Stream discharge in gaged watersheds at the HJ Andrews Experimental Forest, 1949 to present

Abstract:
Streamflow from selected small watersheds has been continuously monitored at the Andrews Forest beginning in November 1952 and the Lookout Creek Gauging Station has been maintained by the USGS since October, 1949. The objectives of this study include: (1) to evaluate long-term changes in hydrology associated with various management treatments, notably clearcut logging, selective logging, and burning; (2) to provide baseline data for affiliated precipitation and stream water chemistry and sediment transport studies; and (3) to characterize the hydrologic regime of old-growth forests at different elevations. Streamflow records from small watersheds began in November 1952 at WS 1, 2, and 3 (60 to 100 ha), 1963 at WS 6, 7, and 8 (15 to 22 ha) 1968 at WS 9 and 10 (9 and 10 ha), 1980 at Mack Creek (580 ha), and 1949 at Lookout Creek (6242 ha). Data have been collected continuously since the start of data collection for all watersheds, with the exception of WS7, which was shut down as a cost-saving maneuver from WY1988 through WY1994. See https://andrewsforest.oregonstate.edu/research/infrastructure/watersheds for other information.

Raw instantaneous streamflow data in cubic feet per second (cfs) and mean flow at fine temporal intervals are available. Rating curves for fixed trapezoidal flumes are maintained for all small watersheds except Lookout Creek and allow calculation of mean and total flow. The USGS-maintained Lookout Creek relies on annual rating table development to reflect changes in the open channel for instantaneous flow calculation. Entity 1 includes a reconstructed history of USGS Lookout Creek hourly data beginning in 1950 and more recently 30 and 15 minute interval data. Calculated mean cfs and total flow for each watershed are available at daily (Entity 2), monthly (Entity 3), annual (Entity 4), and stream sampling (Entity 6) time intervals. An interactive program, FLOW (Entity 5), allows the user to download instantaneous, mean and total flow at requested time periods (e.g., 5 minute, 15 minute, hourly) for all watersheds except for Lookout Creek.

Keywords: hydrology; silviculture; floods; radio telemetry; disturbance; hydrologic processes; stream discharge; streamflow; long term monitoring; timber harvest; water; runoff; forest ecosystems; experimental forests; watersheds; streams; long term studies;

Date data commenced: 1949-10-01
Date data terminated: 2019-09-30
Principal Investigator: Sherri L. Johnson

List of Entities:
1. Corrected instantaneous stage height with flow calculations
2. Daily streamflow summaries
3. Monthly streamflow summaries
4. Annual streamflow summaries by wateryear (October 1 - September 30)
5. Instantaneous and total discharge for requested time intervals
6. Flow summaries for sediment and nutrient sampling periods
7. Discharge data calculated from discontinued rating curves (5 minute frequency data)

1. Corrected instantaneous stage height with flow calculations

Only Lookout Creek streamflow data is available through this entity from the Andrews Forest data catalog. Entity 5 (the interactive FLOW program) is available from our catalog to download high temporal resolution streamflow data for all other Andrews small watersheds. The full dataset (all watersheds) is available in this entity through the Environmental Data Initiative (EDI) portal. Please use the DOI in the citation to access the current dataset in EDI. Lookout Creek data available here: 1) Hourly data has been reconstructed from USGS and USFS streamflow charts and punch tapes (1950-1998), 2) USGS 30 minute data (1998-2010), and 3) USGS 15 minute data (2010-present).

