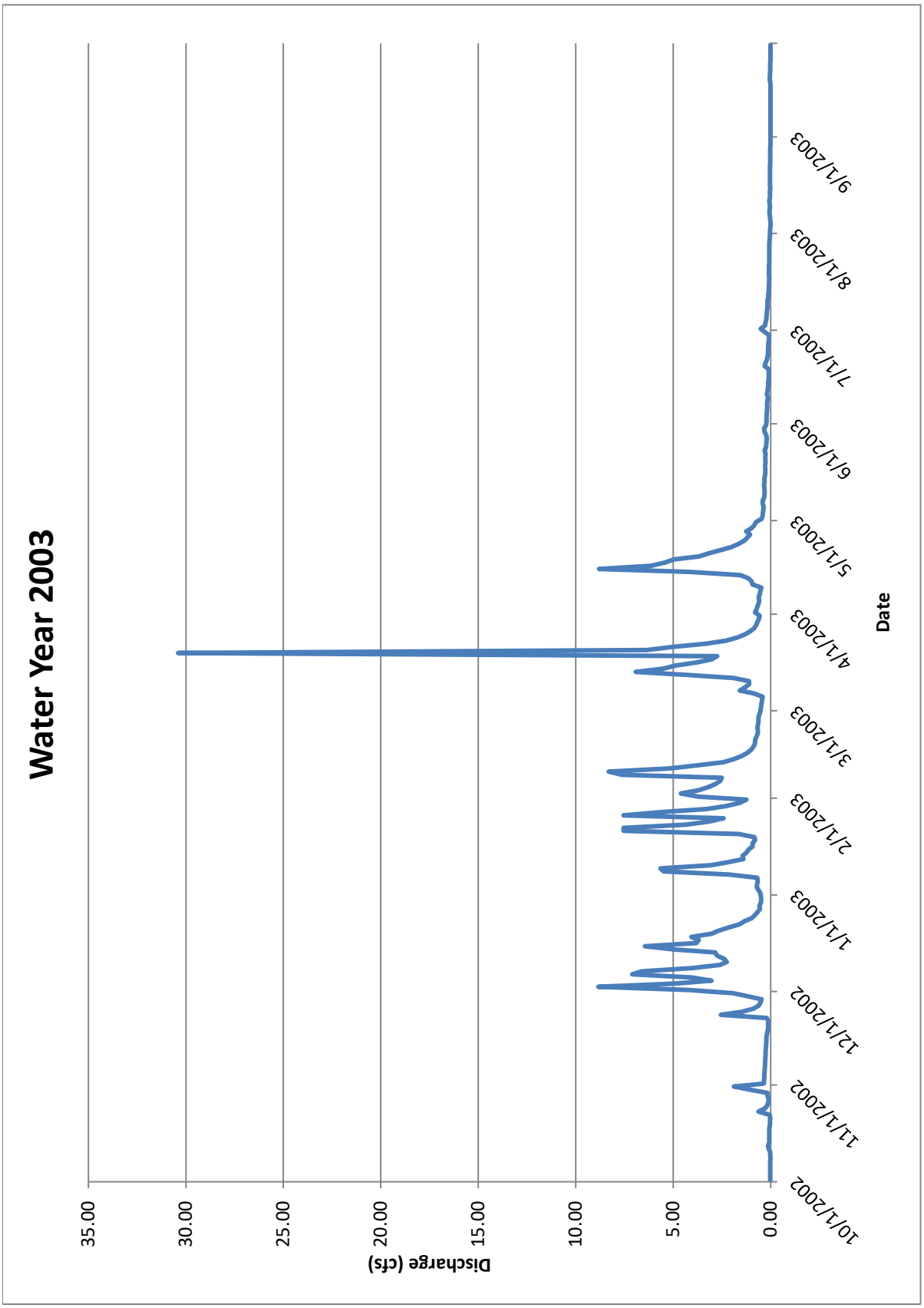
1/1/2002
2/1/2002
3/1/2002
4/1/2002
5/1/2002
6/1/2002
7/1/2002
8/1/2002
9/1/2002
Date


Water Year 2003
Discharge (cfs)
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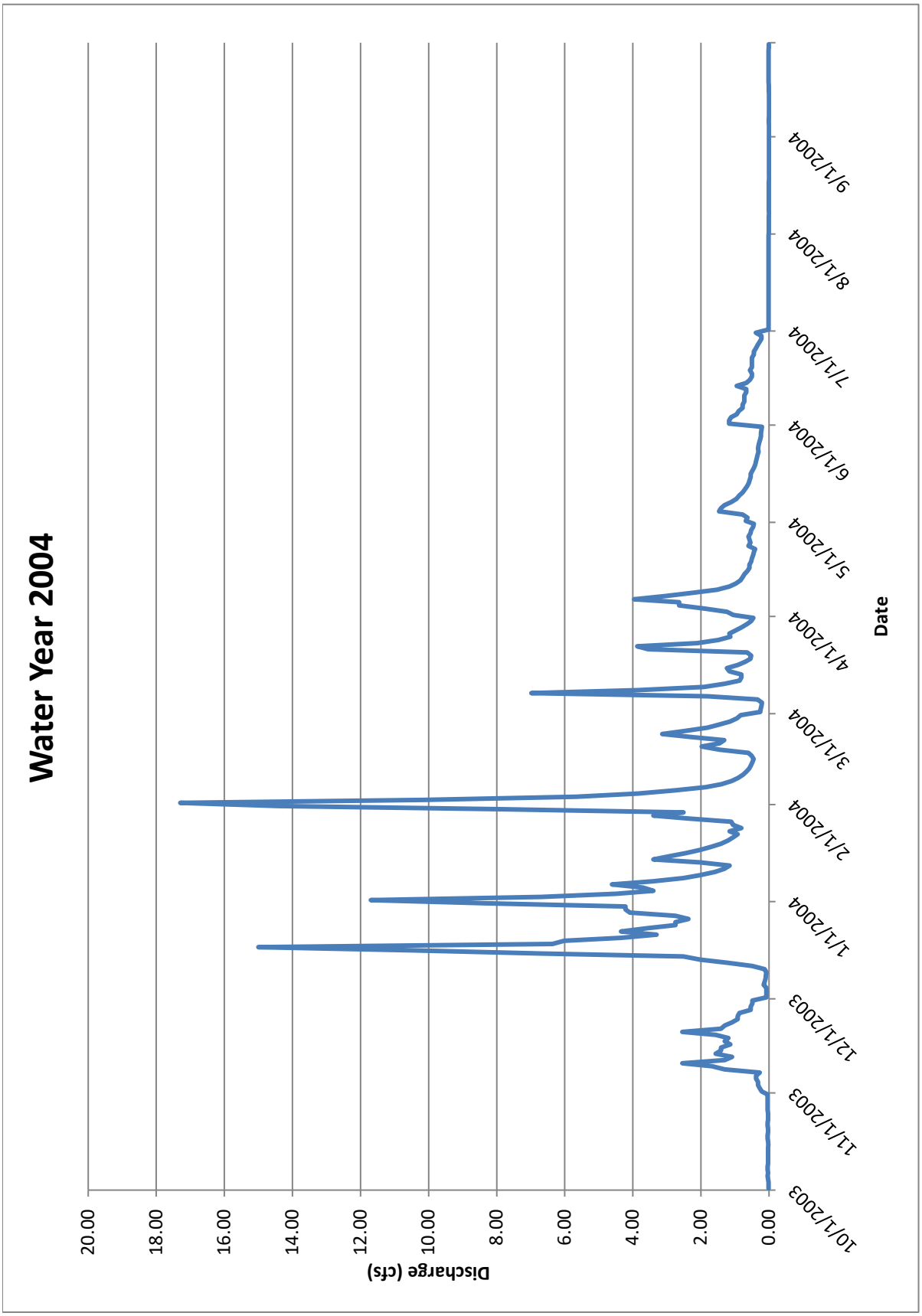
30.00
25.00
20.00
15.00
10.00
5.00
0.00
10/1/2002
11/1/2002
12/1/2002
1/1/2003
2/1/2003
3/1/2003
4/1/2003
5/1/2003
6/1/2003
7/1/2003
8/1/2003
9/1/2003
Date


Water Year 2004
Discharge (cfs)
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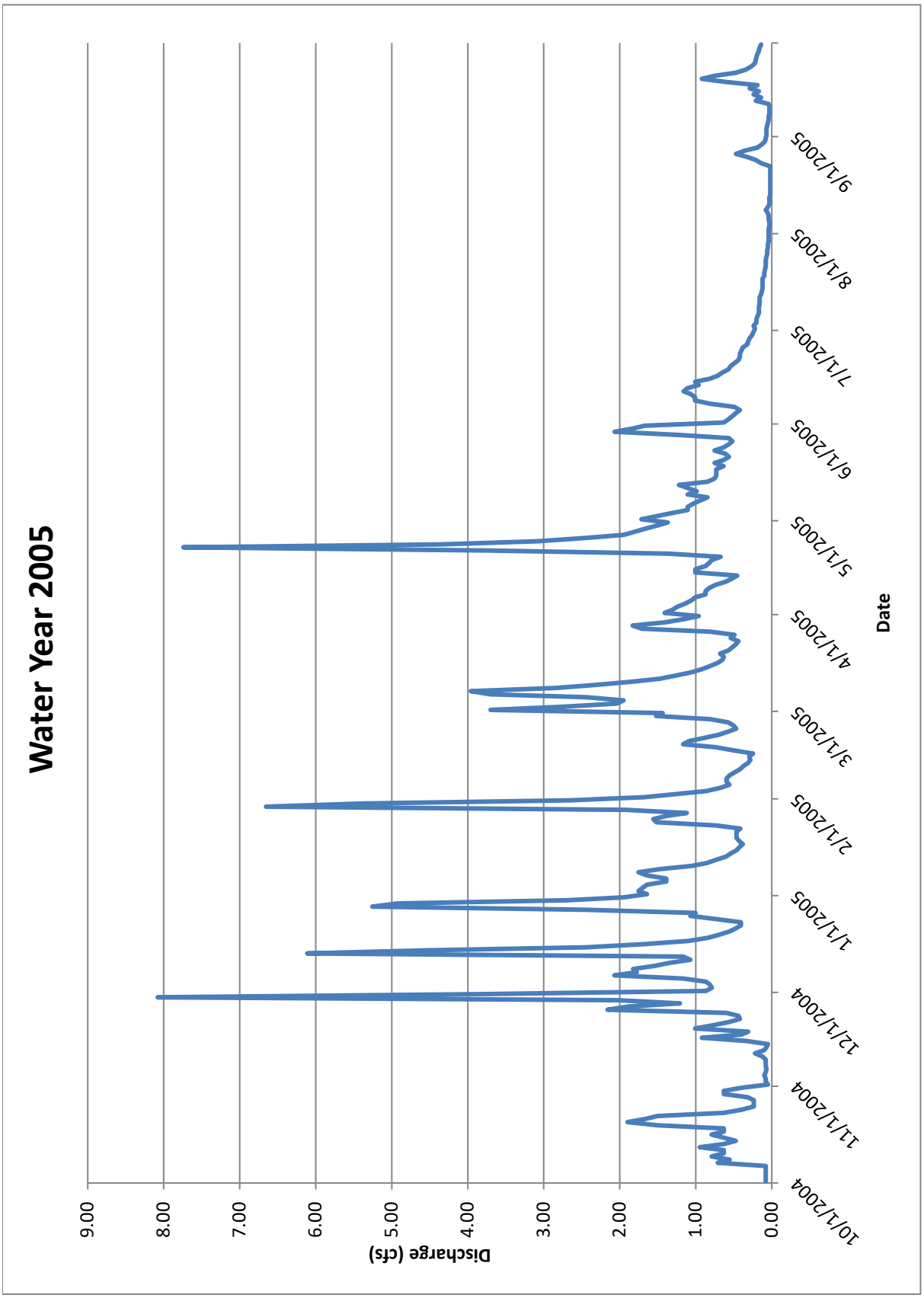
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
10/1/2003
11/1/2003
12/1/2003
1/1/2004
2/1/2004
3/1/2004
4/1/2004
5/1/2004
6/1/2004
7/1/2004
8/1/2004
9/1/2004
Date


Water Year 2005
Discharge (cfs)
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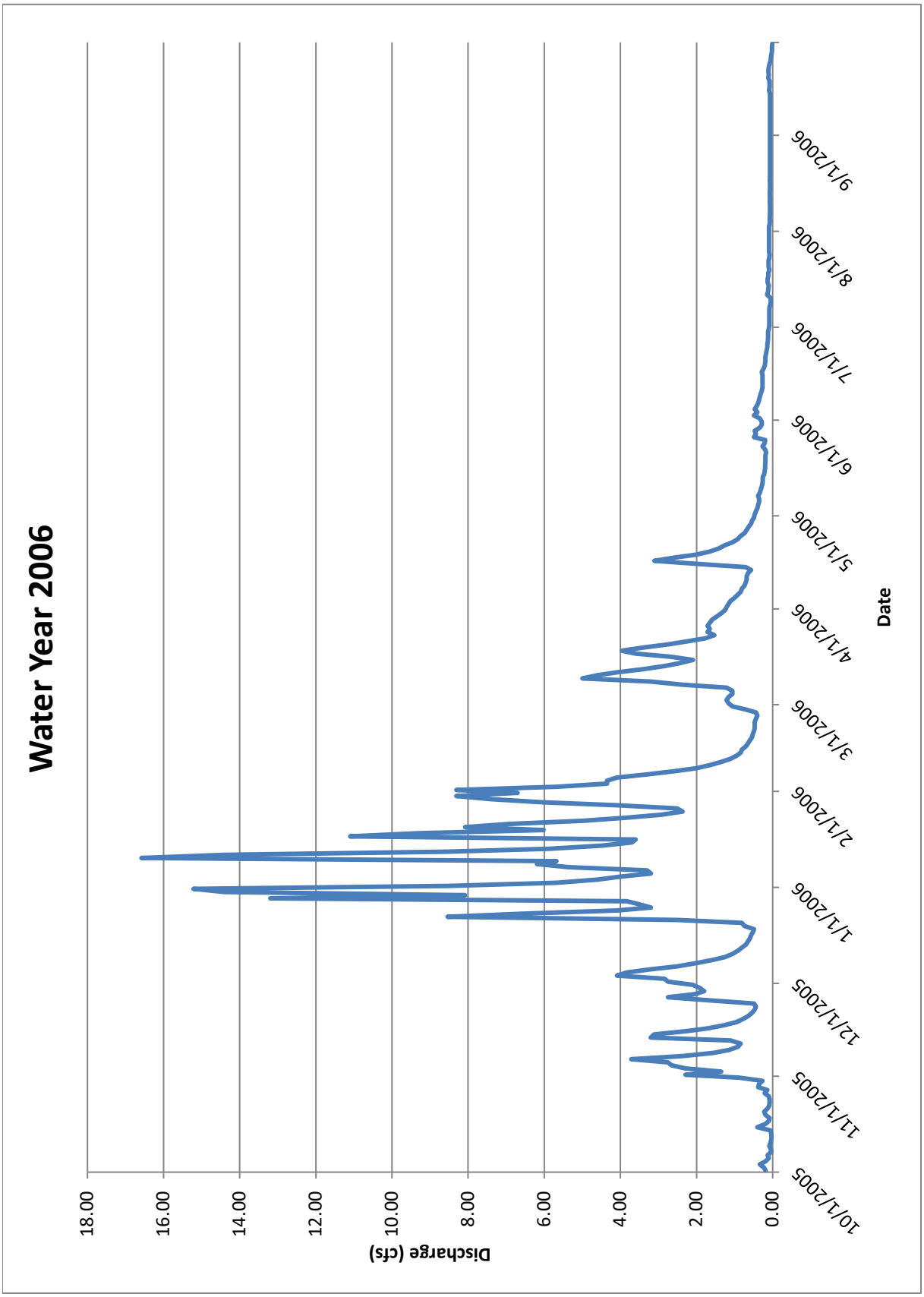
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10/1/2004
11/1/2004
12/1/2004
1/1/2005
2/1/2005
3/1/2005
4/1/2005
5/1/2005
6/1/2005
7/1/2005
8/1/2005
9/1/2005
Date


Water Year 2006
Discharge (cfs)
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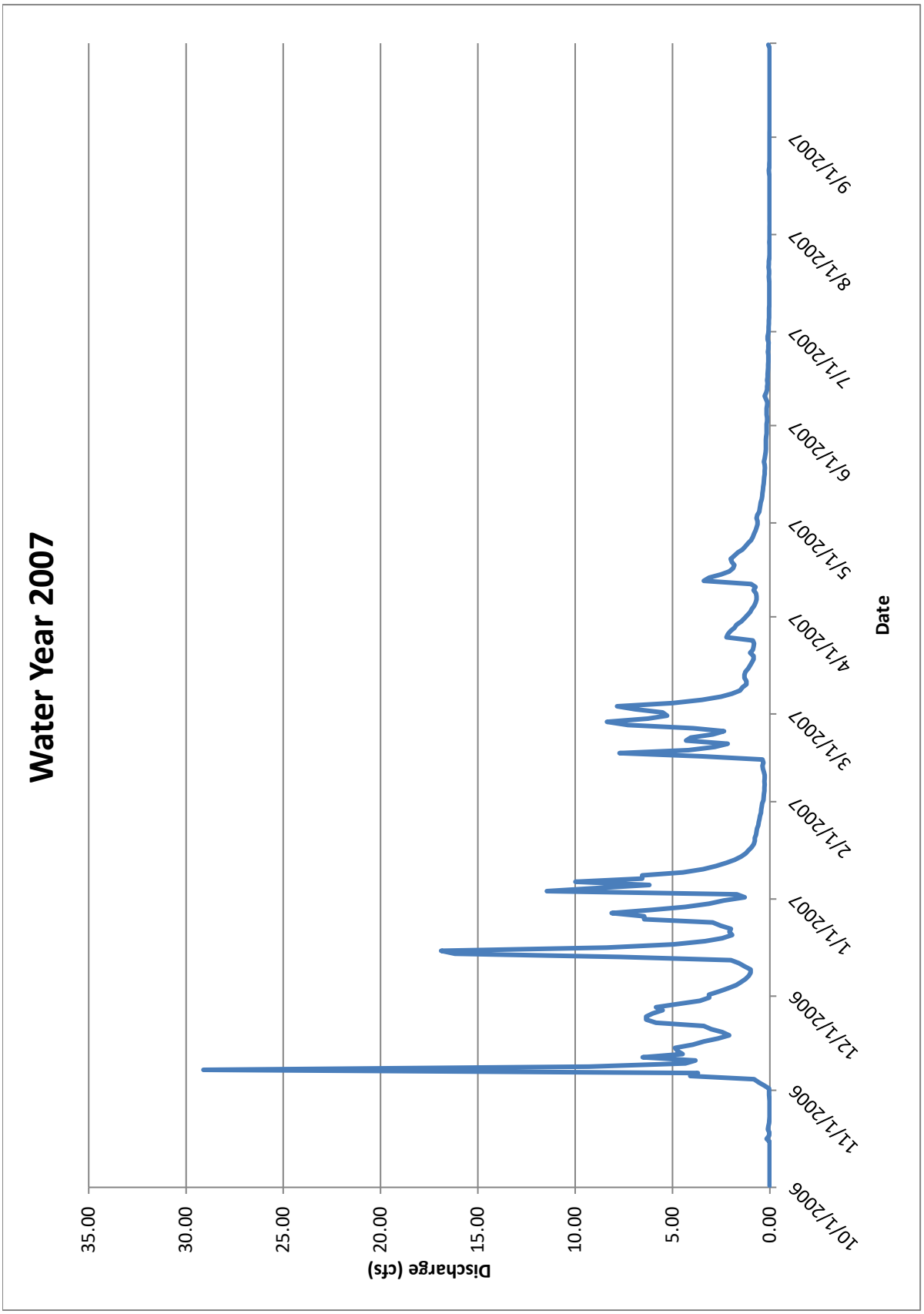
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
10/1/2005
11/1/2005
12/1/2005
1/1/2006
2/1/2006
3/1/2006
4/1/2006
5/1/2006
6/1/2006
7/1/2006
8/1/2006
9/1/2006
Date


Water Year 2007
Discharge (cfs)
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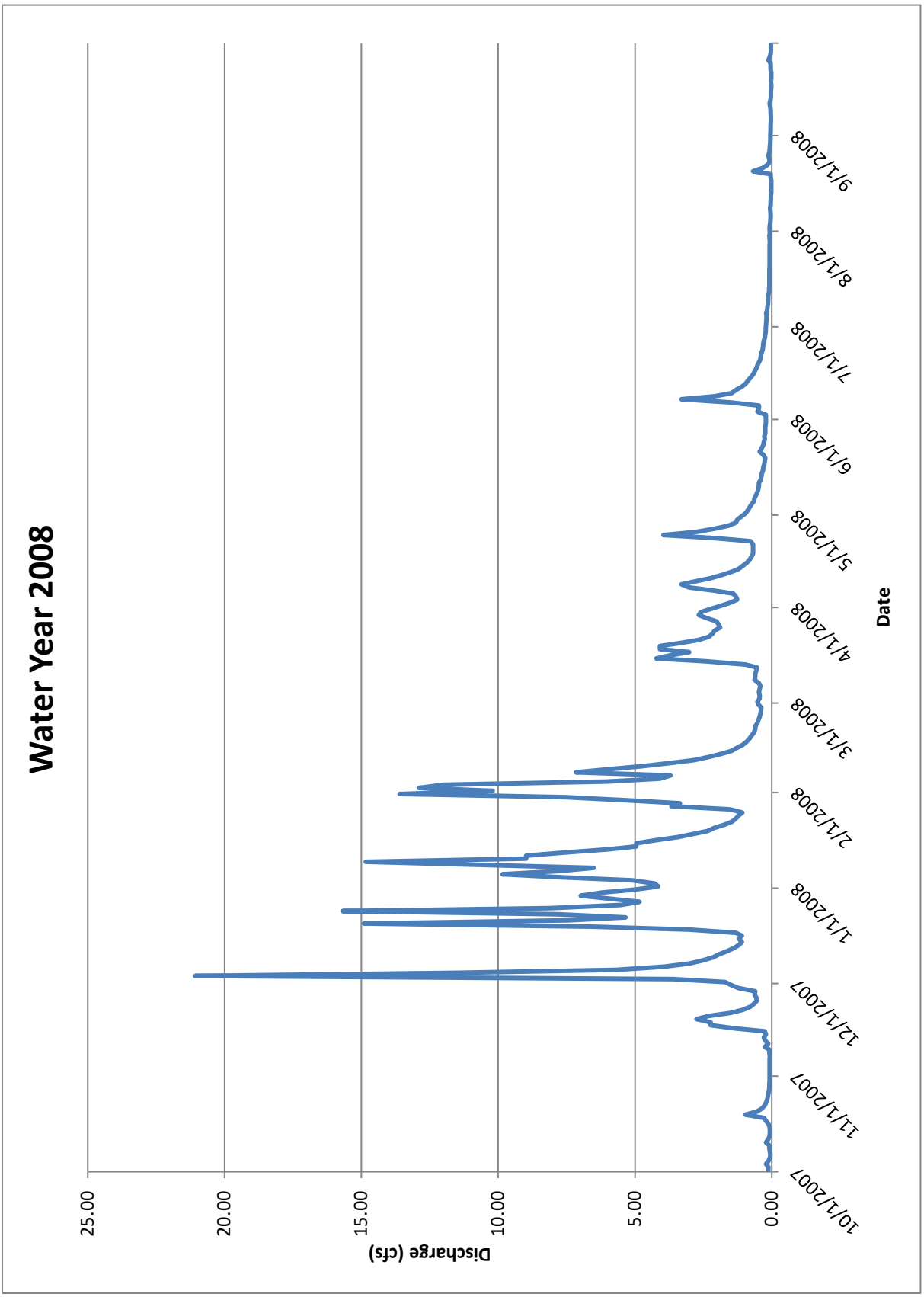
30.00
25.00
20.00
15.00
10.00
5.00
0.00
10/1/2006
11/1/2006
12/1/2006
1/1/2007
2/1/2007
3/1/2007
4/1/2007
5/1/2007
6/1/2007
7/1/2007
8/1/2007
9/1/2007
Date


Water Year 2008
Discharge (cfs)
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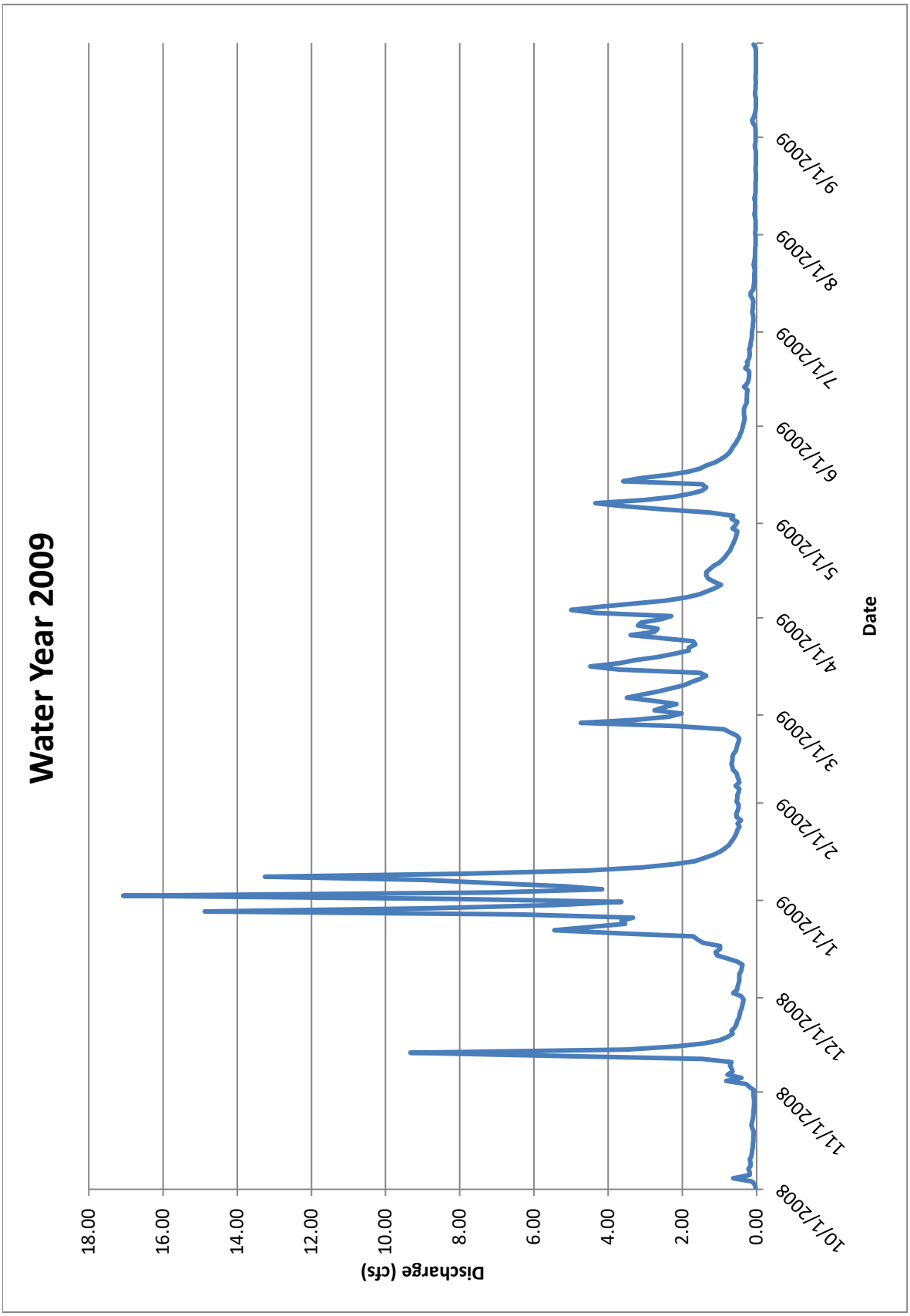
20.00
15.00
10.00
5.00
0.00
10/1/2007
11/1/2007
12/1/2007
1/1/2008
2/1/2008
3/1/2008
4/1/2008
5/1/2008
6/1/2008
7/1/2008
8/1/2008
9/1/2008
Date


Water Year 2009
Discharge (cfs)
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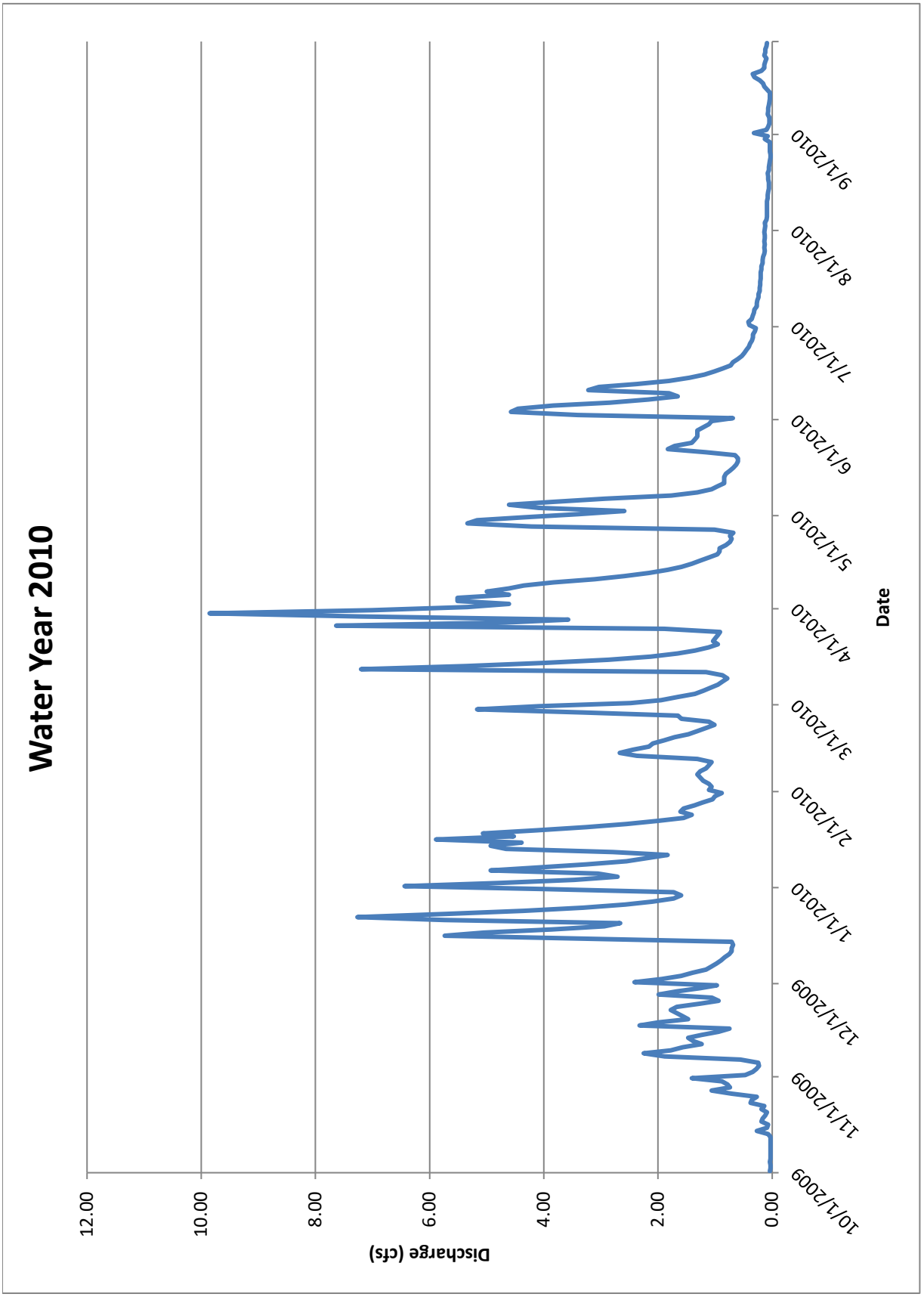
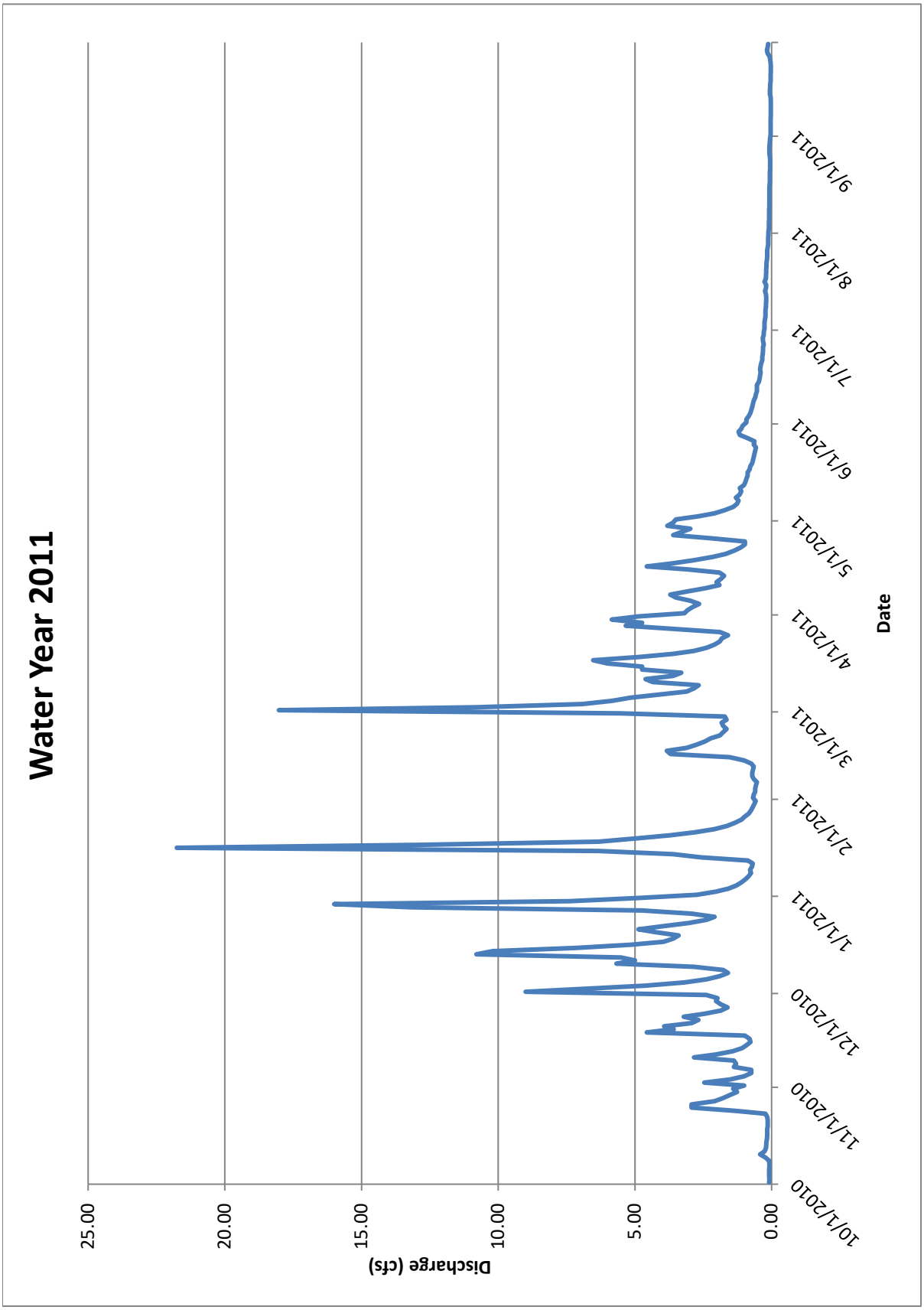
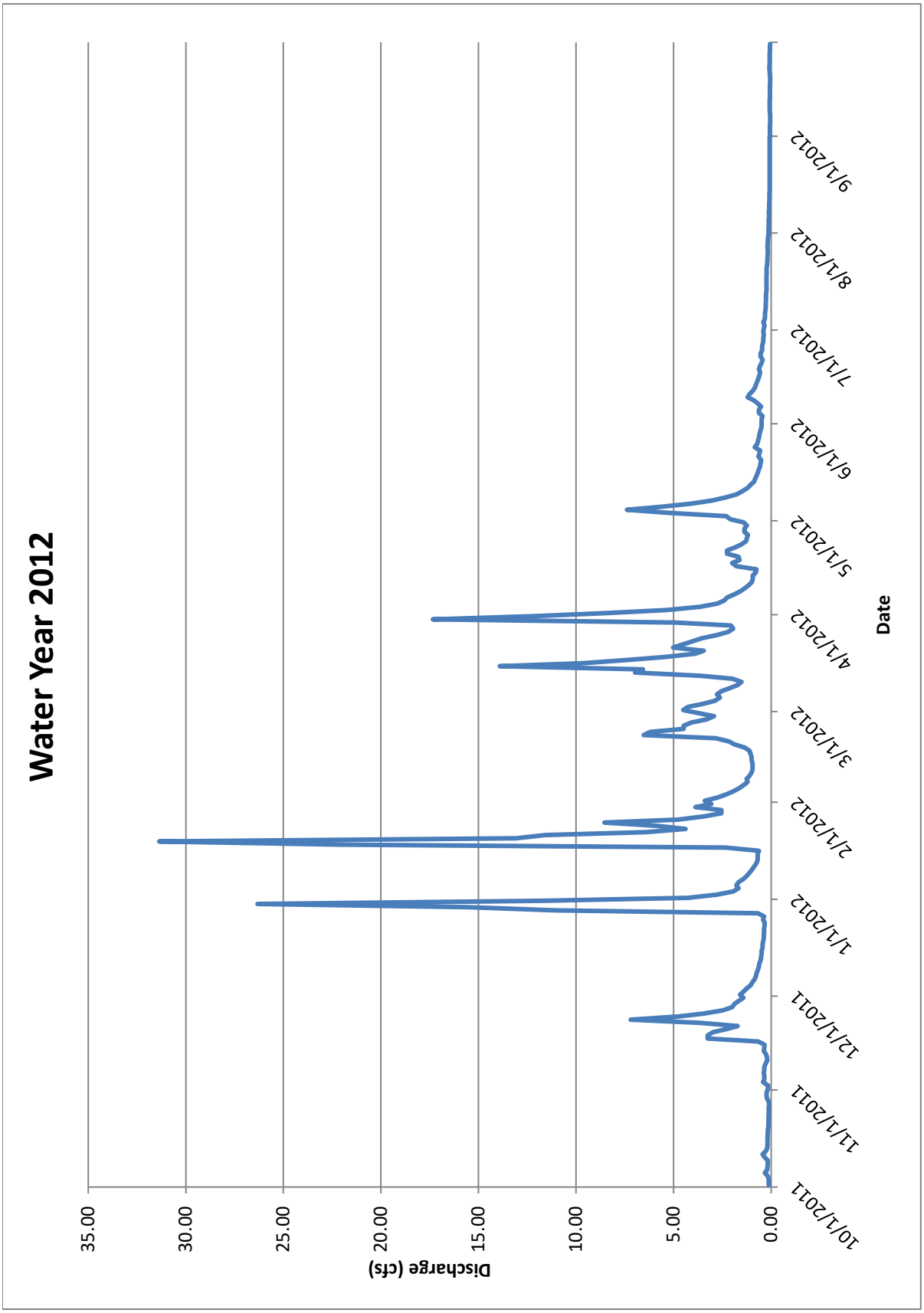
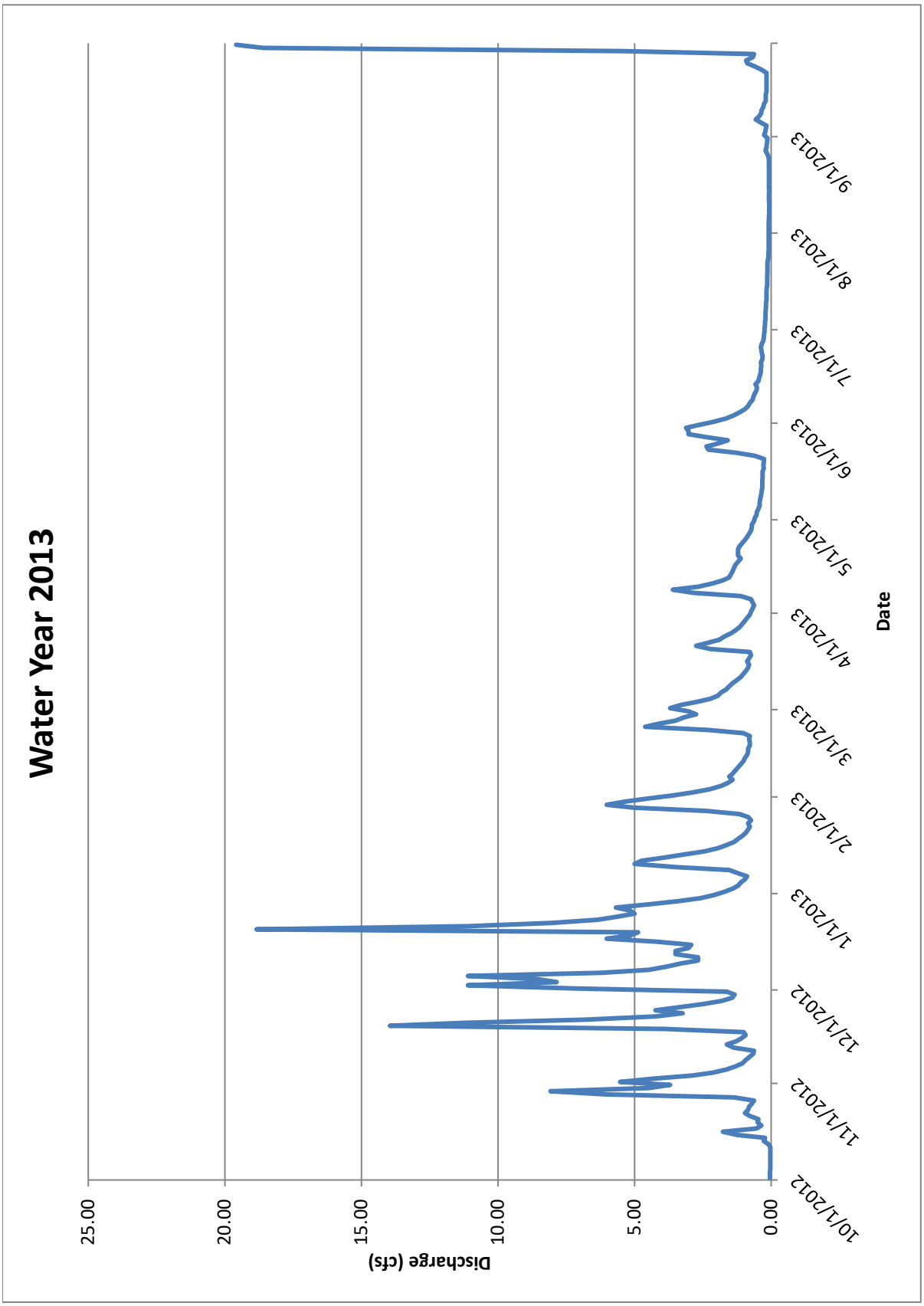
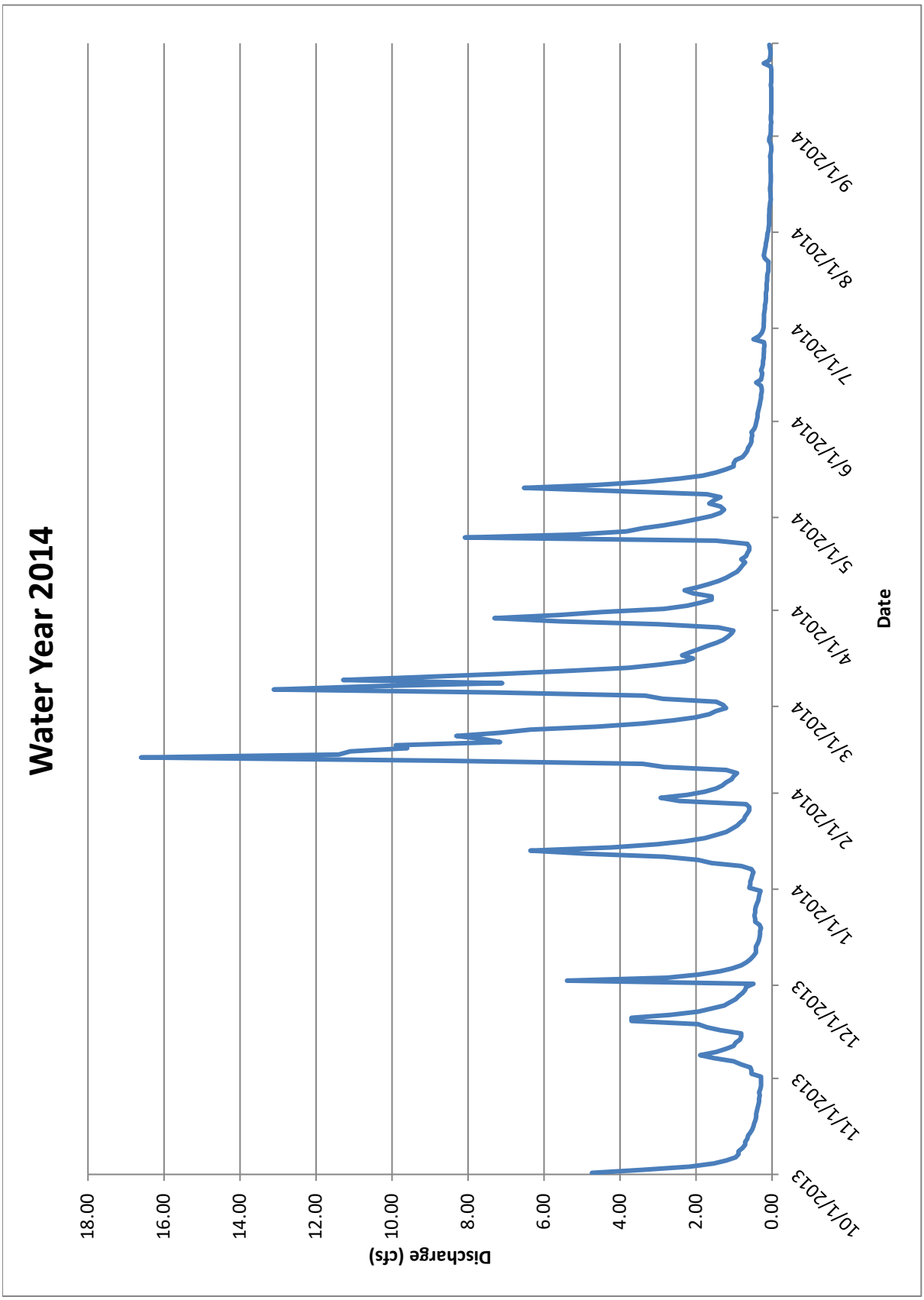
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
10/1/2008
11/1/2008
12/1/2008
1/1/2009
2/1/2009
3/1/2009
4/1/2009
5/1/2009
6/1/2009
7/1/2009
8/1/2009
9/1/2009
Date