Attribute List:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>STCODE</td>
<td>N</td>
<td>char(5)</td>
<td>enum</td>
</tr>
<tr>
<td>FORMAT</td>
<td>N</td>
<td>numeric(2,0)</td>
<td>range</td>
</tr>
<tr>
<td>SITCODE</td>
<td>Y</td>
<td>char(6)</td>
<td>place</td>
</tr>
<tr>
<td>WATERYEAR</td>
<td>N</td>
<td>numeric(4,0)</td>
<td>range</td>
</tr>
<tr>
<td>DATE_TIME</td>
<td>Y</td>
<td>datetime</td>
<td>range</td>
</tr>
<tr>
<td>EQU_SET_CODE</td>
<td>N</td>
<td>char(3)</td>
<td>enum</td>
</tr>
<tr>
<td>Attribute</td>
<td>Type</td>
<td>Description</td>
<td>Range</td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
<td>-------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>STAGE</td>
<td>N Y</td>
<td>numeric(6,3)</td>
<td>range 0.0000 10.0300 ft</td>
</tr>
<tr>
<td>INST_Q</td>
<td>N Y</td>
<td>numeric(8,3)</td>
<td>range 0.0000 8000.0000 cfs</td>
</tr>
<tr>
<td>INST_Q_AREA</td>
<td>N Y</td>
<td>numeric(7,3)</td>
<td>range 0.0000 332.0000 cfsm</td>
</tr>
<tr>
<td>INTERVAL</td>
<td>N Y</td>
<td>numeric(4,0)</td>
<td>range 0.0000 1440.0000 min</td>
</tr>
<tr>
<td>MEAN_Q</td>
<td>N Y</td>
<td>numeric(8,3)</td>
<td>range 0.0000 6605.0000 cfs</td>
</tr>
<tr>
<td>MEAN_Q_AREA</td>
<td>N Y</td>
<td>numeric(7,3)</td>
<td>range 0.0000 275.0000 cfsm</td>
</tr>
<tr>
<td>TOTAL_Q_INT</td>
<td>N Y</td>
<td>numeric(8,6)</td>
<td>range 0.0000 2.1000 in</td>
</tr>
<tr>
<td>ESTCODE</td>
<td>N N</td>
<td>char(1)</td>
<td>enum</td>
</tr>
<tr>
<td>EVENT_CODE</td>
<td>N N</td>
<td>char(6)</td>
<td>enum</td>
</tr>
</tbody>
</table>

2. **Daily streamflow summaries**

Daily data can also be interactively viewed, downloaded, and graphically displayed using [ClimDB/HydroDB](https://climhy.lternet.edu/).

**Attribute List:**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>STCODE</td>
<td>N N</td>
<td>char(5)</td>
<td>enum</td>
</tr>
<tr>
<td>FORMAT</td>
<td>N N</td>
<td>numeric(2,0)</td>
<td>range 2.0000 2.0000 number</td>
</tr>
<tr>
<td>SITECODE</td>
<td>Y N</td>
<td>char(6)</td>
<td>place</td>
</tr>
<tr>
<td>WATERYEAR</td>
<td>N N</td>
<td>numeric(4,0)</td>
<td>range 1950.0000 2019.0000 number</td>
</tr>
<tr>
<td>DATE</td>
<td>Y N</td>
<td>datetime</td>
<td>range 10/1/1949 9/30/2019 YYYY-MM-DD</td>
</tr>
<tr>
<td>MEAN_Q</td>
<td>N Y</td>
<td>numeric(8,3)</td>
<td>range 0.0000 4890.0000 cfs</td>
</tr>
<tr>
<td>MAX_Q</td>
<td>N Y</td>
<td>numeric(8,3)</td>
<td>range 0.0000 8000.0000 cfs</td>
</tr>
<tr>
<td>MIN_Q</td>
<td>N Y</td>
<td>numeric(8,3)</td>
<td>range 0.0000 2415.0000 cfs</td>
</tr>
<tr>
<td>MEAN_Q_AREA</td>
<td>N Y</td>
<td>numeric(7,3)</td>
<td>range 0.0000 202.9200 cfsm</td>
</tr>
<tr>
<td>TOTAL_Q_AREA</td>
<td>N Y</td>
<td>numeric(7,3)</td>
<td>range 0.0000 7.5430 in</td>
</tr>
<tr>
<td>ESTCODE</td>
<td>N N</td>
<td>char(1)</td>
<td>enum</td>
</tr>
</tbody>
</table>

3. **Monthly streamflow summaries**

Monthly data can also be interactively viewed, downloaded, and graphically displayed using [ClimDB/HydroDB](https://climhy.lternet.edu/).