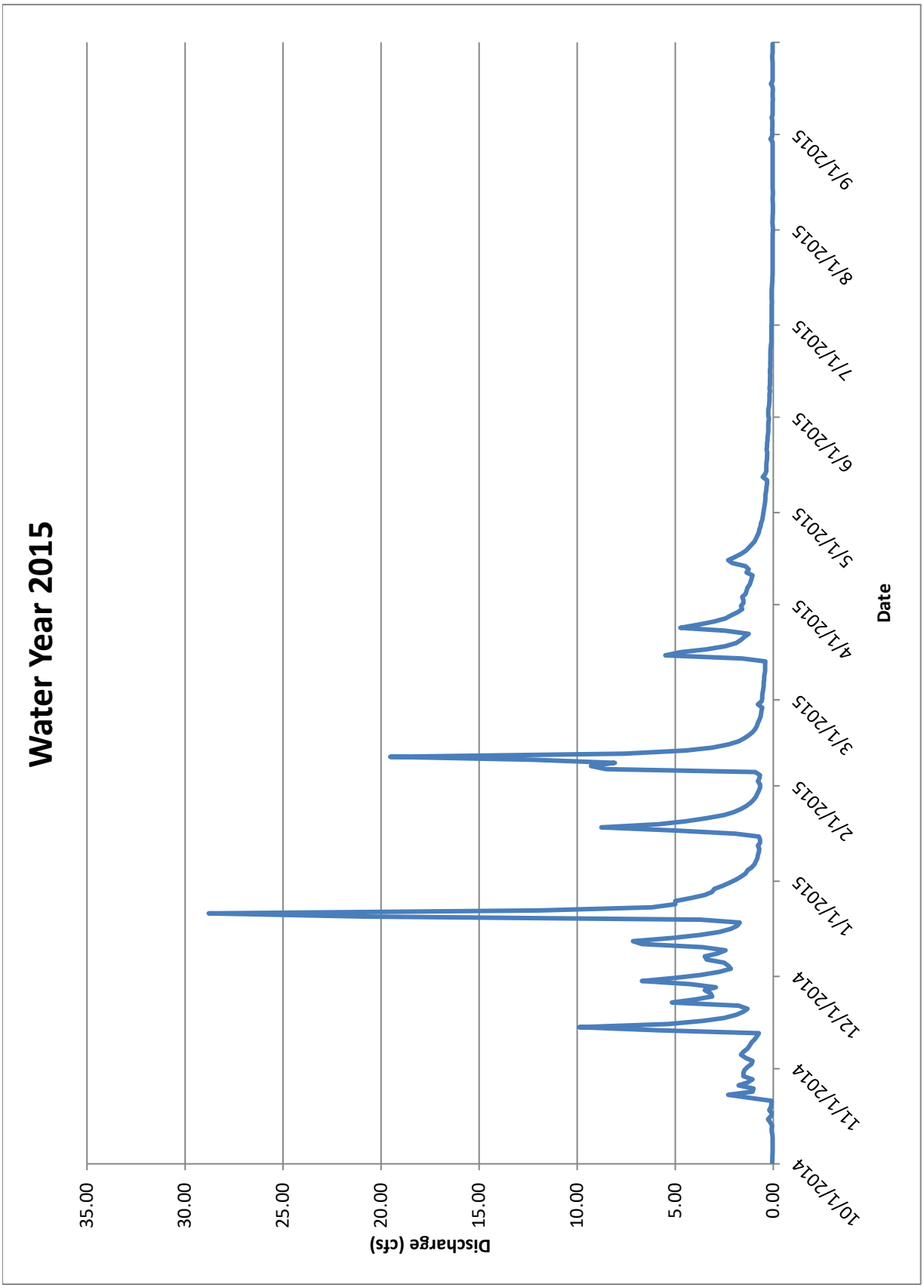

Water Year 2010
Discharge (cfs)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
10/1/2009
11/1/2009
12/1/2009
1/1/2010
2/1/2010
3/1/2010
4/1/2010
5/1/2010
6/1/2010
7/1/2010
8/1/2010
9/1/2010
Date


Water Year 2011
Discharge (cfs)
25.00
20.00
15.00
10.00
5.00
0.00
10/1/2010
11/1/2010
12/1/2010
1/1/2011
2/1/2011
3/1/2011
4/1/2011
5/1/2011
6/1/2011
7/1/2011
8/1/2011
9/1/2011
Date


Water Year 2012
Discharge (cfs)
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
10/1/2011
11/1/2011
12/1/2011
1/1/2012
2/1/2012
3/1/2012
4/1/2012
5/1/2012
6/1/2012
7/1/2012
8/1/2012
9/1/2012
Date


Water Year 2013
Discharge (cfs)
25.00
20.00
15.00
10.00
5.00
0.00
10/1/2012
11/1/2012
12/1/2012
1/1/2013
2/1/2013
3/1/2013
4/1/2013
5/1/2013
6/1/2013
7/1/2013
8/1/2013
9/1/2013
Date


Water Year 2014
Discharge (cfs)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
10/1/2013
11/1/2013
12/1/2013
1/1/2014
2/1/2014
3/1/2014
4/1/2014
5/1/2014
6/1/2014
7/1/2014
8/1/2014
9/1/2014
Date


Water Year 2015
Discharge (cfs)
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
10/1/2014
11/1/2014
12/1/2014
1/1/2015
2/1/2015
3/1/2015
4/1/2015
5/1/2015
6/1/2015
7/1/2015
8/1/2015
9/1/2015
Date

NEEDLE BRANCH UPPER
STREAMFLOW WATER YEARS 2007-2015

SUMMARY

This report summarizes the methods and compilation of the streamflow data for Needle Branch Upper (NBU) (Needle Branch Upper Gauging station, watershed area 84 acres) for water years 2007-2015. See the Excel file entitled, NBU_Final_WY2007-2015, for all data. Given the amount of prediction and confidence in the actual stage measurements, the streamflow data are rated as poor (per Rantz et al. 1982). Streamflow values can be used for relative comparisons between the different years and different gauging locations. The data cannot be used to estimate annual water yields as affected by timber harvesting. A series of new recommendations have been made to improve streamflow measurement and water yield quantification.

There is an 18-inch 45-degree PlastiFab trapezoidal flume installed at NBU. A lookup table (LUT) and a low flow equation were provided by PlastiFab where the user inputs the stage to get the corresponding discharge. Stage data were collected every 10 minutes by a pressure transducer located in the flume stilling well. These data are recorded on a logger and physically downloaded at various intervals, and all files are shared at the water year end. As noted from the field notes, there are no stage corrections resulting from frequent debris removal and/or sediment removal from the flume or when the flume was leaking. The higher stage measurement overestimates streamflow.

Stage data were used to calculate daily, monthly, and annual streamflow. These runoff values (measured as depth) were compared to on-site precipitation values. Precipitation recorders are located throughout the watershed; however data quality is generally poor due to missing records or equipment failure. The nearest available long-term precipitation data for the Alsea Fish Hatchery (AFH) (NOAA 350145) were downloaded. AFH measures precipitation to the tenth of a millimeter (0.1 mm/tip). These data were further confirmed by monthly PRISM data (on-file at Oregon State University). Water yield efficiency was calculated—runoff depth divided by precipitation depth. Many months had more runoff than precipitation and indicate an overestimation of streamflow. There are different efficiencies in water yield given the wet or dry soil mantle; nonetheless, it was determined that streamflow estimates were too high.

Once identified, new streamflow estimates were made by linear prediction from Needle Branch Gauging Station (NBL) discharge when possible, since it is the closest streamflow gauging station. Predictions were largely based on hydrograph comparisons (Rantz et al. 1982) a visual comparison of paired hydrograph shapes. Missing data (Needle Branch Upper Gauging Station, NBU) were estimated by comparison to the existing streamflow data (Needle Branch Gauging Station, NBL). Streamflow predictions were for a daily time step, since finer resolution would be too speculative, thus if a prediction was necessary a finer time step is unavailable. Streamflow records (NBU_Final_WY2007-2015) include 10 minute, daily, monthly and annual values.

RECOMMENDATIONS

1. A common and readily accessible database needs to be built and maintained. All data need to be uploaded shortly after collection. A common naming/labeling system needs to be implemented. Similarly, field notes, anecdotal observations, and pictures can be included.

2. Standard non-recording rain gauges (SRG) should be placed in and around the study watersheds for additional precipitation data collection and to validate tipping bucket rain gauges. Alter shields are less important than additional rain gauges.

3. Stream gauging stations all should have ‘outside’ staff gauges (rather than depth to water minus bench mark elevation calculations), including NBH and NBU. The weirs and the flumes are not self-

maintaining with respect to organic debris and sediment accumulation. Routine maintenance will include removing said debris; however stage measurements should include 'before and after' readings to allow better estimation of actual stage before debris accumulation. Streamflow measurements should be collected like other stations to confirm the rating curve. Low flows can be measured volumetrically. Other than prevention of back-waters impeding the downstream flume discharge, downstream channel maintenance efforts are generally not needed.

4. More frequent site visits to gauging stations and/or increased recording of stage during site visits. Stage values are rarely corrected or adjusted, but stage shifts are recognized at all streamflow gauging stations. Stage notes can be collected on the proposed discharge form in Appendix VI (p. 1.23).

5. All weirs and flumes are subject to leakage. It is advised that a small amount of fluorescein dye be injected into the upstream channel especially during low flows and to identify structure leakage. Maintenance can include caulking, mortar, or water proof epoxy.

6. More frequent discharge measurements (cross-sections) should be made to build better rating curves for all stations. The rating curve (stage-discharge relationship) should not be considered constant. All stations are subject to channel shape changes which will affect the rating curve, specifically, the lower portion of the rating curve is subject to change. Offsets are rarely addressed in the streamflow reduction. We advise that each discharge measurement be plotted to assess rating curve functionality and consistency. A point to the left of the curve will show backwater conditions, conversely a point to the right of the curve may show a steeper energy slope - as on a rising limb. Each gauging station has a zero-flow stage that needs to be included in the rating curve. Units are often problematic, whereby streamflow may be measured as m/s and then incorrectly converted to ft/s. See proposed discharge measurement form in Appendix VI (p. 1.23).

METHODOLOGY

1. Using the LUT and the low flow equation provided by PlastiFab, the 10-minute stage data were converted to a discharge value.

Equation 1: PlastiFab Low Flow Equation (If stage height is less than 0.25 feet)

$$NBU\ Q[cfs] = 2.853(Stage\ ht[ft] + 0.13558)^{2.497}$$

   a. When the 10-minute stage data were available it was converted to a discharge value using Equation 1 and the LUT provided. The 10-minute data were averaged to get a mean daily discharge value and labeled as raw NBU discharge.

2. The mean daily discharge data were converted to a runoff (RO) value using the equation.

Equation 2: Runoff Equation

$$Raw\ NBU\ RO[in] = \frac{12 * 86400 * Q[cfs]}{Area[ft^2]}$$

3. When raw NBU RO was missing, it was predicted.
   a. When linear interpolation could be used, it was.
   b. Linear interpolation was not used when there was a precipitation event during the section of missing data or when the section of missing data exceeded 7 days.
   c. If the section of missing data were greater than 7 days the entire month was set at a constant value.

Equation 3: Pre-Harvest Regression (Use 10/1/2006-9/30/2009)

$$NBU\ RO[in] = 1.03(NBL\ RO[in])$$

$$R^2 = 0.98$$

Equation 4: Post-Harvest Regression (Use 10/1/2009-present)

$$NBU\ RO[in] = 1.08(NBL\ RO[in])$$

$$R^2 = 0.94$$

4. To account for over estimation of NBU RO, a peak RO equation was developed.

Equation 5: Peak Runoff Equation

$$NBU\ RO[in]_{Peak} = 0.77(NBL\ RO[in]_{Peak})$$

$$R^2 = 0.92$$

NOTE: *This equation was used on RO values greater than one inch.*

5. The raw NBU RO data and the predicted NBU RO data were summed by month to get a monthly RO value.
6. On a monthly time-step, raw NBU RO and predicted NBU RO were compared to NBL RO and the differences were analyzed.
7. If the value of the difference between the predicted RO and the raw RO was greater than two inches/month, the raw RO was corrected with Equation 3 and Equation 4. If the value of the difference between the predicted RO and the raw RO was less than two inches/month then it was assumed that the raw RO value was correct.

LITERATURE CITED

Rantz, S.E. et al. 1982. *Measurement and Computation of Streamflow* (two volumes). USGS Water Supply Paper 2175. Washington DC: US Geological Survey.

TABLES

Table 1. Summary of Stage Data Collected by Year at NBU

NBU Missing Data by Year			
Water Year	**Number of Days in Year**	**Number of Days Recorded**	**Percent Missing**
2007	365	327	10.41
2008	366	366	
2009	365	365	
2010	365	348	4.66
2011	365	255	30.14
2012	366	364	0.55
2013	365	363	0.55
2014	365	343	6.03
2015	365	365	
Total	3287	3096	5.81

Table 2. Summary of NBU Daily Streamflow Predictions

NBU Daily Flow Predictions	Number of Days	Total Number of Days	Percent
Observed Q value assumed correct	2173	3287	66.11
Pre-Harvest Linear Regression: NBU RO [in] = 1.03(NBL RO [in]) R^2 = 0.98	222	3287	6.75
Post-Harvest Linear Regression: NBU RO [in] = 1.08(NBL RO [in]) R^2 = 0.94	892	3287	27.14

Table 3. NBU Lookup Table to be Used to Estimate Streamflows

2015 NBU LUT 18" 45 Deg. Trap. Flume			
Stage (h) (ft)	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**
<0.25	$Q = 2.853(h+0.13558)^{2.497}$	0.61	1.371
0.25	0.264	0.62	1.417
0.26	0.282	0.63	1.464
0.27	0.3	0.64	1.513
0.28	0.318	0.65	1.562
0.29	0.338	0.66	1.612
0.3	0.358	0.67	1.663
0.31	0.379	0.68	1.715
0.32	0.401	0.69	1.768
0.33	0.423	0.7	1.822
0.34	0.446	0.71	1.877
0.35	0.47	0.72	1.933
0.36	0.494	0.73	1.99
0.37	0.52	0.74	2.047
0.38	0.546	0.75	2.106
0.39	0.572	0.76	2.166
0.4	0.6	0.77	2.227
0.41	0.628	0.78	2.289
0.42	0.658	0.79	2.352
0.43	0.688	0.8	2.416
0.44	0.718	0.81	2.481
0.45	0.75	0.82	2.547
0.46	0.782	0.83	2.614
0.47	0.815	0.84	2.682
0.48	0.849	0.85	2.751
0.49	0.884	0.86	2.822
0.5	0.92	0.87	2.893
0.51	0.957	0.88	2.965
0.52	0.994	0.89	3.039
0.53	1.032	0.9	3.113
0.54	1.072	0.91	3.189
0.55	1.112	0.92	3.266
0.56	1.153	0.93	3.343
0.57	1.194	0.94	3.422
0.58	1.237	0.95	3.502
0.59	1.281	0.96	3.583
0.6	1.325	0.97	3.666

2015 NBU LUT 18" 45 Deg. Trap. Flume			
Stage (h) (ft)	Discharge (Q) (cfs)	Stage (h) (ft)	Discharge (Q) (cfs)
0.98	3.749	1.37	7.926
0.99	3.833	1.38	8.058
1	3.919	1.39	8.191
1.01	4.006	1.4	8.326
1.02	4.094	1.41	8.462
1.03	4.183	1.42	8.599
1.04	4.273	1.43	8.738
1.05	4.364	1.44	8.878
1.06	4.457	1.45	9.019
1.07	4.55	1.46	9.162
1.08	4.645	1.47	9.306
1.09	4.741	1.48	9.451
1.1	4.838	1.49	9.598
1.11	4.937	1.5	9.746
1.12	5.036	1.51	9.896
1.13	5.137	1.52	10.047
1.14	5.239	1.53	10.199
1.15	5.342	1.54	10.352
1.16	5.447	1.55	10.507
1.17	5.552	1.56	10.664
1.18	5.659	1.57	10.821
1.19	5.767	1.58	10.981
1.2	5.876	1.59	11.141
1.21	5.987	1.6	11.303
1.22	6.098	1.61	11.466
1.23	6.211	1.62	11.631
1.24	6.326	1.63	11.797
1.25	6.441	1.64	11.965
1.26	6.558	1.65	12.134
1.27	6.676	1.66	12.304
1.28	6.795	1.67	12.476
1.29	6.915	1.68	12.649
1.3	7.037	1.69	12.824
1.31	7.16	1.7	13
1.32	7.285	1.71	13.178
1.33	7.41	1.72	13.357
1.34	7.537	1.73	13.537
1.35	7.665	1.74	13.719
1.36	7.795	1.75	13.902

2015 NBU LUT 18" 45 Deg. Trap. Flume			
Stage (h) (ft)	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**
1.76	14.087	2.15	22.476
1.77	14.273	2.16	22.722
1.78	14.461	2.17	22.97
1.79	14.65	2.18	23.22
1.8	14.841	2.19	23.471
1.81	15.033	2.2	23.724
1.82	15.227	2.21	23.978
1.83	15.422	2.22	24.234
1.84	15.619	2.23	24.492
1.85	15.817	2.24	24.751
1.86	16.017	2.25	25.012
1.87	16.218	2.26	25.275
1.88	16.421	2.27	25.539
1.89	16.625	2.28	25.805
1.9	16.83	2.29	26.073
1.91	17.038	2.3	26.342
1.92	17.246	2.31	26.613
1.93	17.457	2.32	26.885
1.94	17.668	2.33	27.16
1.95	17.882	2.34	27.436
1.96	18.097	2.35	27.713
1.97	18.313	2.36	27.992
1.98	18.531	2.37	28.273
1.99	18.751	2.38	28.556
2	18.972	2.39	28.84
2.01	19.194	2.4	29.126
2.02	19.418	2.41	29.414
2.03	19.644	2.42	29.703
2.04	19.871	2.43	29.994
2.05	20.1	2.44	30.287
2.06	20.331	2.45	30.582
2.07	20.563	2.46	30.878
2.08	20.796	2.47	31.176
2.09	21.031	2.48	31.475
2.1	21.268	2.49	31.777
2.11	21.506	2.5	32.08
2.12	21.746		
2.13	21.988		
2.14	22.231		

Table 4. Annual NBU Runoff Values were Assessed for Water Yield Efficiency (NBU runoff/AFH precipitation). Streamflow Corrections Made when Values were Considered Out of Range.

Water Year	AFH (in)	NBU RO (in)	NBU/AFH
2007	98.26	78.99	0.80
2008	92.93	80.63	0.87
2009	79.52	64.26	0.81
2010	94.40	92.80	0.98
2011	103.22	100.12	0.97
2012	97.98	100.02	1.02
2013	100.02	92.92	0.93
2014	76.13	80.04	1.05
2015	78.91	78.78	1.00

Key
Observed Q value assumed correct
Pre-Harvest Linear Regression: NBU RO [in] = 1.03(NBL RO [in]) R^2 = 0.98
Post-Harvest Linear Regression: NBU RO [in] = 1.08(NBL RO [in]) R^2 = 0.94

MONTHLY WATER YIELD

Key
Observed Q value is correct
Pre-Harvest Linear Regression: NBU RO [in] = 1.03(NBL RO [in]) R^2 = 0.98
Post-Harvest Linear Regression: NBU RO [in] = 1.08(NBL RO [in]) R^2 = 0.94

Table 5. Monthly NBU Runoff Values were Assessed for Water Yield Efficiency (NBU runoff/AFH precipitation). Streamflow Corrections Made when Values were Considered Out of Range.

Water Year	Month	AFH (in)	NBU RO (in)
2007	October	1.89	0.12
	November	30.78	19.96
	December	16.16	15.29
	January	10.40	10.46
	February	19.12	11.90
	March	6.52	10.12
	April	6.27	5.58
	May	2.01	3.06
	June	1.31	1.41
	July	0.49	0.63
	August	0.65	0.28
	September	2.65	0.18
2008	October	6.63	2.59
	November	9.26	4.83
	December	21.18	18.06
	January	19.68	17.17
	February	8.65	12.24
	March	10.98	7.92
	April	9.56	8.22
	May	1.17	2.76
	June	3.40	4.30
	July	0.06	1.05
	August	2.03	0.85
	September	0.33	0.63

Water Year	Month	AFH (in)	NBU RO (in)
2009	October	4.67	0.97
	November	14.69	6.36
	December	14.20	11.70
	January	11.42	12.64
	February	7.00	4.44
	March	11.30	11.23
	April	5.47	6.32
	May	6.62	6.67
	June	1.45	1.36
	July	0.59	0.85
	August	0.43	0.76
	September	1.68	0.96
2010	October	7.64	2.57
	November	13.32	5.60
	December	12.22	9.65
	January	11.29	17.61
	February	9.33	8.44
	March	13.97	15.61
	April	11.30	11.98
	May	5.73	7.47
	June	5.38	9.47
	July	0.22	1.70
	August	1.34	1.31
	September	2.66	1.38

Water Year	Month	AFH (in)	NBU RO (in)
2011	October	9.00	2.77
	November	13.05	8.40
	December	19.55	24.00
	January	11.51	13.17
	February	11.57	6.75
	March	19.06	21.17
	April	11.89	11.52
	May	3.91	5.65
	June	1.43	3.13
	July	1.35	1.58
	August	0.01	1.11
	September	0.89	0.87
2012	October	6.16	0.84
	November	13.13	6.90
	December	11.00	12.02
	January	18.20	21.81
	February	9.33	10.10
	March	22.57	22.20
	April	7.73	8.06
	May	5.02	7.07
	June	4.02	3.96
	July	0.77	3.02
	August	0.02	2.26
	September	0.04	1.76
2013	October	13.73	5.63
	November	18.29	12.97
	December	20.44	26.41
	January	8.25	10.15
	February	6.28	7.64
	March	5.91	7.02
	April	6.36	5.60
	May	6.43	2.80
	June	1.80	4.00
	July	0.01	1.66
	August	0.96	1.29
	September	11.55	7.74

Water Year	Month	AFH (in)	NBU RO (in)
2014	October	2.07	3.84
	November	7.50	5.75
	December	5.22	3.44
	January	8.00	7.41
	February	16.61	20.05
	March	17.82	19.40
	April	6.22	8.51
	May	6.83	7.81
	June	2.76	1.69
	July	1.13	1.02
	August	0.23	0.62
	September	1.74	0.52
2015	October	11.69	3.46
	November	13.27	13.62
	December	19.85	21.86
	January	5.76	8.52
	February	12.49	12.44
	March	8.13	7.56
	April	4.53	5.46
	May	1.56	2.00
	June	0.40	1.31
	July	0.06	0.96
	August	1.16	0.64
	September	0.00	0.97

SUMMARY TABLES

Table 6. Summary Tables of Mean Daily Streamflow Values have been Compiled for Each Water Year. Along the Base of the Table, Monthly and Annual Statistics can be Found for that Water Year.

Key
Observed Q value assumed correct
Pre-Harvest Linear Regression: NBU RO [in] = 1.03(NBL RO [in]) R^2 = 0.98
Post-Harvest Linear Regression: NBU RO [in] = 1.08(NBL RO [in]) R^2 = 0.94

Needle Branch Upper, Alsea Watershed Study												
Water Year 2007												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.00	0.02	1.32	0.79	0.55	2.55	0.57	0.55	0.16	0.12	0.04	0.02
2	0.00	0.15	1.10	1.03	0.63	2.56	0.50	0.55	0.16	0.11	0.04	0.02
3	0.00	0.28	0.91	4.23	0.60	2.90	0.46	0.52	0.15	0.10	0.04	0.02
4	0.00	0.40	0.73	3.24	0.47	2.23	0.40	0.49	0.17	0.09	0.04	0.02
5	0.00	2.03	0.62	2.29	0.42	1.51	0.37	0.63	0.18	0.08	0.03	0.02
6	0.00	1.84	0.52	3.69	0.40	1.15	0.34	0.55	0.19	0.08	0.03	0.02
7	0.00	9.45	0.46	2.43	0.42	1.03	0.34	0.45	0.19	0.08	0.04	0.02
8	0.00	3.67	0.42	2.43	0.38	0.88	0.35	0.40	0.17	0.07	0.04	0.02
9	0.00	1.77	0.42	2.73	0.38	0.85	0.42	0.40	0.25	0.07	0.04	0.02
10	0.00	2.17	0.55	2.09	0.40	0.82	0.37	0.36	0.30	0.07	0.03	0.02
11	0.00	2.41	0.67	1.68	0.45	0.82	0.47	0.36	0.23	0.06	0.03	0.02
12	0.00	2.61	0.85	1.36	0.49	0.85	1.68	0.40	0.19	0.06	0.03	0.02
13	0.00	2.89	3.23	1.10	0.57	0.96	1.54	0.45	0.18	0.06	0.02	0.02
14	0.00	3.04	6.83	0.91	0.60	1.11	1.24	0.34	0.17	0.06	0.02	0.02
15	0.00	2.35	7.12	0.76	3.27	0.92	1.03	0.32	0.19	0.06	0.02	0.02
16	0.08	2.11	3.54	0.67	2.85	0.78	0.93	0.30	0.17	0.06	0.02	0.02
17	0.02	1.77	2.09	0.57	2.61	0.72	0.91	0.30	0.16	0.06	0.02	0.02
18	0.01	1.51	1.40	0.50	1.77	0.69	0.96	0.28	0.15	0.08	0.02	0.02
19	0.05	1.66	1.03	0.47	1.46	0.72	1.00	0.30	0.14	0.08	0.02	0.02
20	0.04	2.05	0.82	0.47	3.27	0.78	0.91	0.34	0.13	0.08	0.03	0.02
21	0.02	2.29	0.88	0.44	2.68	0.85	0.82	0.30	0.13	0.09	0.07	0.02
22	0.01	2.16	0.85	0.42	1.77	0.72	0.70	0.28	0.13	0.09	0.06	0.02
23	0.01	2.35	1.07	0.40	1.42	0.72	0.62	0.26	0.12	0.08	0.05	0.02
24	0.01	2.35	1.24	0.37	2.89	0.75	0.55	0.26	0.15	0.07	0.05	0.02
25	0.01	3.50	2.73	0.35	2.70	1.28	0.47	0.24	0.14	0.06	0.04	0.02
26	0.01	3.27	2.73	0.32	3.09	1.28	0.44	0.23	0.12	0.05	0.03	0.02
27	0.01	3.42	3.43	0.31	2.32	1.33	0.40	0.23	0.11	0.05	0.03	0.02
28	0.01	2.89	2.56	0.28	3.34	1.28	0.37	0.22	0.16	0.05	0.02	0.02
29	0.01	2.35	1.83	0.27		1.03	0.34	0.20	0.17	0.04	0.02	0.02
30	0.02	2.05	1.32	0.26		0.96	0.31	0.18	0.13	0.05	0.02	0.08
31	0.02		1.00	0.24		0.88		0.17		0.04	0.02	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.00	0.02	0.42	0.24	0.38	0.69	0.31	0.17	0.11	0.04	0.02	0.02
Max Q (cfs)	0.08	9.45	7.12	4.23	3.34	2.90	1.68	0.63	0.30	0.12	0.07	0.08
Mean Monthly Q (cfs)	0.01	2.36	1.75	1.20	1.51	1.16	0.66	0.35	0.17	0.07	0.03	0.02
Cumulative Q (cfs)	0.43	70.83	54.24	37.09	42.20	35.90	19.79	10.84	5.02	2.23	1.01	0.64
Annual Water Yield (in)		78.99				**Mean Annual Q (cfs)**			0.77			

Needle Branch Upper, Alsea Watershed Study												
Water Year 2008												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.18	0.13	0.65	1.49	3.77	0.26	1.11	0.63	0.21	0.17	0.10	0.09
2	0.16	0.14	1.36	1.54	4.77	0.22	0.92	0.60	0.19	0.14	0.10	0.08
3	0.26	0.15	7.98	1.83	5.77	0.22	0.78	0.57	0.32	0.14	0.09	0.08
4	0.21	0.16	4.34	2.81	3.04	0.23	0.78	0.49	0.36	0.15	0.09	0.08
5	0.19	0.20	2.15	3.54	2.05	0.22	0.78	0.47	0.38	0.16	0.09	0.08
6	0.19	0.18	1.49	2.81	1.99	0.21	1.28	0.45	1.07	0.16	0.09	0.08
7	0.15	0.17	1.14	2.34	2.65	0.23	1.77	0.42	2.17	0.15	0.09	0.07
8	0.20	0.18	0.96	3.77	3.42	0.31	1.88	0.40	1.37	0.14	0.09	0.07
9	0.19	0.15	0.82	5.34	2.61	0.30	1.51	0.36	0.96	0.13	0.08	0.08
10	0.26	0.20	0.73	3.23	1.99	0.30	1.24	0.34	0.85	0.14	0.08	0.08
11	0.24	0.15	0.62	3.23	1.51	0.28	1.03	0.36	0.78	0.13	0.08	0.07
12	0.20	0.26	0.52	2.73	1.19	0.27	0.85	0.32	0.72	0.13	0.08	0.07
13	0.18	0.26	0.46	2.15	1.03	0.47	0.72	0.32	0.63	0.12	0.08	0.07
14	0.15	0.28	0.42	1.78	0.88	1.17	0.63	0.30	0.57	0.10	0.07	0.07
15	0.15	0.52	0.46	1.78	0.75	2.09	0.60	0.26	0.49	0.12	0.07	0.07
16	0.18	1.07	0.42	1.54	0.69	1.83	0.55	0.23	0.47	0.12	0.06	0.07
17	0.32	1.37	0.50	1.24	0.60	1.49	0.49	0.23	0.42	0.12	0.05	0.07
18	0.45	1.37	1.14	1.03	0.55	2.02	0.45	0.20	0.38	0.12	0.07	0.07
19	1.03	1.56	2.47	0.85	0.52	2.02	0.40	0.18	0.34	0.11	0.07	0.07
20	0.88	1.42	5.64	0.76	0.47	1.63	0.45	0.22	0.30	0.11	0.28	0.07
21	0.75	1.15	2.81	0.62	0.38	1.32	0.45	0.30	0.28	0.11	0.20	0.07
22	0.49	0.96	2.02	0.52	0.40	1.14	0.45	0.23	0.28	0.11	0.12	0.07
23	0.34	0.99	2.98	0.47	0.36	1.07	1.37	0.21	0.26	0.10	0.10	0.07
24	0.36	0.66	5.94	0.44	0.34	1.03	2.61	0.20	0.26	0.10	0.10	0.07
25	0.36	0.42	3.06	0.39	0.38	0.93	1.72	0.21	0.25	0.09	0.11	0.09
26	0.26	0.42	2.09	0.55	0.36	0.96	1.24	0.20	0.23	0.09	0.10	0.08
27	0.22	0.45	1.83	1.32	0.34	1.00	0.96	0.21	0.19	0.09	0.10	0.07
28	0.18	0.45	2.22	1.21	0.30	1.17	0.78	0.22	0.17	0.09	0.10	0.08
29	0.17	0.75	2.64	1.96	0.34	1.32	0.69	0.22	0.17	0.09	0.09	0.07
30	0.16	0.96	2.34	2.73		1.28	0.69	0.21	0.18	0.09	0.09	0.08
31	0.15		1.89	4.90		1.10		0.21		0.08	0.09	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.15	0.13	0.42	0.39	0.30	0.21	0.40	0.18	0.17	0.08	0.05	0.07
Max Q (cfs)	1.03	1.56	7.98	5.34	5.77	2.09	2.61	0.63	2.17	0.17	0.28	0.09
Mean Monthly Q (cfs)	0.30	0.57	2.07	1.96	1.50	0.91	0.97	0.32	0.51	0.12	0.10	0.08
Cumulative Q (cfs)	9.20	17.13	64.08	60.90	43.44	28.11	29.16	9.78	15.25	3.71	3.02	2.25
Annual Water Yield (in)		80.63				**Mean Annual Q (cfs)**			0.78			

Needle Branch Upper, Alsea Watershed Study												
Water Year 2009												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.07	0.08	0.34	3.03	0.36	0.96	1.03	0.26	0.20	0.10	0.08	0.09
2	0.06	0.14	0.47	6.31	0.36	1.28	2.17	0.30	0.19	0.10	0.08	0.09
3	0.06	0.22	0.45	2.62	0.34	1.15	2.61	0.34	0.18	0.11	0.08	0.09
4	0.26	0.57	0.45	1.99	0.30	1.11	1.93	0.63	0.18	0.10	0.09	0.09
5	0.13	0.34	0.42	3.11	0.26	1.42	1.46	1.28	0.19	0.11	0.08	0.11
6	0.13	0.66	0.42	2.62	0.32	1.93	1.03	2.05	0.20	0.11	0.09	0.13
7	0.16	0.55	0.40	3.31	0.30	1.61	0.75	2.35	0.19	0.11	0.10	0.12
8	0.12	0.52	0.40	4.90	0.26	1.28	0.63	1.51	0.17	0.11	0.09	0.10
9	0.13	0.60	0.38	2.94	0.32	1.11	0.55	1.07	0.17	0.11	0.09	0.10
10	0.13	0.60	0.36	2.35	0.30	0.99	0.52	0.82	0.17	0.10	0.10	0.11
11	0.12	1.28	0.34	1.51	0.40	0.96	0.49	0.72	0.17	0.11	0.09	0.10
12	0.11	2.08	0.36	1.15	0.42	0.85	0.57	0.63	0.16	0.13	0.10	0.09
13	0.11	3.45	0.55	0.92	0.40	0.75	0.66	0.66	0.20	0.12	0.10	0.09
14	0.11	2.42	0.78	0.78	0.42	0.72	0.72	1.93	0.17	0.10	0.10	0.12
15	0.11	1.37	0.88	0.69	0.38	2.11	0.75	1.56	0.16	0.10	0.10	0.12
16	0.12	0.92	0.82	0.63	0.36	2.42	0.72	1.15	0.15	0.10	0.09	0.12
17	0.11	0.72	0.75	0.55	0.40	1.93	0.66	0.88	0.15	0.10	0.08	0.12
18	0.11	0.60	1.03	0.52	0.40	1.61	0.60	0.72	0.14	0.10	0.07	0.10
19	0.11	0.49	1.19	0.47	0.38	1.28	0.55	0.66	0.18	0.09	0.07	0.13
20	0.12	0.52	1.19	0.42	0.36	0.99	0.49	0.55	0.15	0.08	0.08	0.14
21	0.12	0.49	2.61	0.40	0.32	0.75	0.45	0.49	0.16	0.09	0.09	0.12
22	0.11	0.52	2.01	0.38	0.32	0.85	0.40	0.45	0.15	0.10	0.08	0.13
23	0.11	0.49	2.82	0.36	0.40	0.82	0.38	0.40	0.13	0.09	0.08	0.13
24	0.10	0.49	1.82	0.34	0.57	0.88	0.36	0.38	0.14	0.09	0.08	0.15
25	0.10	0.47	2.05	0.34	1.28	1.37	0.36	0.34	0.15	0.09	0.08	0.14
26	0.10	0.42	1.99	0.32	2.82	1.77	0.32	0.32	0.13	0.09	0.09	0.13
27	0.09	0.42	2.36	0.36	1.77	1.37	0.30	0.28	0.13	0.08	0.08	0.10
28	0.09	0.40	5.50	0.38	1.24	1.19	0.30	0.25	0.12	0.06	0.10	0.09
29	0.08	0.38	3.25	0.38		1.61	0.36	0.25	0.12	0.06	0.10	0.11
30	0.08	0.36	3.11	0.38		1.51	0.30	0.23	0.12	0.07	0.09	0.12
31	0.10		1.99	0.38		1.24		0.22		0.08	0.09	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.06	0.08	0.34	0.32	0.26	0.72	0.30	0.22	0.12	0.06	0.07	0.09
Max Q (cfs)	0.26	3.45	5.50	6.31	2.82	2.42	2.61	2.35	0.20	0.13	0.10	0.15
Mean Monthly Q (cfs)	0.11	0.75	1.34	1.45	0.56	1.28	0.75	0.76	0.16	0.10	0.09	0.11
Cumulative Q (cfs)	3.45	22.58	41.50	44.83	15.76	39.83	22.41	23.68	4.83	3.00	2.71	3.39
Annual Water Yield (in)		64.26				**Mean Annual Q (cfs)**			0.62			

Needle Branch Upper, Alsea Watershed Study												
Water Year 2010												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.11	0.25	0.96	5.14	0.63	1.56	2.42	1.76	0.55	0.26	0.16	0.24
2	0.11	0.18	0.82	3.58	0.60	1.11	1.82	1.34	2.55	0.28	0.16	0.14
3	0.10	0.14	0.69	2.17	0.66	0.96	2.97	2.12	3.58	0.26	0.16	0.13
4	0.10	0.12	0.60	1.51	0.63	0.85	2.75	2.39	3.27	0.26	0.15	0.13
5	0.10	0.13	0.55	1.88	0.75	0.78	2.11	1.99	2.68	0.25	0.15	0.13
6	0.10	0.29	0.49	3.58	0.85	0.69	2.68	1.52	1.77	0.22	0.15	0.12
7	0.10	0.98	0.47	2.68	0.82	0.66	2.48	0.92	1.33	0.19	0.15	0.13
8	0.10	1.17	0.45	1.82	0.78	0.60	2.11	0.68	1.03	0.21	0.15	0.14
9	0.10	0.92	0.40	1.46	0.75	0.55	1.93	0.55	1.15	0.21	0.15	0.14
10	0.10	0.81	0.40	1.19	0.69	0.57	1.37	0.50	2.55	0.21	0.15	0.13
11	0.10	0.64	0.38	0.96	0.72	0.72	1.11	0.44	2.23	0.20	0.15	0.14
12	0.09	0.72	0.36	1.61	1.51	5.24	0.92	0.44	1.66	0.20	0.14	0.13
13	0.09	0.76	0.34	3.42	1.77	3.83	0.88	0.49	1.24	0.20	0.12	0.13
14	0.18	0.64	0.34	3.67	1.46	2.48	0.82	0.47	0.99	0.19	0.14	0.12
15	0.14	0.49	1.42	2.68	1.33	1.66	0.75	0.42	0.82	0.19	0.15	0.14
16	0.12	0.39	2.82	4.01	1.24	1.19	0.66	0.36	0.72	0.19	0.13	0.14
17	0.18	1.20	2.42	2.55	1.11	0.96	0.63	0.32	0.63	0.18	0.15	0.15
18	0.18	1.03	1.72	3.50	0.99	0.82	0.55	0.36	0.55	0.19	0.15	0.17
19	0.17	0.76	1.24	2.61	0.88	0.69	0.45	0.32	0.52	0.18	0.15	0.22
20	0.16	0.81	0.99	1.88	0.75	0.63	0.49	0.38	0.47	0.18	0.13	0.26
21	0.19	0.87	2.48	1.37	0.69	0.63	0.47	0.55	0.42	0.17	0.15	0.20
22	0.17	0.92	3.27	1.03	0.60	0.66	0.45	1.07	0.40	0.18	0.15	0.19
23	0.30	0.87	2.29	0.96	0.57	0.66	0.45	1.11	0.38	0.17	0.16	0.19
24	0.38	0.66	1.61	0.85	0.82	0.63	0.45	0.88	0.36	0.16	0.13	0.18
25	0.32	0.49	1.19	1.07	0.99	1.15	0.40	0.78	0.34	0.15	0.14	0.18
26	0.60	0.55	0.96	1.19	1.82	5.66	0.52	0.78	0.32	0.15	0.17	0.19
27	0.99	1.03	0.82	1.03	3.19	3.04	2.19	0.82	0.28	0.16	0.16	0.19
28	0.82	0.87	0.69	0.88	2.35	1.99	2.77	0.78	0.28	0.16	0.16	0.19
29	0.75	0.66	0.60	0.78		4.55	2.68	0.72	0.28	0.16	0.16	0.18
30	0.92	0.50	0.69	0.75		5.88	2.26	0.66	0.26	0.16	0.17	0.16
31	1.24		1.82	0.66		4.01		0.60		0.16	0.14	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.09	0.12	0.34	0.66	0.57	0.55	0.40	0.32	0.26	0.15	0.12	0.12
Max Q (cfs)	1.24	1.20	3.27	5.14	3.19	5.88	2.97	2.39	3.58	0.28	0.17	0.26
Mean Monthly Q (cfs)	0.29	0.66	1.10	2.02	1.07	1.79	1.42	0.86	1.12	0.19	0.15	0.16
Cumulative Q (cfs)	9.11	19.85	34.24	62.49	29.95	55.39	42.52	26.51	33.59	6.02	4.64	4.90
Annual Water Yield (in)		92.80				**Mean Annual Q (cfs)**			0.90			