**Attribute List:**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Type</th>
<th>Description</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>STCODE</td>
<td>N N</td>
<td>char(5)</td>
<td>enum</td>
</tr>
<tr>
<td>FORMAT</td>
<td>N N</td>
<td>numeric(2,0)</td>
<td>range 3.0000 3.0000 number</td>
</tr>
<tr>
<td>SITECODE</td>
<td>Y N</td>
<td>char(6)</td>
<td>place</td>
</tr>
<tr>
<td>WATERYEAR</td>
<td>N N</td>
<td>numeric(4,0)</td>
<td>range 1950.0000 2019.0000 number</td>
</tr>
<tr>
<td>YEAR</td>
<td>Y N</td>
<td>numeric(4,0)</td>
<td>range 1949.0000 2019.0000 number</td>
</tr>
<tr>
<td>MONTH</td>
<td>Y N</td>
<td>numeric(2,0)</td>
<td>range 1.0000 12.0000 number</td>
</tr>
<tr>
<td>MEAN_Q</td>
<td>N Y</td>
<td>numeric(8,3)</td>
<td>range 0.0000 794.1290 cfs</td>
</tr>
<tr>
<td>MAX_Q</td>
<td>N Y</td>
<td>numeric(8,3)</td>
<td>range 0.0000 8000.0000 cfs</td>
</tr>
</tbody>
</table>
4. Annual streamflow summaries by wateryear (October 1 - September 30)

Annual data can also be interactively viewed, downloaded, and graphically displayed using <a href="https://climhy.lternet.edu/" target="_blank">ClimDB/HydroDB</a>.

**Attribute List:**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Mandatory</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STCODE</td>
<td>N</td>
<td></td>
<td>char(5) enum</td>
</tr>
<tr>
<td>FORMAT</td>
<td>N</td>
<td></td>
<td>numeric(2,0) range 4.0000 4.0000 number</td>
</tr>
<tr>
<td>SITECODE</td>
<td>Y</td>
<td></td>
<td>char(6) place</td>
</tr>
<tr>
<td>WATERYEAR</td>
<td>Y</td>
<td></td>
<td>numeric(4,0) range 1950.0000 2019.0000 number</td>
</tr>
<tr>
<td>MEAN_Q</td>
<td>Y</td>
<td></td>
<td>numeric(8,3) range 0.0340 207.1000 cfs</td>
</tr>
<tr>
<td>MAX_Q</td>
<td>Y</td>
<td></td>
<td>numeric(8,3) range 0.4130 8000.0000 cfs</td>
</tr>
<tr>
<td>MIN_Q</td>
<td>Y</td>
<td></td>
<td>numeric(8,3) range 0.0000 15.0000 cfs</td>
</tr>
<tr>
<td>MEAN_Q_AREA</td>
<td>Y</td>
<td></td>
<td>numeric(7,3) range 0.0180 8.9380 cfsm</td>
</tr>
<tr>
<td>TOTAL_Q_AREA</td>
<td>Y</td>
<td></td>
<td>numeric(7,3) range 0.2490 116.6000 in</td>
</tr>
<tr>
<td>ESTCODE</td>
<td>N</td>
<td></td>
<td>char(1) enum</td>
</tr>
<tr>
<td>ESTDAYS</td>
<td>N</td>
<td></td>
<td>numeric(3,0) range 0.0000 150.0000 days</td>
</tr>
<tr>
<td>TOTAL_DAYS</td>
<td>N</td>
<td></td>
<td>numeric(3,0) range 0.0000 366.0000 days</td>
</tr>
</tbody>
</table>

5. Instantaneous and total discharge for requested time intervals

This is the interactive FLOW program which allows downloads of all Andrews small watersheds for any time period at user-specified time intervals. Rating equations can also be displayed. The full dataset (all watersheds) is available in this entity through the Environmental Data Initiative (EDI) portal. Please use the DOI in the citation to access the current dataset in EDI.

**Attribute List:**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Mandatory</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STCODE</td>
<td>N</td>
<td></td>
<td>char(5) enum</td>
</tr>
<tr>
<td>FORMAT</td>
<td>N</td>
<td></td>
<td>numeric(2,0) range 5.0000 5.0000 number</td>
</tr>
<tr>
<td>SITECODE</td>
<td>Y</td>
<td></td>
<td>char(6) place</td>
</tr>
<tr>
<td>DATE_TIME</td>
<td>Y</td>
<td></td>
<td>datetime range 10/1/1952 10/1/2018 12:00:00 AM 12:00:00 AM YYYY-MM-DD hh:mm:ss AM AM</td>
</tr>
<tr>
<td>EQN_SET_CODE</td>
<td>N</td>
<td></td>
<td>char(3) enum</td>
</tr>
<tr>
<td>STAGE</td>
<td>Y</td>
<td></td>
<td>numeric(6,3) range 0.0000 2.5000 ft</td>
</tr>
<tr>
<td>INST_Q</td>
<td>Y</td>
<td></td>
<td>numeric(8,3) range 0.0000 8000.0000 cfs</td>
</tr>
<tr>
<td>MEAN_Q</td>
<td>Y</td>
<td></td>
<td>numeric(8,3) range 0.0000 500.0000 cfs</td>
</tr>
<tr>
<td>MEAN_Q_AREA</td>
<td>Y</td>
<td></td>
<td>numeric(7,3) range 0.0000 400.0000 cfsm</td>
</tr>
</tbody>
</table>
TOTAL_Q_INT N Y numeric(8,6) range 0.0000 2.0000 in
TOTAL_Q N Y numeric(10,1) range 0.0000 30000000.0000 ft³
ESTCODE N N char(1) enum

5. Flow summaries for sediment and nutrient sampling periods

Total flow is summarized, generally in 3 week periods, for inclusion with stream sampling data in CF002.

Attribute List:
STCODE N N char(5) enum
FORMAT N N numeric(2,0) range 6.0000 6.0000 number
SITECODE Y N char(6) place
WATERYEAR N N numeric(4,0) range 1969.0000 2019.0000 number
BEGIN_DATETIME Y N datetime range 10/1/1968 12:00:00 AM 9/25/2019 5:00:00 PM
END_DATETIME N N datetime range 10/9/1968 12:00:00 PM 10/1/2019 5:15:00 PM
TOTAL_Q_SMPL N Y numeric(7,3) range 0.0000 68.8390 in
ESTCODE N N char(1) enum

6. Discharge data calculated from discontinued rating curves (5 minute frequency data)

This data was online previously but has been deprecated in favor of new rating equations: WS1, 2, 3 (WY1999-2016); WS 8 (WY 1988-2016); and WS10 (WY 1997 - 2016)

Attribute List:
STCODE N N char(5) enum
FORMAT N N numeric(2,0) range 7.0000 7.0000 number
SITECODE Y N char(6) place
WATERYEAR N N numeric(4,0) range 1988.0000 2016.0000 number
DATE_TIME Y N datetime range 10/1/1987 12:00:00 AM 10/1/2016 12:00:00 AM
EQN_SET_CODE N N char(3) enum
STAGE N Y numeric(6,3) range 0.0010 1.6300 ft
INST_Q N Y numeric(8,3) range 0.0000 53.0500 cfs
INST_Q_AREA N Y numeric(7,3) range 0.0000 168.4200 cfsm
INTERVAL N Y numeric(4,0) range 5.0000 5.0000 min
MEAN_Q N Y numeric(8,3) range 0.0000 52.0700 cfs
MEAN_Q_AREA N Y numeric(7,3) range 0.0010 168.2900 cfsm
TOTAL_Q_INT N Y numeric(8,6) range 0.0000 0.0220 in
ESTCODE N N char(1) enum
EVENT_CODE N N char(6) enum