Needle Branch Upper, Alsea Watershed Study												
Water Year 2011												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.05	0.52	4.67	1.42	0.35	9.35	1.65	1.66	0.66	0.22	0.15	0.11
2	0.04	1.28	3.48	1.05	0.34	5.60	1.60	1.28	0.66	0.22	0.15	0.11
3	0.05	0.78	2.39	0.82	0.31	3.60	1.50	1.03	0.60	0.22	0.14	0.09
4	0.05	0.52	1.66	0.67	0.31	3.04	1.38	0.85	0.57	0.21	0.15	0.09
5	0.05	0.39	1.23	0.57	0.30	2.68	1.54	0.72	0.55	0.21	0.14	0.10
6	0.04	0.39	0.98	0.49	0.28	2.12	1.81	0.60	0.52	0.20	0.15	0.10
7	0.04	0.72	0.82	0.43	0.34	1.61	1.92	0.55	0.49	0.21	0.15	0.10
8	0.05	0.68	0.92	0.39	0.37	1.47	1.60	0.63	0.47	0.19	0.14	0.11
9	0.11	0.72	1.47	0.41	0.37	1.39	1.26	0.69	0.45	0.19	0.14	0.10
10	0.22	1.47	2.95	0.37	0.35	2.26	0.99	0.66	0.42	0.18	0.13	0.08
11	0.13	1.05	2.59	0.36	0.34	2.39	1.05	0.66	0.38	0.19	0.14	0.09
12	0.11	0.74	2.86	0.45	0.38	1.87	0.96	0.66	0.36	0.19	0.13	0.10
13	0.10	0.56	5.60	1.34	0.52	1.71	0.90	0.57	0.38	0.20	0.13	0.11
14	0.10	0.47	5.29	1.87	0.79	2.46	0.99	0.52	0.36	0.18	0.13	0.11
15	0.09	0.40	3.71	3.28	1.92	2.46	1.60	0.49	0.34	0.17	0.13	0.11
16	0.08	0.42	2.68	11.29	1.99	3.12	2.37	0.55	0.32	0.19	0.13	0.11
17	0.08	0.50	2.05	6.69	1.61	3.39	1.87	0.45	0.30	0.19	0.13	0.10
18	0.08	2.37	1.87	3.28	1.43	2.53	1.46	0.49	0.32	0.18	0.13	0.10
19	0.07	1.86	1.76	2.59	1.27	1.87	1.11	0.49	0.30	0.18	0.12	0.10
20	0.07	2.04	2.19	1.93	1.16	1.47	0.87	0.47	0.28	0.17	0.11	0.10
21	0.07	1.52	2.53	1.46	0.98	1.23	0.71	0.45	0.26	0.17	0.12	0.10
22	0.08	1.39	2.05	1.09	0.92	1.08	0.59	0.42	0.26	0.17	0.12	0.10
23	0.11	1.67	1.57	0.85	0.86	0.98	0.50	0.42	0.26	0.16	0.12	0.10
24	0.71	1.28	1.23	0.70	0.92	0.95	0.50	0.38	0.25	0.16	0.11	0.08
25	1.52	0.97	1.08	0.57	0.95	0.82	1.15	0.38	0.24	0.16	0.11	0.12
26	1.52	0.83	1.52	0.51	0.86	0.98	1.87	0.40	0.23	0.16	0.11	0.11
27	1.08	0.97	2.46	0.43	0.89	1.87	1.71	0.52	0.20	0.16	0.11	0.15
28	0.92	1.05	6.85	0.39	2.86	2.77	1.54	0.75	0.20	0.15	0.11	0.11
29	0.79	1.03	8.30	0.36		2.46	1.98	0.85	0.24	0.15	0.11	0.09
30	0.65	1.24	3.83	0.33		3.04	1.87	0.75	0.24	0.15	0.11	0.10
31	0.73		2.53	0.30		2.53		0.72		0.14	0.11	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.04	0.39	0.82	0.30	0.28	0.82	0.50	0.38	0.20	0.14	0.11	0.08
Max Q (cfs)	1.52	2.37	8.30	11.29	2.86	9.35	2.37	1.66	0.66	0.22	0.15	0.15
Mean Monthly Q (cfs)	0.32	0.99	2.75	1.51	0.86	2.42	1.36	0.65	0.37	0.18	0.13	0.10
Cumulative Q (cfs)	9.82	29.81	85.14	46.71	23.95	75.10	40.85	20.05	11.12	5.62	3.93	3.08
Annual Water Yield (in)		100.12				**Mean Annual Q (cfs)**		0.97				

Needle Branch Upper, Alsea Watershed Study

Water Year 2012

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	0.06	0.08	0.82	2.21	1.76	2.34	4.32	0.82	0.38	0.40	0.34	0.24
2	0.07	0.08	0.73	1.44	1.43	2.21	2.79	0.82	0.40	0.38	0.28	0.26
3	0.07	0.22	0.65	1.01	1.19	1.79	1.07	2.68	0.40	0.42	0.25	0.24
4	0.09	0.18	0.55	0.87	1.01	1.49	1.03	3.83	0.42	0.36	0.24	0.22
5	0.17	0.18	0.50	0.92	0.86	1.36	0.99	2.95	0.49	0.34	0.25	0.18
6	0.10	0.20	0.44	0.87	0.73	1.44	0.99	1.15	0.42	0.38	0.30	0.18
7	0.10	0.18	0.40	0.74	0.63	1.32	0.85	0.92	0.42	0.36	0.30	0.22
8	0.09	0.18	0.38	0.64	0.65	1.11	0.75	0.78	0.57	0.32	0.32	0.24
9	0.09	0.14	0.35	0.57	0.58	0.89	0.69	0.75	0.75	0.36	0.28	0.25
10	0.17	0.10	0.33	0.51	0.52	0.79	0.57	0.69	0.72	0.34	0.26	0.25
11	0.23	0.11	0.31	0.45	0.50	1.04	0.55	0.60	0.66	0.32	0.25	0.23
12	0.13	0.14	0.28	0.39	0.50	1.89	0.52	0.55	0.60	0.34	0.23	0.22
13	0.10	0.20	0.27	0.36	0.50	3.62	0.55	0.49	0.60	0.34	0.25	0.18
14	0.10	0.18	0.25	0.36	0.52	3.41	0.57	0.47	0.52	0.32	0.26	0.20
15	0.10	0.18	0.25	0.36	0.52	7.22	0.55	0.47	0.49	0.34	0.24	0.22
16	0.10	0.35	0.23	0.33	0.55	5.02	0.85	0.45	0.47	0.30	0.23	0.19
17	0.09	1.69	0.23	1.21	0.58	3.85	0.96	0.45	0.42	0.32	0.26	0.17
18	0.09	1.69	0.22	11.46	0.71	2.79	0.85	0.45	0.49	0.38	0.25	0.21
19	0.08	1.54	0.20	16.27	0.98	2.01	0.85	0.40	0.47	0.32	0.28	0.21
20	0.07	1.17	0.20	6.78	1.12	1.79	1.03	0.36	0.40	0.38	0.26	0.23
21	0.07	0.89	0.19	6.01	1.47	2.61	0.96	0.40	0.36	0.34	0.26	0.24
22	0.07	1.89	0.19	3.32	3.39	2.34	0.82	0.45	0.38	0.36	0.25	0.22
23	0.07	3.74	0.18	2.28	3.21	2.08	0.72	0.42	0.38	0.34	0.26	0.20
24	0.07	2.46	0.17	3.05	2.32	1.84	0.66	0.45	0.42	0.30	0.24	0.19
25	0.07	1.79	0.22	4.44	2.32	1.44	0.60	0.47	0.42	0.30	0.21	0.19
26	0.06	1.28	0.19	2.47	2.12	1.14	0.60	0.52	0.42	0.32	0.22	0.18
27	0.05	1.04	0.35	1.79	1.71	1.01	0.78	0.49	0.38	0.36	0.26	0.16
28	0.07	0.98	5.76	1.32	1.52	1.07	0.78	0.49	0.40	0.38	0.26	0.15
29	0.11	0.87	8.09	1.32	1.92	2.54	0.69	0.47	0.40	0.36	0.25	0.19
30	0.12	0.74	13.65	2.01		9.00	0.69	0.45	0.38	0.34	0.22	0.18
31	0.11		6.07	1.59		6.32		0.42		0.34	0.24	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.05	0.08	0.17	0.33	0.50	0.79	0.52	0.36	0.36	0.30	0.21	0.15
Max Q (cfs)	0.23	3.74	13.65	16.27	3.39	9.00	4.32	3.83	0.75	0.42	0.34	0.26
Mean Monthly Q (cfs)	0.10	0.82	1.38	2.50	1.24	2.54	0.95	0.81	0.47	0.35	0.26	0.21
Cumulative Q (cfs)	2.98	24.48	42.64	77.36	35.83	78.78	28.61	25.10	14.06	10.72	8.03	6.26
Annual Water Yield (in)		100.02				**Mean Annual Q (cfs)**			0.97			

Needle Branch Upper, Alsea Watershed Study												
Water Year 2013												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.17	2.87	3.71	0.89	1.87	1.92	0.38	0.18	1.37	0.24	0.17	0.14
2	0.15	2.26	5.76	0.73	1.47	1.71	0.35	0.15	1.11	0.23	0.17	0.11
3	0.16	1.50	4.07	0.63	1.16	1.43	0.33	0.13	0.92	0.23	0.16	0.10
4	0.15	1.10	4.43	0.58	0.95	1.16	0.35	0.12	0.78	0.22	0.15	0.09
5	0.14	0.84	5.76	0.50	0.82	1.01	0.38	0.12	0.69	0.22	0.15	0.19
6	0.14	0.67	3.21	0.46	0.73	0.95	0.58	0.11	0.63	0.22	0.14	0.29
7	0.14	0.54	2.32	0.63	0.79	0.86	1.47	0.11	0.60	0.22	0.15	0.23
8	0.16	0.48	1.99	0.79	0.73	0.79	1.87	0.10	0.55	0.21	0.15	0.19
9	0.17	0.41	1.71	1.82	0.68	0.73	1.39	0.10	0.49	0.21	0.15	0.18
10	0.17	0.34	1.39	2.59	0.63	0.65	1.12	0.10	0.47	0.20	0.16	0.15
11	0.17	0.33	1.39	2.46	0.58	0.58	0.92	0.09	0.45	0.20	0.16	0.14
12	0.26	0.72	1.82	2.05	0.52	0.52	0.79	0.09	0.47	0.20	0.15	0.10
13	0.38	0.84	1.82	1.66	0.50	0.48	0.76	0.09	0.52	0.19	0.14	0.10
14	0.26	0.67	1.57	1.27	0.46	0.44	0.73	0.10	0.40	0.19	0.14	0.10
15	0.52	0.56	1.52	1.01	0.44	0.42	0.71	0.09	0.36	0.19	0.16	0.09
16	0.85	0.48	2.19	0.86	0.44	0.46	0.68	0.08	0.36	0.19	0.15	0.09
17	0.52	0.52	3.12	0.71	0.40	0.42	0.63	0.07	0.34	0.19	0.15	0.09
18	0.42	2.02	2.68	0.63	0.40	0.38	0.58	0.10	0.32	0.18	0.14	0.09
19	0.42	7.24	2.53	0.55	0.42	0.40	0.63	0.11	0.32	0.18	0.14	0.09
20	0.49	5.82	9.77	0.48	0.40	1.16	0.63	0.08	0.32	0.18	0.13	0.09
21	0.57	3.51	5.76	0.44	0.52	1.43	0.63	0.13	0.30	0.18	0.13	0.09
22	0.57	2.20	4.19	0.40	1.19	1.19	0.60	0.26	0.28	0.17	0.14	0.18
23	0.66	1.68	3.30	0.44	2.39	0.98	0.55	0.42	0.28	0.17	0.14	0.30
24	0.69	2.20	2.95	0.38	2.12	0.89	0.50	0.45	0.30	0.17	0.14	0.45
25	0.66	1.73	2.59	0.44	1.82	0.76	0.46	0.40	0.30	0.16	0.14	0.47
26	0.63	1.28	2.68	0.60	1.66	0.68	0.42	0.36	0.28	0.16	0.15	0.35
27	0.75	0.95	2.95	1.23	1.43	0.60	0.38	0.42	0.26	0.16	0.16	0.33
28	3.12	0.74	2.32	2.59	1.57	0.55	0.37	0.49	0.25	0.16	0.14	2.83
29	4.19	0.69	1.76	3.12		0.50	0.37	0.96	0.24	0.16	0.15	9.64
30	1.19	0.84	1.34	2.77		0.46	0.33	2.11	0.24	0.16	0.16	10.16
31	1.07		1.08	2.32		0.40		1.82		0.17	0.14	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.14	0.33	1.08	0.38	0.40	0.38	0.33	0.07	0.24	0.16	0.13	0.09
Max Q (cfs)	4.19	7.24	9.77	3.12	2.39	1.92	1.87	2.11	1.37	0.24	0.17	10.16
Mean Monthly Q (cfs)	0.64	1.53	3.02	1.16	0.97	0.80	0.66	0.32	0.47	0.19	0.15	0.92
Cumulative Q (cfs)	19.96	46.02	93.69	36.02	27.10	24.91	19.88	9.94	14.19	5.90	4.59	27.47
Annual Water Yield (in)		92.92				**Mean Annual Q (cfs)**			0.90			

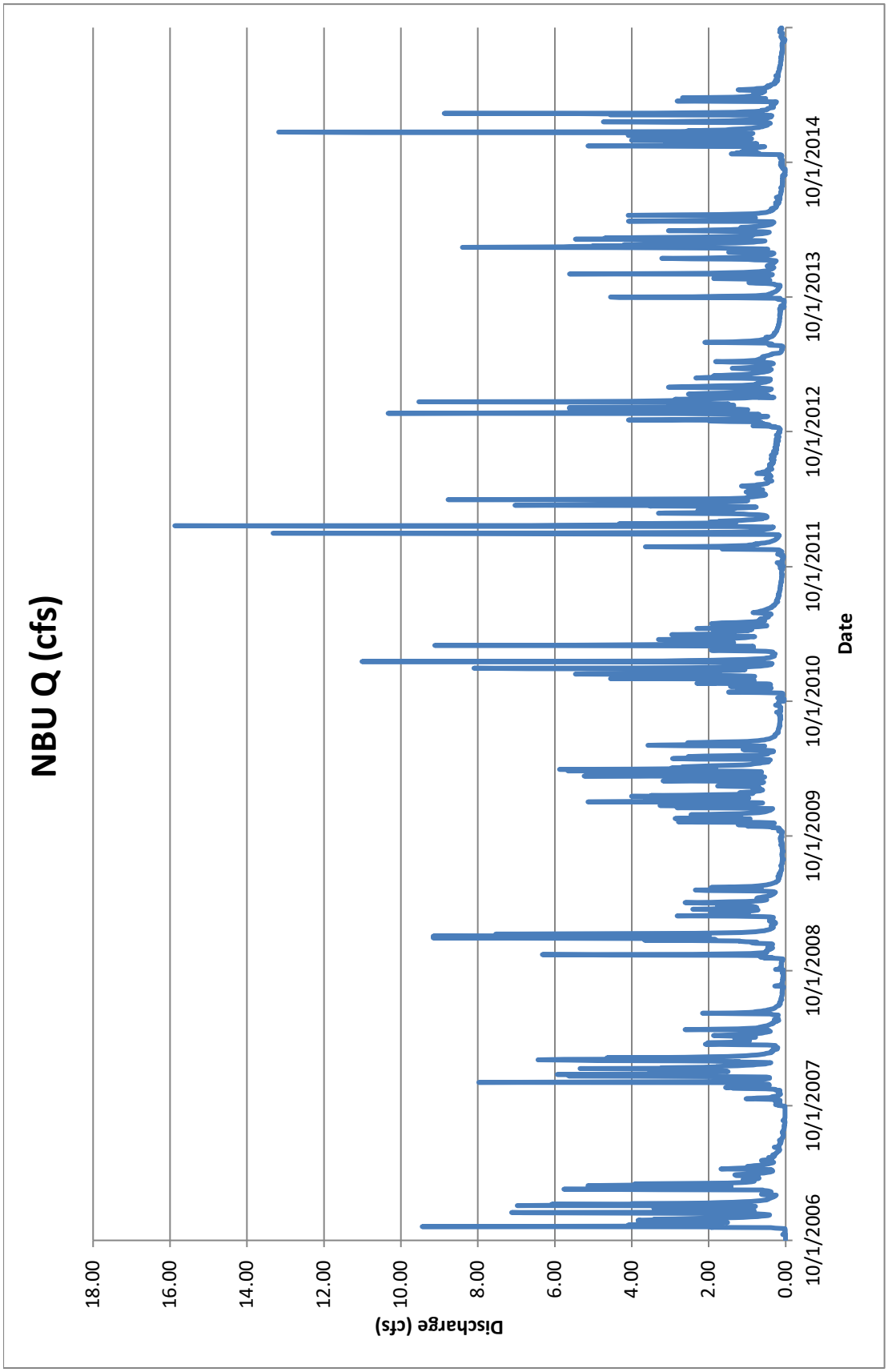
Needle Branch Upper, Alsea Watershed Study