Attributes Definitions:
BEGIN_DATETIME
   Beginning date and time of proportional sampling period
DATE
   Date
DATE_TIME
   Date and time (PST) of stage height measurement
END_DATETIME
   Ending date and time of proportional sampling period
EQN_SET_CODE
   Equation set code describes the rating equation set and version used to calculate streamflow
ESTCODE
   Estimate code
ESTDAYS
   Number of days estimated in the summary period
EVENT_CODE
   Indicates that a comment exists independently for this date and time, and is typically the installation or removal of a v-notch or other change in rating curves used, or a site maintenance visit
FORMAT
   Entity number
INST_Q
   Instantaneous flow as cubic feet per second (cfs)
INST_Q_AREA
   Instantaneous flow as cubic feet per second per square mile (cfsm)
INTERVAL
   Time interval in minutes (length of time since previous stage value)
MAX_Q
   Maximum cubic feet per second (cfs) for this date (entity 2) or month (entity 3) or year (entity 4)
MEAN_Q
   Mean flow as cubic feet per second (cfs) for the preceding time interval (entity 1, 5) or this date (entity 2) or month (entity 3) or year (entity 4)
MEAN_Q_AREA
   Mean flow as cubic feet per second per square mile (cfsm) for the preceding time interval (entity 1, 5) or this date (entity 2) or month (entity 3) or year (entity 4)
MIN_Q
   Minimum cubic feet per second (cfs) for this date (entity 2) or month (entity 3) or year (entity 4)
MONTH
   Calendar month
SITECODE
   Site code
STAGE
Stage height

STCODE
Study code

TOTAL_DAYS
Total days of non-missing record included in the summary period

TOTAL_Q
Total flow in cubic feet for the preceding time interval

TOTAL_Q_AREA
Total flow as inches of water (over the watershed area) for this date (entity 2) or month (entity 3) or year (entity 4)

TOTAL_Q_INT
Total flow as inches of water (over the watershed area) for the preceding time interval

TOTAL_Q_SMPL
Total flow as inches of water during proportional sampling period (over the watershed area)

WATERYEAR
Wateryear: October 1 - September 30

YEAR
Calendar year

Enumerated Domains:

Enumerated Domain for Attribute: ESTCODE
A Accepted value
M Missing value
E Estimated value
P Provisional data (subject to change)
Q Questionable value
S Proportional nutrient sample removed

Enumerated Domain for Attribute: STCODE
HF004 Study code HF004

Enumerated Domain for Attribute: EQN_SET_CODE
1 GSWS01, Equation set A, version 1, current version, original flume 1952-1956
2 GSWS01, Equation set B, version 1, current version, main flume 1956-Present
3 GSWS01, Equation set C, version 1, current version, v-notch 1999-Present summers only
4 GSWS02, Equation set A, version 1, current version, main flume 1952-Present
5 GSWS02, Equation set B, version 1, current version, v-notch 1999-Present summers only
6 GSWS03, Equation set A, version 1, current version, main flume 1952-Present
7 GSWS03, Equation set B, version 1, current version, main flume post-flood 1964-1966
GSWS03, Equation set C, version 1, current version, v-notch 1999-Present
summers only

GSWS06, Equation set A, version 1, current version, original H-flume
1963-1997

GSWS06, Equation set B, version 1, current version, main flume 1997-Present
summers only

GSWS06, Equation set C, version 1, current version, v-notch 1998-Present
summers only

GSWS07, Equation set A, version 1, current version, original H-flume
1963-1997

GSWS07, Equation set B, version 1, current version, main flume 1997-Present
summers only

GSWS07, Equation set C, version 1, current version, v-notch 1998-Present
summers only

GSWS08, Equation set A, version 1, current version, original H-flume
1963-1987

GSWS08, Equation set B, version 1, old version, main flume 1987-Present

GSWS08, Equation set B, version 2, current version, main flume 1987-Present
summers only

GSWS08, Equation set C, version 1, current version, v-notch 1997-Present
summers only

GSWS09, Equation set A, version 1, current version, original H-flume
1968-1973

GSWS09, Equation set B, version 1, old version, original v-notch 1973-1979
summers only

GSWS09, Equation set B, version 2, current version, original v-notch 1973-1979
summers only

GSWS09, Equation set C, version 1, old version, main flume 1973-Present

GSWS09, Equation set C, version 2, current version, main flume 1973-Present
summers only

GSWS09, Equation set D, version 1, current version, v-notch 1997-Present
summers only

GSWS10, Equation set A, version 1, current version, original H-flume
1968-1973

GSWS10, Equation set B, version 1, current version, original v-notch 1973-1979
summers only

GSWS10, Equation set C, version 1, old version, main flume 1973-Present

GSWS10, Equation set C, version 2, current version, main flume 1973-Present
summers only

GSWS10, Equation set D, version 1, current version, v-notch 1997-Present
summers only

GSWSMA, Equation set A, version 1, older version, main flume 1979-1995

GSWSMA, Equation set A, version 2, old version, main flume 1979-1995

GSWSMA, Equation set A, version 3, old version, main flume 1979-1995 prior
to fish ladder

GSWSMF, Equation set A, version 1, old version, fish ladder 1995-Present

GSWSMF, Equation set A, version 2, current version, fish ladder 1995-Present

GSWSMA, Equation set A, version 4, current version, main flume 1995-Present
represents concurrent fish ladder operation; equations are the same as version
3

GSWSMC, combined Mack Creek main flume + fish ladder (sum of eqn sets
34-35)

GSLOOK, USGS rating tables for Lookout Creek near Blue River (14161500)

GSTIDB, USGS rating tables for Blue River below Tidbits Creek (14161100)

GSLOOK, USGS rating table a for Lookout Creek near Blue River (14161500);
reconstructed rating curve 0

GSLOOK, USGS rating table b for Lookout Creek near Blue River (14161500);
reconstructed rating curve 1
Enumerated Domain for Attribute: EVENT_CODE
NA No event is reported (not applicable)
INSREM Installation or removal of a v-notch weir, or a change in rating equations applied
MAINTE  A maintenance event has occurred (e.g., site visit)
WEATHER A weather event is affecting the stream discharge measurement

Enumerated Domain for Attribute: ESTCODE
A  Accepted value
M  Missing value
E  Estimated value
P  Provisional data (subject to change)
Q  Questionable value
S  Proportional nutrient sample removed

Enumerated Domain for Attribute: STCODE
HF004 Study code HF004

Enumerated Domain for Attribute: ESTCODE
A  Accepted value
M  Missing value
E  Estimated value
P  Provisional data (subject to change)
Q  Questionable value
S  Proportional nutrient sample removed

Enumerated Domain for Attribute: STCODE
HF004 Study code HF004

Enumerated Domain for Attribute: ESTCODE
A  Accepted value
M  Missing value
E  Estimated value
P  Provisional data (subject to change)
Q  Questionable value
S  Proportional nutrient sample removed

Enumerated Domain for Attribute: STCODE
HF004 Study code HF004

Enumerated Domain for Attribute: ESTCODE
A  Accepted value
M  Missing value
E  Estimated value
P  Provisional data (subject to change)
Q  Questionable value

Enumerated Domain for Attribute: STCODE
HF004 Study code HF004

Enumerated Domain for Attribute: ESTCODE
A  Accepted value
M  Missing value
E  Estimated value
P  Provisional data (subject to change)
Q  Questionable value
Proportional nutrient sample removed