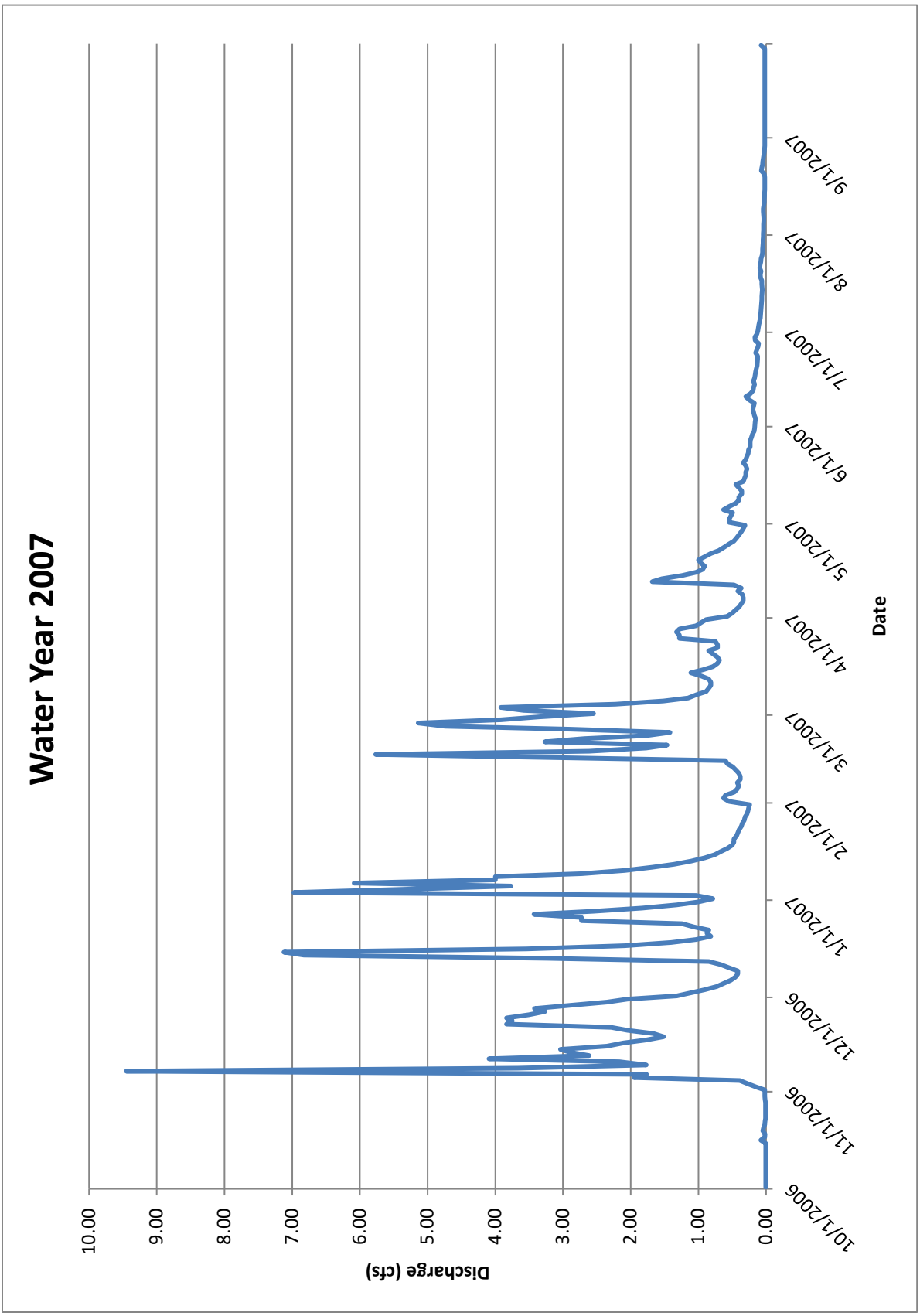
Water Year 2014

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	2.46	0.15	0.25	0.31	0.92	0.67	1.47	0.96	0.25	0.15	0.09	0.02
2	1.76	0.28	2.80	0.30	0.76	0.76	1.16	0.88	0.24	0.14	0.09	0.02
3	1.12	0.28	1.43	0.30	0.68	1.49	0.98	0.78	0.23	0.14	0.09	0.02
4	0.79	0.30	1.00	0.28	0.63	1.73	0.82	0.82	0.25	0.14	0.08	0.02
5	0.63	0.42	0.72	0.27	0.55	3.79	0.82	1.07	0.23	0.14	0.08	0.01
6	0.50	0.52	0.54	0.25	0.52	6.80	1.08	1.15	0.22	0.13	0.08	0.02
7	0.46	0.79	0.42	0.28	0.48	5.52	1.19	0.99	0.26	0.13	0.08	0.02
8	0.46	0.98	0.34	0.42	0.63	3.68	1.01	1.03	0.24	0.13	0.09	0.01
9	0.40	0.76	0.29	0.82	1.47	5.86	0.86	2.48	0.22	0.13	0.08	0.01
10	0.37	0.63	0.25	1.01	1.76	4.80	0.73	4.09	0.20	0.13	0.08	0.01
11	0.37	0.52	0.22	1.47	4.55	3.68	0.63	2.75	0.18	0.13	0.08	0.01
12	0.34	0.50	0.22	2.53	8.61	2.74	0.55	1.72	0.18	0.12	0.08	0.01
13	0.33	0.44	0.22	3.30	5.91	1.96	0.48	1.15	0.26	0.12	0.08	0.08
14	0.30	0.42	0.20	2.19	5.76	1.54	0.44	0.85	0.21	0.12	0.09	0.08
15	0.27	0.42	0.18	1.57	4.98	1.19	0.40	0.69	0.18	0.11	0.09	0.08
16	0.25	0.71	0.17	1.19	5.14	1.08	0.37	0.66	0.17	0.11	0.08	0.08
17	0.24	0.89	0.16	0.92	3.71	1.23	0.42	0.52	0.22	0.11	0.08	0.08
18	0.23	1.01	0.16	0.76	3.95	1.11	0.35	0.49	0.18	0.11	0.08	0.09
19	0.22	1.92	0.15	0.63	4.31	1.00	0.34	0.47	0.16	0.11	0.08	0.12
20	0.22	1.92	0.17	0.55	3.71	0.89	0.31	0.42	0.20	0.11	0.08	0.08
21	0.21	1.39	0.23	0.48	3.30	0.76	0.31	0.42	0.16	0.11	0.08	0.08
22	0.20	1.01	0.23	0.44	2.39	0.67	0.34	0.36	0.15	0.10	0.08	0.08
23	0.19	0.82	0.24	0.38	1.76	0.60	0.76	0.36	0.15	0.13	0.08	0.09
24	0.18	0.65	0.23	0.37	1.34	0.55	4.19	0.38	0.16	0.12	0.08	0.14
25	0.18	0.58	0.23	0.34	1.05	0.53	2.68	0.32	0.15	0.10	0.08	0.09
26	0.17	0.50	0.22	0.31	0.86	0.73	1.99	0.34	0.15	0.10	0.02	0.10
27	0.18	0.46	0.20	0.31	0.76	1.54	1.76	0.32	0.24	0.10	0.01	0.10
28	0.16	0.40	0.19	0.35	0.63	2.90	1.47	0.38	0.19	0.09	0.01	0.08
29	0.15	0.37	0.18	1.27		3.79	1.23	0.32	0.20	0.09	0.02	0.09
30	0.15	0.35	0.17	1.52		2.90	1.01	0.26	0.16	0.09	0.04	0.13
31	0.15		0.16	1.16		2.33		0.26		0.09	0.04	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.15	0.15	0.15	0.25	0.48	0.53	0.31	0.26	0.15	0.09	0.01	0.01
Max Q (cfs)	2.46	1.92	2.80	3.30	8.61	6.80	4.19	4.09	0.26	0.15	0.09	0.14
Mean Monthly Q (cfs)	0.44	0.68	0.39	0.85	2.54	2.22	1.01	0.89	0.20	0.12	0.07	0.06
Cumulative Q (cfs)	13.61	20.39	12.20	26.27	71.15	68.83	30.17	27.70	6.00	3.62	2.19	1.84
Annual Water Yield (in)		80.04				**Mean Annual Q (cfs)**			0.78			

Needle Branch Upper, Alsea Watershed Study												
Water Year 2015												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.12	1.03	1.82	0.88	0.38	0.36	0.85	0.28	0.20	0.12	0.08	0.09
2	0.12	0.88	1.15	0.78	0.40	0.32	0.85	0.28	0.20	0.12	0.09	0.09
3	0.11	0.78	0.88	0.69	0.40	0.38	0.78	0.26	0.19	0.12	0.09	0.09
4	0.10	0.99	1.07	0.66	0.36	0.38	0.69	0.26	0.18	0.12	0.09	0.09
5	0.10	1.07	1.28	0.60	0.47	0.38	0.66	0.30	0.17	0.12	0.08	0.13
6	0.09	0.99	1.88	0.57	4.55	0.36	0.63	0.28	0.17	0.12	0.08	0.13
7	0.09	0.92	1.93	0.55	4.55	0.30	0.60	0.26	0.17	0.12	0.09	0.13
8	0.11	0.82	1.46	0.52	3.92	0.30	0.66	0.22	0.17	0.11	0.09	0.11
9	0.12	0.75	1.19	0.47	5.45	0.30	0.60	0.24	0.16	0.12	0.09	0.11
10	0.12	0.69	1.82	0.47	8.88	0.26	0.55	0.25	0.16	0.13	0.09	0.10
11	0.14	0.63	3.50	0.49	3.42	0.26	0.72	0.21	0.16	0.12	0.09	0.09
12	0.12	0.55	4.09	0.52	1.99	0.30	0.75	0.26	0.15	0.13	0.10	0.10
13	0.11	3.58	2.55	0.42	1.33	0.24	0.72	0.24	0.16	0.12	0.09	0.09
14	0.12	5.14	1.72	0.40	1.07	0.69	1.19	0.22	0.16	0.11	0.09	0.09
15	0.16	2.68	1.28	0.42	0.82	2.82	1.24	0.21	0.17	0.12	0.08	0.09
16	0.12	1.51	1.03	1.15	0.63	2.29	0.96	0.22	0.15	0.11	0.09	0.09
17	0.10	1.11	0.92	2.89	0.60	1.51	0.82	0.21	0.15	0.11	0.10	0.11
18	0.16	0.92	0.85	4.74	0.63	1.19	0.75	0.23	0.15	0.11	0.09	0.16
19	0.10	0.82	2.05	3.11	0.55	0.85	0.60	0.24	0.14	0.10	0.09	0.15
20	0.11	0.75	10.82	1.99	0.49	0.69	0.52	0.19	0.14	0.10	0.09	0.13
21	0.14	0.96	13.18	1.46	0.47	0.66	0.49	0.20	0.14	0.11	0.08	0.13
22	0.66	3.11	5.04	1.24	0.47	0.52	0.52	0.20	0.14	0.11	0.06	0.14
23	1.42	2.23	2.75	0.99	0.47	1.03	0.42	0.26	0.13	0.10	0.04	0.14
24	0.78	1.61	2.23	0.75	0.42	2.68	0.42	0.21	0.13	0.09	0.03	0.13
25	0.69	1.66	2.55	0.60	0.38	1.93	0.42	0.19	0.13	0.09	0.03	0.13
26	1.28	1.88	1.99	0.52	0.32	1.37	0.47	0.20	0.13	0.10	0.03	0.15
27	1.03	1.51	1.56	0.49	0.38	1.07	0.38	0.20	0.13	0.11	0.02	0.12
28	0.82	2.05	1.46	0.52	0.34	1.03	0.40	0.20	0.14	0.10	0.02	0.10
29	1.15	4.01	1.37	0.47		0.85	0.38	0.20	0.14	0.09	0.02	0.12
30	1.03	2.68	1.07	0.45		0.72	0.34	0.19	0.13	0.09	0.09	0.11
31	0.96		1.03	0.38		0.78		0.19		0.08	0.05	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.09	0.55	0.85	0.38	0.32	0.24	0.34	0.19	0.13	0.08	0.02	0.09
Max Q (cfs)	1.42	5.14	13.18	4.74	8.88	2.82	1.24	0.30	0.20	0.13	0.10	0.16
Mean Monthly Q (cfs)	0.40	1.61	2.50	0.97	1.58	0.87	0.65	0.23	0.16	0.11	0.07	0.11
Cumulative Q (cfs)	12.27	48.31	77.54	30.22	44.12	26.83	19.37	7.10	4.66	3.39	2.27	3.43
Annual Water Yield (in)		78.78				**Mean Annual Q (cfs)**			0.77			

HYDROGRAPHS

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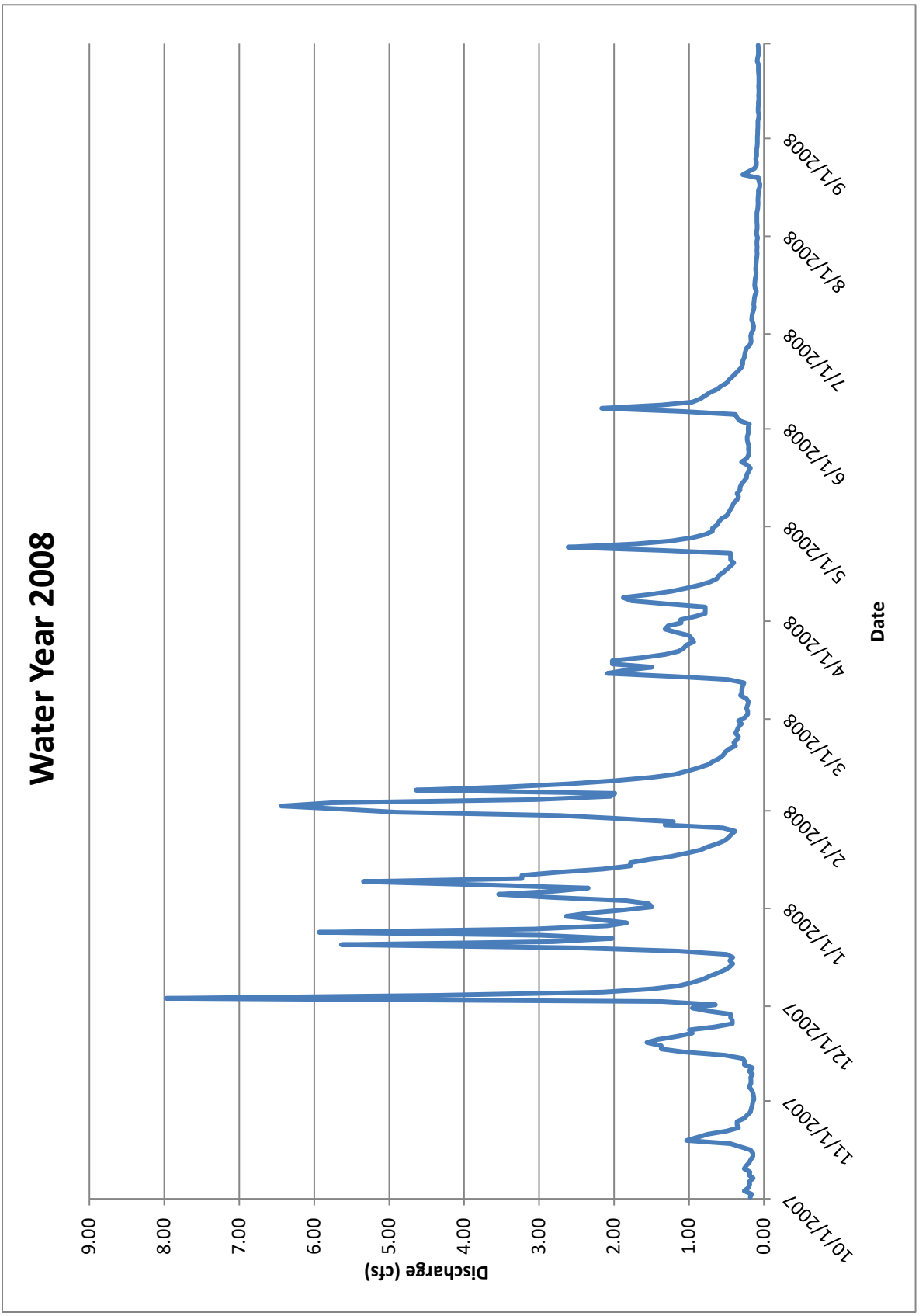
Discharge (cfs)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/1/2006
11/1/2006
12/1/2006
1/1/2007
2/1/2007
3/1/2007
4/1/2007
5/1/2007
6/1/2007
7/1/2007
8/1/2007
9/1/2007
Date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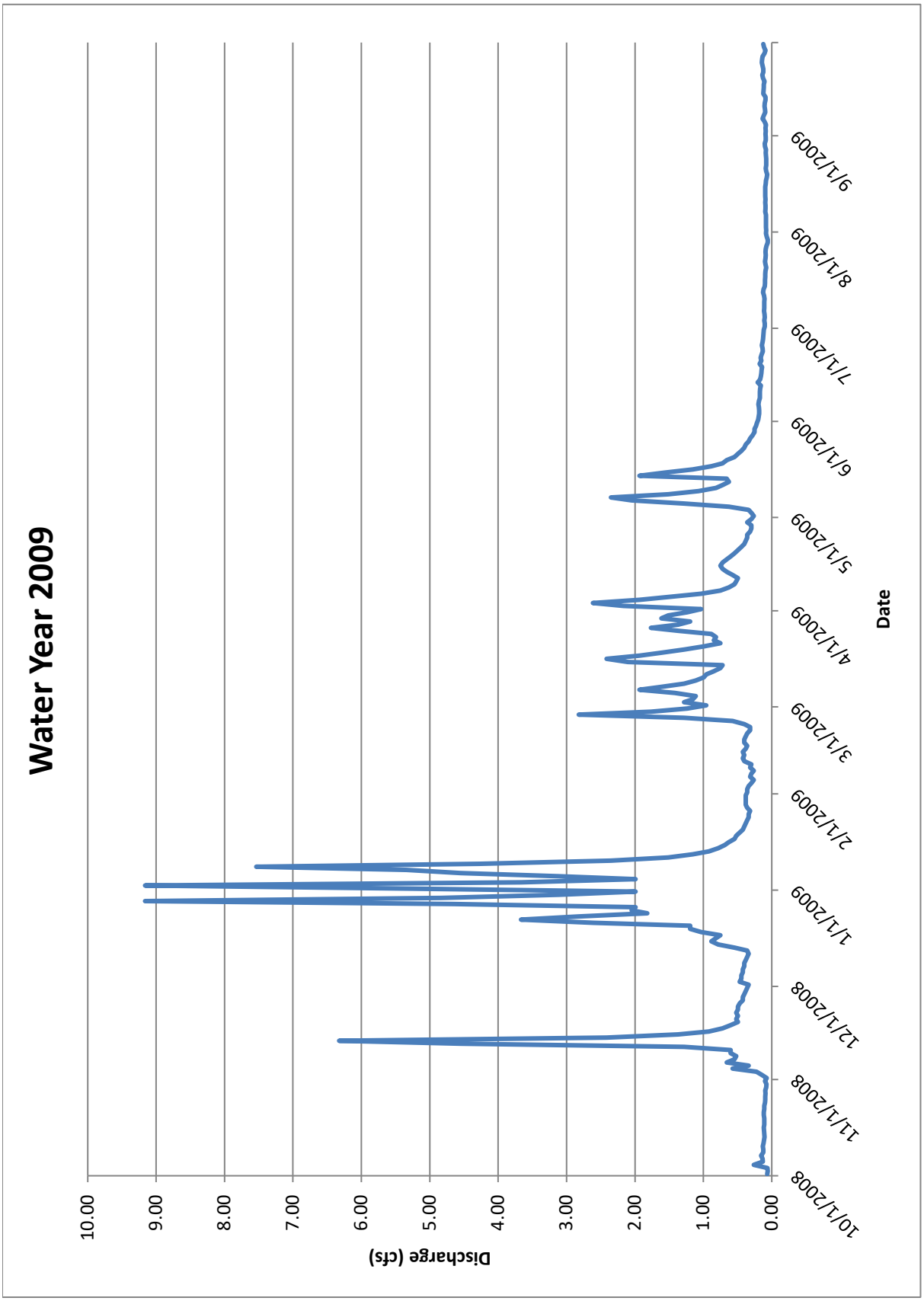
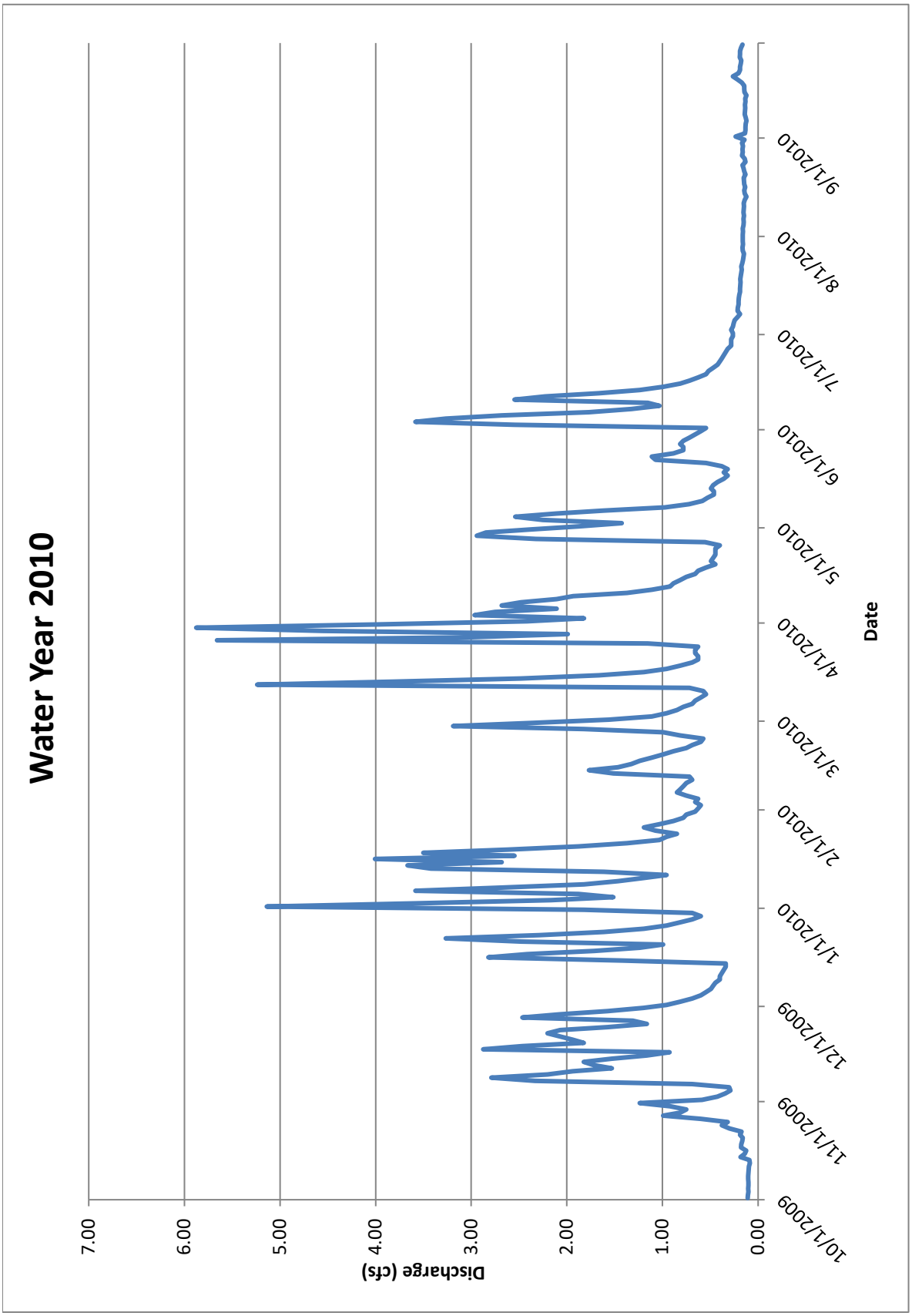
Discharge (cfs)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10/1/2007
11/1/2007
12/1/2007
1/1/2008
2/1/2008
3/1/2008
4/1/2008
5/1/2008
6/1/2008
7/1/2008
8/1/2008
9/1/2008
Date


Water Year 2009
Discharge (cfs)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/1/2008
11/1/2008
12/1/2008
1/1/2009
2/1/2009
3/1/2009
4/1/2009
5/1/2009
6/1/2009
7/1/2009
8/1/2009
9/1/2009
Date