<table>
<thead>
<tr>
<th>Enumerated Domain for Attribute: STCODE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HF004 Study code HF004</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enumerated Domain for Attribute: EQN_SET_CODE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 GSWS01, Equation set A, version 1, current version, original flume 1952-1956</td>
<td></td>
</tr>
<tr>
<td>2 GSWS01, Equation set B, version 1, current version, main flume 1956-Present</td>
<td></td>
</tr>
<tr>
<td>3 GSWS01, Equation set C, version 1, current version, v-notch 1999-Present summers only</td>
<td></td>
</tr>
<tr>
<td>4 GSWS02, Equation set A, version 1, current version, main flume 1952-Present</td>
<td></td>
</tr>
<tr>
<td>5 GSWS02, Equation set B, version 1, current version, v-notch 1999-Present summers only</td>
<td></td>
</tr>
<tr>
<td>6 GSWS03, Equation set A, version 1, current version, main flume 1952-Present</td>
<td></td>
</tr>
<tr>
<td>7 GSWS03, Equation set B, version 1, current version, main flume post-flood 1964-1966</td>
<td></td>
</tr>
<tr>
<td>8 GSWS03, Equation set C, version 1, current version, v-notch 1999-Present summers only</td>
<td></td>
</tr>
<tr>
<td>9 GSWS06, Equation set A, version 1, current version, original H-flume 1963-1997</td>
<td></td>
</tr>
<tr>
<td>10 GSWS06, Equation set B, version 1, current version, main flume 1997-Present</td>
<td></td>
</tr>
<tr>
<td>11 GSWS06, Equation set C, version 1, current version, v-notch 1997-Present summers only</td>
<td></td>
</tr>
<tr>
<td>13 GSWS07, Equation set B, version 1, current version, main flume 1997-Present</td>
<td></td>
</tr>
<tr>
<td>14 GSWS07, Equation set C, version 1, current version, v-notch 1998-Present summers only</td>
<td></td>
</tr>
<tr>
<td>15 GSWS08, Equation set A, version 1, current version, original H-flume 1963-1987</td>
<td></td>
</tr>
<tr>
<td>16 GSWS08, Equation set B, version 1, old version, main flume 1987-Present</td>
<td></td>
</tr>
<tr>
<td>17 GSWS08, Equation set C, version 1, current version, v-notch 1997-Present summers only</td>
<td></td>
</tr>
<tr>
<td>18 GSWS09, Equation set A, version 1, current version, original H-flume 1968-1973</td>
<td></td>
</tr>
<tr>
<td>19 GSWS09, Equation set B, version 1, old version, original v-notch 1973-1979 summers only</td>
<td></td>
</tr>
<tr>
<td>20 GSWS09, Equation set B, version 2, current version, original v-notch 1973-1979 summers only</td>
<td></td>
</tr>
<tr>
<td>21 GSWS09, Equation set C, version 1, old version, main flume 1973-Present</td>
<td></td>
</tr>
<tr>
<td>22 GSWS09, Equation set C, version 2, current version, main flume 1973-Present</td>
<td></td>
</tr>
<tr>
<td>23 GSWS10, Equation set A, version 1, current version, v-notch 1997-Present summers only</td>
<td></td>
</tr>
<tr>
<td>24 GSWS10, Equation set A, version 1, current version, original H-flume 1968-1973</td>
<td></td>
</tr>
<tr>
<td>25 GSWS10, Equation set B, version 1, current version, original v-notch 1973-1979 summers only</td>
<td></td>
</tr>
<tr>
<td>26 GSWS10, Equation set C, version 1, old version, main flume 1973-Present</td>
<td></td>
</tr>
<tr>
<td>27 GSWS10, Equation set C, version 2, current version, main flume 1973-Present</td>
<td></td>
</tr>
<tr>
<td>28 GSWS10, Equation set D, version 1, current version, v-notch 1997-Present summers only</td>
<td></td>
</tr>
<tr>
<td>29 GSWS10, Equation set D, version 1, current version, original H-flume 1968-1973</td>
<td></td>
</tr>
<tr>
<td>30 GSWSMA, Equation set A, version 1, older version, main flume 1979-1995</td>
<td></td>
</tr>
</tbody>
</table>
GSWSMA, Equation set A, version 2, old version, main flume 1979-1995

GSWSMA, Equation set A, version 3, old version, main flume 1979-1995 prior to fish ladder

GSWSMF, Equation set A, version 1, old version, fish ladder 1995-Present

GSWSMF, Equation set A, version 2, current version, fish ladder 1995-Present

GSWSMA, Equation set A, version 4, current version, main flume 1995-Present represents concurrent fish ladder operation; equations are the same as version 3

GSWSMC, combined Mack Creek main flume + fish ladder (sum of eqn sets 34+35)

GSLOOK, USGS rating tables for Lookout Creek near Blue River (14161500)

GSTIDB, USGS rating tables for Blue River below Tidbits Creek (14161100)

GSLOOK, USGS rating table a for Lookout Creek near Blue River (14161500); reconstructed rating curve 0

GSLOOK, USGS rating table b for Lookout Creek near Blue River (14161500); reconstructed rating curve 1

GSLOOK, USGS rating table c for Lookout Creek near Blue River (14161500); reconstructed rating curve 2