Water Year 2010
Discharge (cfs)
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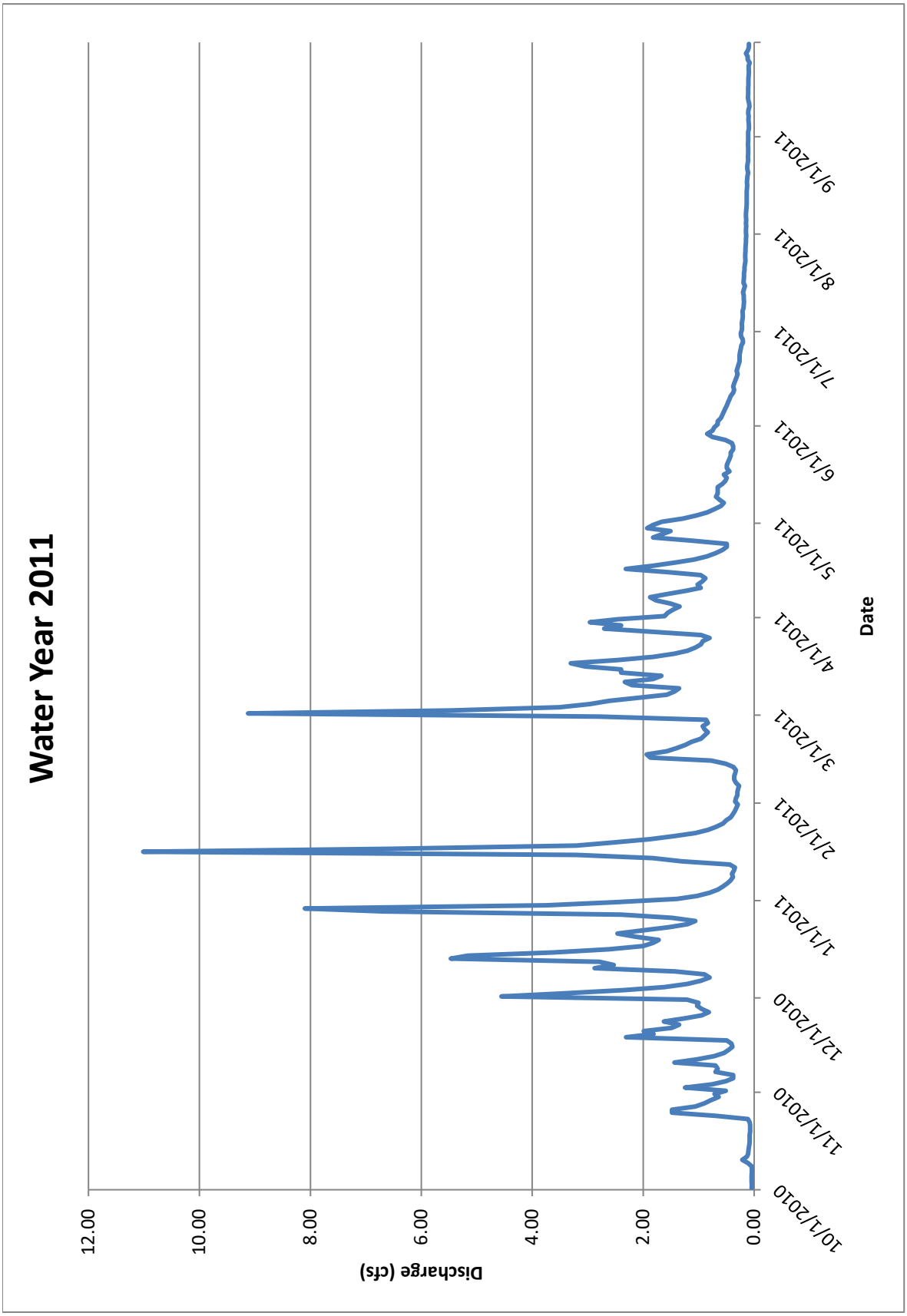
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/1/2009
11/1/2009
12/1/2009
1/1/2010
2/1/2010
3/1/2010
4/1/2010
5/1/2010
6/1/2010
7/1/2010
8/1/2010
9/1/2010
Date


Water Year 2011
Discharge (cfs)
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10.00
8.00
6.00
4.00
2.00
0.00
10/1/2010
11/1/2010
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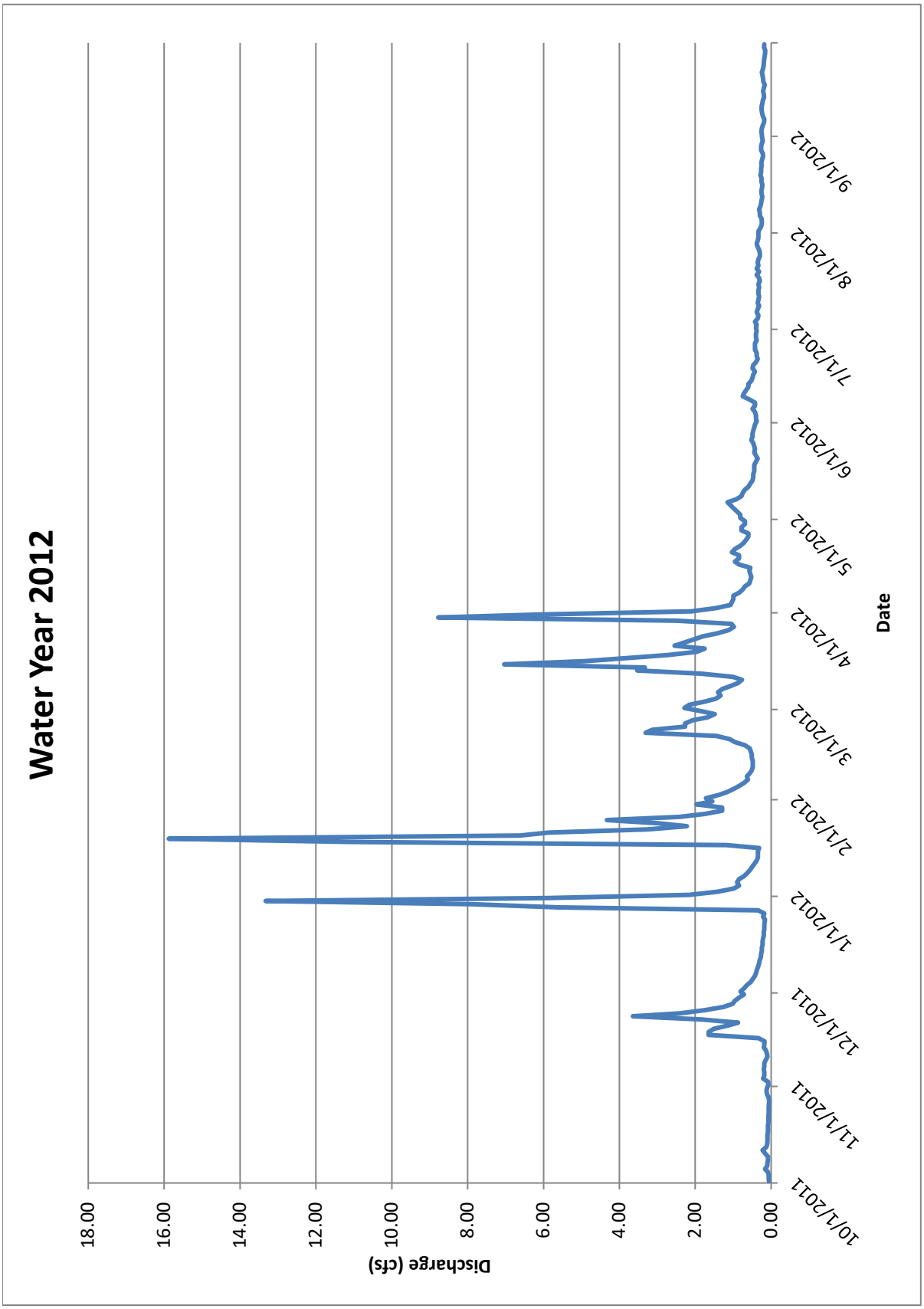
1/1/2011
2/1/2011
3/1/2011
4/1/2011
5/1/2011
6/1/2011
7/1/2011
8/1/2011
9/1/2011
Date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16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
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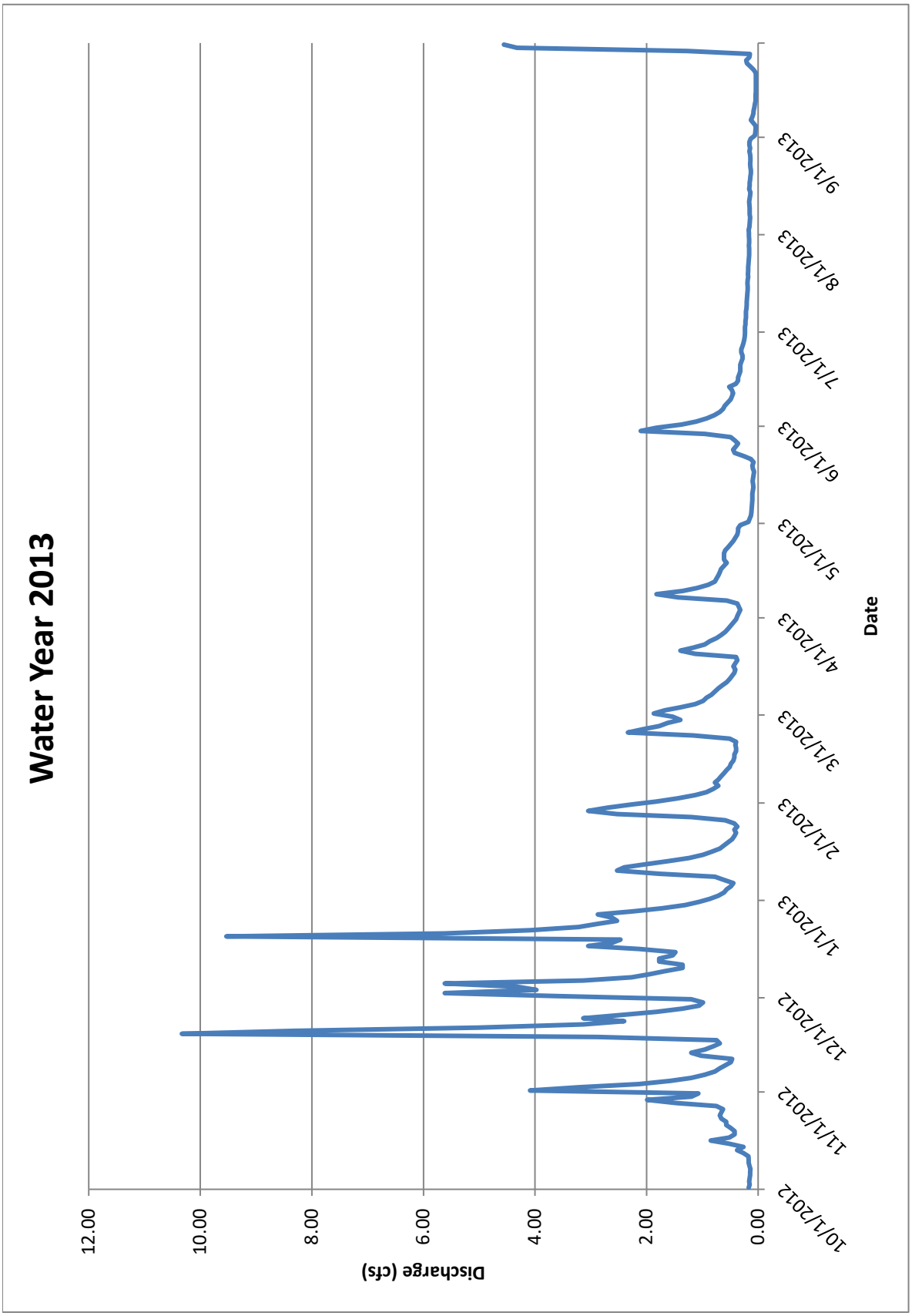
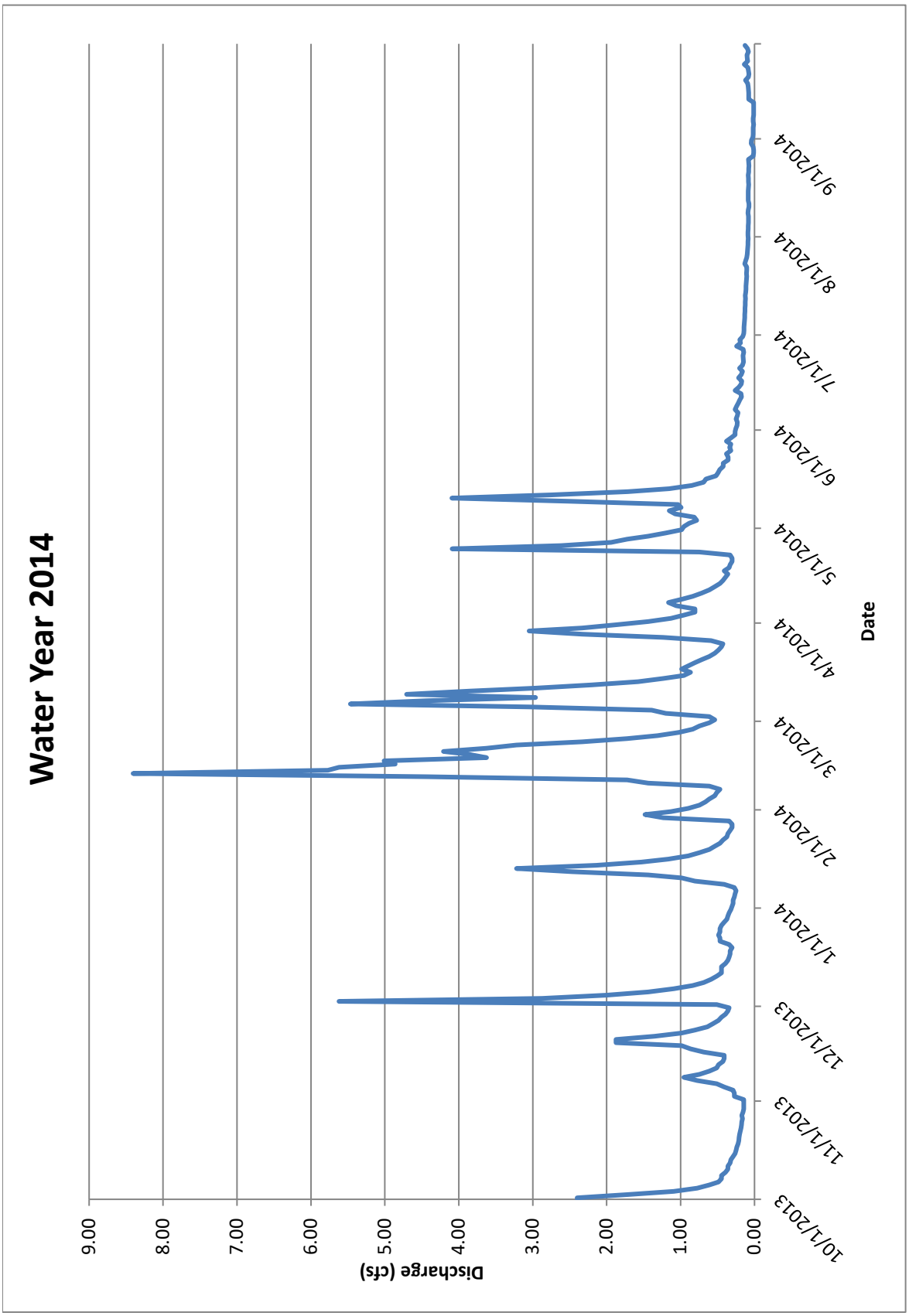
10/1/2011
11/1/2011
12/1/2011
1/1/2012
2/1/2012
3/1/2012
4/1/2012
5/1/2012
6/1/2012
7/1/2012
8/1/2012
9/1/2012
Date


Water Year 2013
Discharge (cfs)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
10/1/2012
11/1/2012
12/1/2012
1/1/2013
2/1/2013
3/1/2013
4/1/2013
5/1/2013
6/1/2013
7/1/2013
8/1/2013
9/1/2013
Date


Water Year 2014
Discharge (cfs)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
Date
10/1/2013
11/1/2013
12/1/2013
1/1/2014
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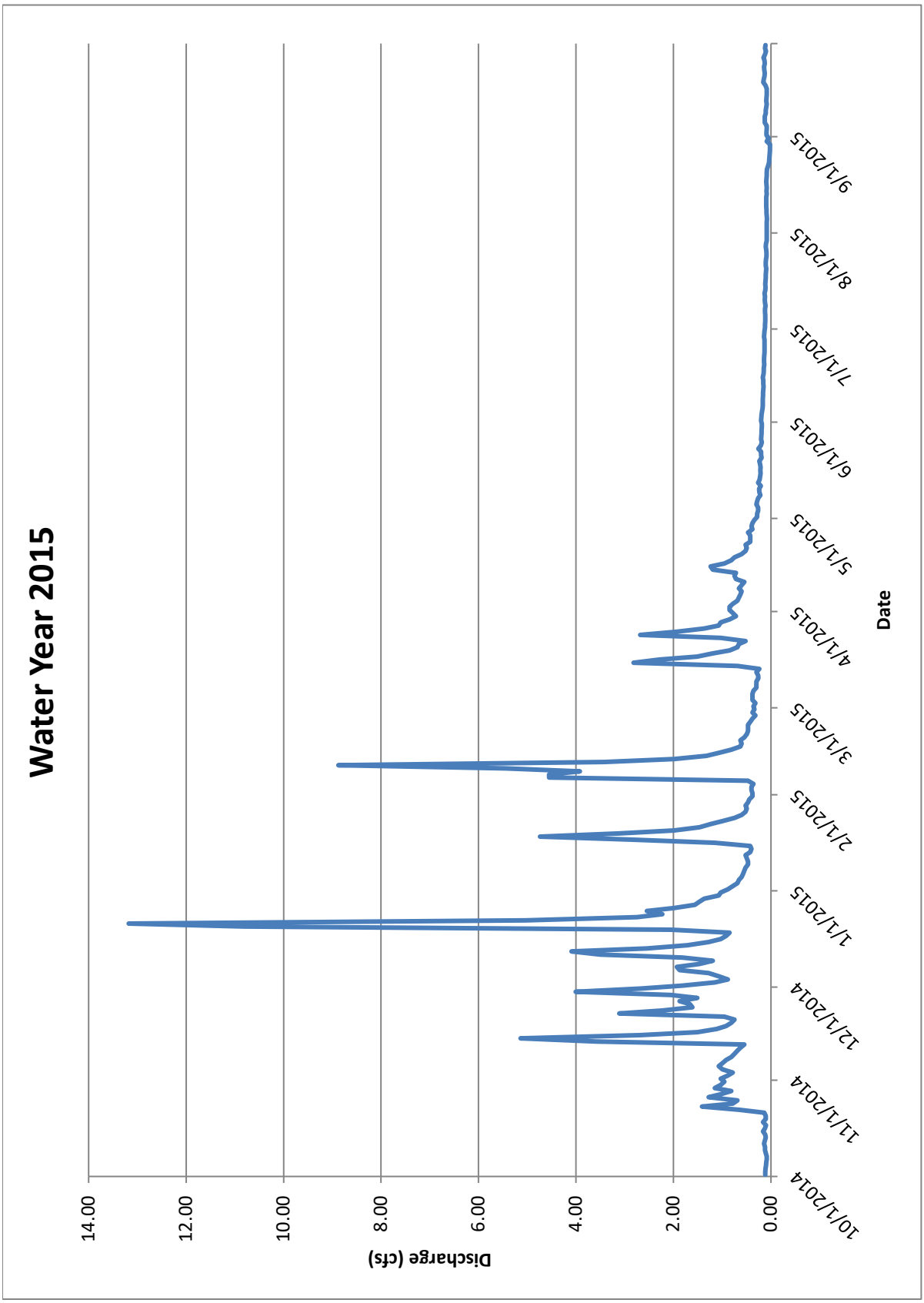
6/1/2014
7/1/2014
8/1/2014
9/1/2014


Water Year 2015
Discharge (cfs)
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12.00
10.00
8.00
6.00
4.00
2.00
0.00
10/1/2014
11/1/2014
12/1/2014
1/1/2015
2/1/2015
3/1/2015
4/1/2015
5/1/2015
6/1/2015
7/1/2015
8/1/2015
9/1/2015
Date

NEEDLE BRANCH H-FLUME
STREAMFLOW WATER YEARS 2009-2015

SUMMARY

This report summarizes the methods and compilation of the streamflow data for Needle Branch H (NBH) (Needle Branch H Gauging station, watershed area 34 acres) for water years 2009-2015. See the Excel file titled, NBH_Final_WY2009-2015, for all data. There is a 3-foot Tracom H-flume installed at NBH. A lookup table (LUT) was provided by the flume manufacturer, Tracom, whereby the user inputs the stage to get the corresponding discharge.

Given the amount of prediction and confidence in the actual stage measurements, the streamflow data are rated as poor to very poor (per Rantz et al. 1982). Streamflow values can be used for relative comparisons between the different years and different gauging locations. The data cannot be used to estimate annual water yields as affected by timber harvesting. A series of new recommendations have been made to improve streamflow measurement and water yield quantification.

Stage data were collected every 10 minutes by a pressure transducer located in the flume stilling well. These data are recorded on a logger and physically downloaded at various intervals, and files are shared at the water year end. As noted from the field notes, there are no stage corrections resulting from frequent debris removal and/or sediment removal from the flume. The higher stage measurement thus overestimates streamflow. Proposed recommendations advise more frequent measurement of outside and inside stages.

Stage data were used to calculate daily, monthly, and annual streamflow. These runoff values (measured as depth) were compared to on-site precipitation values. Precipitation recorders are located throughout the watershed; however, data quality is generally poor due to missing records or equipment failure (see Recommendations). The nearest available long-term precipitation data are at the Alsea Fish Hatchery (AFH) (NOAA 350145). The AFH data were confirmed by monthly PRISM data (on-file at Oregon State University). Water yield efficiency (runoff depth divided by precipitation depth) was calculated, and many months had more runoff than precipitation, indicating an overestimation of streamflow. There are different efficiencies in monthly water yield (wet or dry soil mantle), however it was determined that streamflow estimates were often too high.

Poor correlations of discharge at NBH with NBL, large period of record missing, coupled with overestimation of actual streamflow effectively precludes the use of predictive modeling. Streamflow records (NBH_Final_WY2009-2015) include 10 minute, daily, monthly and annual values.

RECOMMENDATIONS

1. A common and readily accessible database needs to be built and maintained. All data need to be uploaded shortly after collection. A common naming/labeling system needs to be implemented. Similarly, field notes, anecdotal observations, and pictures can be included.

2. Standard non-recording rain gauges (SRG) should be placed in and around the study watersheds for additional precipitation data collection and to validate existing tipping bucket rain gauges. Alter shields are less important than additional rain gauges.

3. Stream gauging stations all should have ‘outside’ staff gauges (rather than depth to water minus bench mark elevation calculations), including NBH and NBU. The weirs and the flumes are not self-maintaining with respect to organic debris or sediment accumulation. Routine maintenance will include removing said debris; however stage measurements should include ‘before and after’ readings

to allow better estimation of actual stage. Other than prevention of back-waters impeding the downstream flume discharge, downstream channel maintenance efforts are generally not needed.

4. More frequent site visits to gauging stations and/or increased recording of stage during site visits. Stage values are rarely corrected or adjusted, but stage shifts are recognized at all streamflow gauging stations. Stage notes can be collected on the proposed discharge form in Appendix V (p. 1.23).
5. All weirs and flumes are subject to leakage. It is advised that a small amount of fluorescein dye be injected into the upstream channel, especially during low flows, to identify structure leakage. Maintenance can include caulking, mortar, or water proof epoxy.
6. More frequent discharge measurements should be made to build better rating curves for all stations. The stage-discharge relationship should not be considered constant. All stations are subject to channel shape changes which will affect the rating curve, specifically, the low flow portion of the rating curve. We advise that each discharge measurement be plotted to assess rating curve functionality and consistency. A point to the left of the curve will show backwater conditions, conversely a point to the right of the curve may show a steeper energy slope - as on a rising limb. Each gauging station has a zero-flow stage that needs to be included in the rating curve.

METHODOLOGY

1. Using the LUT provided by Tracom, the 10-minute stage data were converted to a discharge value.
   a. When the 10-minute stage data were available it was converted to a discharge value using the LUT provided. The 10-minute data were averaged to get a mean daily discharge value and labeled as raw NBH discharge.
2. The mean daily discharge data were converted to a runoff (RO) value using the equation.

Equation 1: Runoff Equation

$$Raw\ NBH\ RO[in] = \frac{12 * 86400 * Q[cfs]}{Area[ft^2]}$$

3. Poor correlations of discharge at NBH with NBL, large period of record missing, coupled with overestimation of actual streamflow effectively precludes the use of predictive modeling.
4. The raw NBH RO data were summed by month to get a monthly RO value.
5. On a monthly time-step, raw NBH RO data were compared to NBL RO and the differences were analyzed.
6. If the difference between NBL RO and the raw NBH RO was greater than two inches/month, the raw RO was considered inaccurate and streamflow was not predicted.

LITERATURE CITED

Rantz, S.E. et al. 1982. *Measurement and Computation of Streamflow* (two volumes). USGS Water Supply Paper 2175. Washington DC: US Geological Survey.

TABLES

Table 1. Summary of Stage Data Collected by Year at NBH

NBH Missing Data by Year			
Water Year	**Number of Days in Year**	**Number of Days Recorded**	**Percent Missing**
2009	365	255	30.14
2010	365	319	12.60
2011	365	202	44.66
2012	366	366	
2013	365	235	35.62
2014	365	365	
2015	365	363	0.55
Total	2556	2105	17.64

Table 2. NBH Lookup Table to be Used to Estimate Streamflows

2015 NBH LUT 3' H-Flume					
Stage (h) (ft)	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**
0.01		0.36	0.329	0.71	1.25
0.02	0.0021	0.37	0.347	0.72	1.29
0.03	0.0045	0.38	0.365	0.73	1.33
0.04	0.0073	0.39	0.383	0.74	1.36
0.05	0.0105	0.40	0.402	0.75	1.40
0.06	0.0143	0.41	0.421	0.76	1.44
0.07	0.0186	0.42	0.441	0.77	1.48
0.08	0.0234	0.43	0.462	0.78	1.52
0.09	0.0288	0.44	0.483	0.79	1.56
0.10	0.0347	0.45	0.504	0.80	1.6
0.11	0.0407	0.46	0.526	0.81	1.65
0.12	0.0471	0.47	0.549	0.82	1.69
0.13	0.0538	0.48	0.572	0.83	1.73
0.14	0.061	0.49	0.596	0.84	1.78
0.15	0.0686	0.50	0.62	0.85	1.82
0.16	0.0766	0.51	0.644	0.86	1.86
0.17	0.0851	0.52	0.669	0.87	1.91
0.18	0.0939	0.53	0.695	0.88	1.96
0.19	0.1032	0.54	0.721	0.89	2.00
0.20	0.113	0.55	0.748	0.90	2.05
0.21	0.123	0.56	0.775	0.91	2.10
0.22	0.134	0.57	0.803	0.92	2.15
0.23	0.145	0.58	0.832	0.93	2.20
0.24	0.156	0.59	0.861	0.94	2.25
0.25	0.168	0.60	0.89	0.95	2.30
0.26	0.18	0.61	0.92	0.96	2.35
0.27	0.193	0.62	0.951	0.97	2.41
0.28	0.207	0.63	0.982	0.98	2.46
0.29	0.22	0.64	1.014	0.99	2.51
0.30	0.234	0.65	1.047	1.00	2.57
0.31	0.249	0.66	1.08	1.01	2.62
0.32	0.264	0.67	1.113	1.02	2.68
0.33	0.28	0.68	1.147	1.03	2.73
0.34	0.296	0.69	1.182	1.04	2.79
0.35	0.312	0.70	1.22	1.05	2.85

2015 NBH LUT 3' H-Flume					
Stage (h) (ft)	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**
1.06	2.91	1.41	5.41	1.76	8.87
1.07	2.97	1.42	5.50	1.77	8.98
1.08	3.03	1.43	5.58	1.78	9.10
1.09	3.09	1.44	5.67	1.79	9.21
1.10	3.15	1.45	5.76	1.80	9.33
1.11	3.21	1.46	5.84	1.81	9.45
1.12	3.27	1.47	5.93	1.82	9.56
1.13	3.34	1.48	6.02	1.83	9.68
1.14	3.40	1.49	6.11	1.84	9.80
1.15	3.46	1.50	6.20	1.85	9.92
1.16	3.53	1.51	6.30	1.86	10.05
1.17	3.60	1.52	6.39	1.87	10.17
1.18	3.66	1.53	6.48	1.88	10.29
1.19	3.73	1.54	6.58	1.89	10.41
1.20	3.80	1.55	6.67	1.90	10.5
1.21	3.87	1.56	6.77	1.91	10.7
1.22	3.94	1.57	6.87	1.92	10.8
1.23	4.01	1.58	6.96	1.93	10.9
1.24	4.08	1.59	7.06	1.94	11.0
1.25	4.15	1.60	7.16	1.95	11.2
1.26	4.23	1.61	7.26	1.96	11.3
1.27	4.30	1.62	7.36	1.97	11.4
1.28	4.37	1.63	7.47	1.98	11.6
1.29	4.45	1.64	7.57	1.99	11.7
1.30	4.53	1.65	7.67	2.00	11.9
1.31	4.60	1.66	7.78	2.01	12.0
1.32	4.68	1.67	7.88	2.02	12.1
1.33	4.76	1.68	7.99	2.03	12.3
1.34	4.84	1.69	8.10	2.04	12.4
1.35	4.92	1.70	8.20	2.05	12.6
1.36	5.00	1.71	8.31	2.06	12.7
1.37	5.08	1.72	8.42	2.07	12.8
1.38	5.16	1.73	8.53	2.08	13.0
1.39	5.24	1.74	8.64	2.09	13.1
1.40	5.33	1.75	8.75	2.10	13.3

2015 NBH LUT 3' H-Flume					
Stage (h) (ft)	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**	**Stage (h) (ft)**	**Discharge (Q) (cfs)**
2.11	13.4	2.46	19.2	2.81	26.2
2.12	13.6	2.47	19.4	2.82	26.5
2.13	13.7	2.48	19.6	2.83	26.7
2.14	13.9	2.49	19.8	2.84	26.9
2.15	14.0	2.50	19.9	2.85	27.1
2.16	14.2	2.51	20.1	2.86	27.4
2.17	14.3	2.52	20.3	2.87	27.6
2.18	14.5	2.53	20.5	2.88	27.6
2.19	14.6	2.54	20.7	2.89	28.0
2.20	14.8	2.55	20.9	2.90	28.3
2.21	14.9	2.56	21.1	2.91	28.5
2.22	15.1	2.57	21.3	2.92	28.7
2.23	15.3	2.58	21.5	2.93	28.9
2.24	15.4	2.59	21.7	2.94	29.2
2.25	15.6	2.60	21.9	2.95	29.4
2.26	15.7	2.61	22.1	2.96	29.7
2.27	15.9	2.62	22.3	2.97	29.9
2.28	16.1	2.63	22.5	2.98	30.1
2.29	16.2	2.64	22.7	2.99	30.4
2.30	16.4	2.65	22.9		
2.31	16.6	2.66	23.1		
2.32	16.7	2.67	23.3		
2.33	16.9	2.68	23.5		
2.34	17.1	2.69	23.7		
2.35	17.2	2.70	23.9		
2.36	17.4	2.71	24.1		
2.37	17.6	2.72	24.3		
2.38	17.8	2.73	24.5		
2.39	17.9	2.74	24.7		
2.40	18.1	2.75	24.9		
2.41	18.3	2.76	25.2		
2.42	18.5	2.77	25.4		
2.43	18.7	2.78	25.6		
2.44	18.8	2.79	25.8		
2.45	19.0	2.80	26.0		

Table 3. Annual NBH Runoff Values (inches) were Assessed for Water Yield Efficiency (NBH runoff/AFH precipitation)

Notes
1.) NBH streamflow not predicted due to the amount of missing data

Water Year	AFH (in)	NBH RO (in)	NBH/AFH
2009	79.52	N/A	N/A
2010	94.40	N/A	N/A
2011	103.22	N/A	N/A
2012	97.98	N/A	N/A
2013	100.02	N/A	N/A
2014	76.13	N/A	N/A
2015	78.91	N/A	N/A

MONTHLY WATER YIELD

Table 4. Monthly NBH Runoff Values were Assessed for Water Yield Efficiency (NBH runoff/AFH precipitation). Only the Verified Data are Listed in the Table.

Notes
1.) NBH streamflow not predicted due to the amount of missing data
2.) Table only includes data that were verified

Water Year	Month	AFH (in)	NBH RO (in)
2009	October	4.67	0.05
	November	14.69	
	December	14.20	
	January	11.42	
	February	7.00	2.71
	March	11.30	
	April	5.47	
	May	6.62	
	June	1.45	
	July	0.59	
	August	0.43	
	September	1.68	
2010	October	7.64	0.80
	November	13.32	12.01
	December	12.22	
	January	11.29	
	February	9.33	5.96
	March	13.97	
	April	11.30	
	May	5.73	
	June	5.38	
	July	0.22	
	August	1.34	
	September	2.66	0.28

Water Year	Month	AFH (in)	NBH RO (in)
2011	October	9.00	
	November	13.05	
	December	19.55	
	January	11.51	
	February	11.57	
	March	19.06	
	April	11.89	11.08
	May	3.91	
	June	1.43	
	July	1.35	0.48
	August	0.01	0.18
	September	0.89	0.04
2012	October	6.16	0.17
	November	13.13	
	December	11.00	
	January	18.20	
	February	9.33	
	March	22.57	
	April	7.73	8.19
	May	5.02	
	June	4.02	2.16
	July	0.77	0.71
	August	0.02	0.28
	September	0.04	0.22

Water Year	Month	AFH (in)	NBH RO (in)
2013	October	13.73	5.29
	November	18.29	
	December	20.44	
	January	8.25	
	February	6.28	
	March	5.91	
	April	6.36	
	May	6.43	
	June	1.80	2.44
	July	0.01	0.87
	August	0.96	0.65
	September	11.55	
2014	October	2.07	
	November	7.50	
	December	5.22	
	January	8.00	
	February	16.61	
	March	17.82	
	April	6.22	
	May	6.83	
	June	2.76	2.19
	July	1.13	
	August	0.23	
	September	1.74	
2015	October	11.69	
	November	13.27	
	December	19.85	
	January	5.76	
	February	12.49	
	March	8.13	
	April	4.53	
	May	1.56	
	June	0.40	
	July	0.06	
	August	1.16	
	September	0.00	

SUMMARY TABLES

Table 5. Summary Tables of Mean Daily Streamflow Values have been Compiled for Each Water Year. Along the Base of the Table, Monthly and Annual Statistics can be Found for that Water Year.

Notes
1.) NBH streamflow not predicted due to the amount of missing data
2.) Annual summary tables only include data that were verified

Needle Branch H-Flume, Alsea Watershed Study

Water Year 2009

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	0.00				0.07							
2	0.00				0.06							
3	0.00				0.06							
4	0.03				0.05							
5	0.00				0.05							
6	0.00				0.05							
7	0.01				0.05							
8	0.00				0.05							
9	0.00				0.05							
10	0.00				0.05							
11	0.00				0.07							
12	0.00				0.09							
13	0.00				0.09							
14	0.00				0.09							
15	0.00				0.09							
16	0.00				0.08							
17	0.00				0.07							
18	0.00				0.06							
19	0.00				0.06							
20	0.00				0.05							
21	0.00				0.05							
22	0.00				0.05							
23	0.00				0.08							
24	0.00				0.12							
25	0.00				0.44							
26	0.00				0.98							
27	0.00				0.53							
28	0.00				0.31							
29	0.00											
30	0.00											
31	0.00											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max Q (cfs)	0.03	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean Monthly Q (cfs)	0.00	#DIV/0!	#DIV/0!	#DIV/0!	0.14	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Cumulative Q (cfs)	0.08	0.00	0.00	0.00	3.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual Water Yield (in)		2.76				**Mean Annual Q (cfs)**			0.07			

Needle Branch H-Flume, Alsea Watershed Study												
Water Year 2010												
Mean Daily Q (cfs)	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
1	0.00	0.23			0.15							0.02
2	0.00	0.17			0.16							0.01
3	0.00	0.13			0.17							0.01
4	0.00	0.10			0.18							0.01
5	0.00	0.09			0.22							0.01
6	0.00	0.28			0.23							0.01
7	0.00	1.08			0.21							0.01
8	0.00	1.33			0.21							0.01
9	0.00	0.86			0.18							0.01
10	0.00	0.80			0.17							0.01
11	0.00	0.57			0.18							0.01
12	0.00	0.62			0.53							0.01
13	0.00	0.64			0.53							0.01
14	0.01	0.53			0.40							0.01
15	0.01	0.38			0.38							0.01
16	0.00	0.28			0.33							0.01
17	0.01	1.18			0.31							0.01
18	0.01	0.89			0.26							0.01
19	0.01	0.62			0.22							0.02
20	0.00	0.67			0.18							0.05
21	0.01	0.75			0.16							0.03
22	0.01	0.78			0.13							0.02
23	0.03	0.70			0.12							0.02
24	0.04	0.44			0.22							0.02
25	0.02	0.31			0.31							0.01
26	0.09	0.33			0.67							0.01
27	0.18	0.95			1.01							0.01
28	0.11	0.64			0.64							0.01
29	0.10	0.40										0.01
30	0.19	0.28										0.01
31	0.28											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.00	0.09	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Max Q (cfs)	0.28	1.33	0.00	0.00	1.01	0.00	0.00	0.00	0.00	0.00	0.00	0.05
Mean Monthly Q (cfs)	0.04	0.57	#DIV/0!	#DIV/0!	0.30	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.01
Cumulative Q (cfs)	1.13	17.05	0.00	0.00	8.46	0.00	0.00	0.00	0.00	0.00	0.00	0.40
Annual Water Yield (in)		19.04				**Mean Annual Q (cfs)**			0.23			

Needle Branch H-Flume, Alsea Watershed Study

Water Year 2011

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1							0.53			0.03	0.01	0.00
2							0.57			0.03	0.01	0.00
3							0.60			0.03	0.01	0.00
4							0.46			0.03	0.01	0.00
5							0.64			0.03	0.01	0.00
6							0.80			0.03	0.01	0.00
7							0.80			0.03	0.01	0.00
8							0.55			0.02	0.01	0.00
9							0.38			0.02	0.01	0.00
10							0.30			0.02	0.01	0.00
11							0.33			0.02	0.01	0.00
12							0.38			0.02	0.01	0.00
13							0.33			0.02	0.01	0.00
14							0.37			0.02	0.01	0.00
15							0.86			0.02	0.01	0.00
16							1.18			0.02	0.00	0.00
17							0.72			0.02	0.00	0.00
18							0.48			0.02	0.00	0.00
19							0.37			0.02	0.00	0.00
20							0.26			0.02	0.00	0.00
21							0.22			0.02	0.00	0.00
22							0.18			0.02	0.00	0.00
23							0.16			0.02	0.00	0.00
24							0.15			0.02	0.00	0.00
25							0.44			0.02	0.00	0.00
26							0.92			0.01	0.00	0.00
27							0.62			0.01	0.00	0.00
28							0.53			0.01	0.00	0.00
29							0.89			0.01	0.00	0.00
30							0.72			0.01	0.00	0.00
31										0.01	0.00	
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.01	0.00	0.00
Max Q (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00	0.03	0.01	0.00
Mean Monthly Q (cfs)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.52	#DIV/0!	#DIV/0!	0.02	0.01	0.00
Cumulative Q (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	15.74	0.00	0.00	0.68	0.25	0.06
Annual Water Yield (in)		11.78				**Mean Annual Q (cfs)**			0.14			

Needle Branch H-Flume, Alsea Watershed Study

Water Year 2012

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	0.00						1.69		0.08	0.05	0.02	0.01
2	0.00						1.05		0.07	0.05	0.02	0.01
3	0.00						0.60		0.07	0.05	0.02	0.01
4	0.00						0.44		0.08	0.05	0.02	0.01
5	0.01						0.44		0.08	0.05	0.01	0.01
6	0.00						0.46		0.09	0.04	0.01	0.01
7	0.00						0.37		0.10	0.04	0.01	0.01
8	0.00						0.30		0.16	0.04	0.01	0.01
9	0.00						0.23		0.28	0.04	0.01	0.01
10	0.01						0.21		0.25	0.03	0.01	0.01
11	0.04						0.17		0.19	0.03	0.01	0.01
12	0.02						0.16		0.17	0.03	0.01	0.01
13	0.01						0.15		0.15	0.03	0.01	0.01
14	0.01						0.15		0.13	0.03	0.01	0.01
15	0.01						0.15		0.11	0.03	0.01	0.01
16	0.01						0.40		0.10	0.03	0.01	0.01
17	0.01						0.53		0.09	0.03	0.01	0.01
18	0.00						0.37		0.09	0.03	0.01	0.01
19	0.00						0.33		0.09	0.03	0.01	0.01
20	0.00						0.57		0.08	0.03	0.01	0.01
21	0.00						0.50		0.07	0.03	0.01	0.01
22	0.00						0.38		0.08	0.03	0.01	0.01
23	0.00						0.28		0.07	0.02	0.01	0.01
24	0.00						0.23		0.06	0.02	0.01	0.01
25	0.00						0.19		0.06	0.02	0.01	0.01
26	0.00						0.18		0.06	0.02	0.01	0.01
27	0.00						0.28		0.06	0.02	0.01	0.01
28	0.01						0.31		0.05	0.02	0.01	0.01
29	0.01						0.26		0.05	0.02	0.01	0.01
30	0.01						0.26		0.05	0.02	0.01	0.01
31	0.01									0.02	0.01	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
Min Q (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.05	0.02	0.01	0.01
Max Q (cfs)	0.04	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.28	0.05	0.02	0.01
Mean Monthly Q (cfs)	0.01	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.39	#DIV/0!	0.10	0.03	0.01	0.01
Cumulative Q (cfs)	0.25	0.00	0.00	0.00	0.00	0.00	11.63	0.00	3.07	1.01	0.40	0.32
Annual Water Yield (in)		11.73				Mean Annual Q (cfs)			0.09			

Needle Branch H-Flume, Alsea Watershed Study

Water Year 2013

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1	0.01								0.40	0.05	0.03	
2	0.01								0.31	0.05	0.03	
3	0.01								0.25	0.05	0.03	
4	0.01								0.21	0.05	0.03	
5	0.01								0.18	0.05	0.03	
6	0.01								0.16	0.05	0.03	
7	0.01								0.15	0.05	0.03	
8	0.01								0.13	0.05	0.03	
9	0.01								0.12	0.04	0.03	
10	0.01								0.11	0.04	0.03	
11	0.01								0.10	0.04	0.03	
12	0.02								0.10	0.04	0.03	
13	0.03								0.10	0.04	0.03	
14	0.02								0.09	0.04	0.03	
15	0.15								0.09	0.04	0.03	
16	0.46								0.08	0.04	0.03	
17	0.13								0.08	0.04	0.03	
18	0.09								0.08	0.03	0.03	
19	0.09								0.08	0.03	0.03	
20	0.09								0.07	0.03	0.03	
21	0.16								0.06	0.03	0.03	
22	0.22								0.06	0.03	0.03	
23	0.21								0.06	0.03	0.03	
24	0.18								0.06	0.03	0.03	
25	0.17								0.06	0.03	0.03	
26	0.16								0.06	0.03	0.03	
27	0.28								0.06	0.03	0.03	
28	1.52								0.05	0.03	0.03	
29	1.96								0.05	0.03	0.03	
30	0.80								0.05	0.03	0.03	
31	0.67									0.03	0.03	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
Min Q (cfs)	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.03	0.03	0.00
Max Q (cfs)	1.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.05	0.03	0.00
Mean Monthly Q (cfs)	0.24	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.12	0.04	0.03	#DIV/0!
Cumulative Q (cfs)	7.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.46	1.23	0.92	0.00
Annual Water Yield (in)		9.24				Mean Annual Q (cfs)			0.11			

Needle Branch H-Flume, Alsea Watershed Study

Water Year 2014

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1									0.15			
2									0.15			
3									0.15			
4									0.13			
5									0.12			
6									0.11			
7									0.11			
8									0.10			
9									0.10			
10									0.10			
11									0.10			
12									0.10			
13									0.12			
14									0.10			
15									0.11			
16									0.11			
17									0.10			
18									0.09			
19									0.09			
20									0.09			
21									0.09			
22									0.09			
23									0.08			
24									0.08			
25									0.08			
26									0.08			
27									0.10			
28									0.09			
29									0.09			
30									0.08			
31												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
Min Q (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00
Max Q (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00
Mean Monthly Q (cfs)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.10	#DIV/0!	#DIV/0!	#DIV/0!
Cumulative Q (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.12	0.00	0.00	0.00
Annual Water Yield (in)		2.19				Mean Annual Q (cfs)			0.10			

Needle Branch H-Flume, Alsea Watershed Study

Water Year 2015

Mean Daily Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**
Min Q (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max Q (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean Monthly Q (cfs)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Cumulative Q (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual Water Yield (in)		0.00				**Mean Annual Q (cfs)**			#DIV/0!			