GSLOOK, USGS rating table d for Lookout Creek near Blue River (14161500); reconstructed rating curve 3

GSLOOK, USGS rating table e for Lookout Creek near Blue River (14161500); reconstructed rating curve 4

GSLOOK, USGS rating table f for Lookout Creek near Blue River (14161500); original version; extended forward through WY 1956

GSLOOK, USGS rating table f for Lookout Creek near Blue River (14161500); reconstructed rating curve 5; extended forward through WY 1956

GSLOOK, USFS rating table g for Lookout Creek near Blue River (14161500); original version

GSLOOK, USFS rating table g for Lookout Creek near Blue River (14161500); reconstructed rating curve 6

GSLOOK, USGS rating table 1 for Lookout Creek near Blue River (14161500); original version; extended backward to include WY 1963

GSLOOK, USGS rating table 1 for Lookout Creek near Blue River (14161500); reconstructed rating curve 7; extended backward to include WY 1963

GSLOOK, USGS rating table 2 for Lookout Creek near Blue River (14161500); reconstructed rating curve 8

GSLOOK, USGS rating table 3 for Lookout Creek near Blue River (14161500); reconstructed rating curve 9

GSLOOK, USGS rating table 4 for Lookout Creek near Blue River (14161500); reconstructed rating curve 10

GSLOOK, USGS rating table 5 for Lookout Creek near Blue River (14161500); reconstructed rating curve 11

GSLOOK, USGS rating table 6 for Lookout Creek near Blue River (14161500); reconstructed rating curve 12

GSLOOK, USGS rating table 7 for Lookout Creek near Blue River (14161500); reconstructed rating curve 13

GSLOOK, USGS rating table 8 for Lookout Creek near Blue River (14161500); reconstructed rating curve 14

GSLOOK, USGS rating table 9 for Lookout Creek near Blue River (14161500); reconstructed rating curve 15

GSLOOK, USGS rating table 10 for Lookout Creek near Blue River (14161500); reconstructed rating curve 16

GSLOOK, USGS rating table 11 for Lookout Creek near Blue River (14161500); reconstructed rating curve 17

GSLOOK, USGS rating table 12 for Lookout Creek near Blue River (14161500); reconstructed rating curve 18

GSLOOK, USGS rating table 13 for Lookout Creek near Blue River (14161500); reconstructed rating curve 19

GSLOOK, USGS rating table 14 for Lookout Creek near Blue River (14161500); reconstructed rating curve 20

GSLOOK, USGS rating table 15 for Lookout Creek near Blue River (14161500); reconstructed rating curve 21
64 GSLOOK, USGS rating table 16 for Lookout Creek near Blue River (14161500); reconstructed rating curve 22
65 GSLOOK, USGS rating table 17 for Lookout Creek near Blue River (14161500); reconstructed rating curve 23
66 GSLOOK, USGS rating table 18 for Lookout Creek near Blue River (14161500); reconstructed rating curve 24
67 GSWS01, Equation set D, version 1, current version, main flume 1999-Present (replacement for eqn_set_code=' 2')
68 GSWS02, Equation set C, version 1, current version, main flume 1999-Present (replacement for eqn_set_code=' 4')
69 GSWS03, Equation set D, version 1, current version, main flume 1999-Present (replacement for eqn_set_code=' 6')
70 GSWS08, Equation set D, version 1, current version, main flume 1999-Present (replacement for eqn_set_code=' 17')
71 GSWS10, Equation set E, version 1, current version, main flume 1999-Present (replacement for eqn_set_code=' 28')

Enumerated Domain for Attribute: ESTCODE
A Accepted value
M Missing value
E Estimated value
P Provisional data (subject to change)
Q Questionable value
S Proportional nutrient sample removed

Enumerated Domain for Attribute: STCODE
HF004 Study code HF004

Enumerated Domain for Attribute: ESTCODE
A Accepted value
M Missing value
E Estimated value
P Provisional data (subject to change)
Q Questionable value
S Proportional nutrient sample removed

Enumerated Domain for Attribute: STCODE
HF004 Study code HF004

Enumerated Domain for Attribute: EQN_SET_CODE
1 GSWS01, Equation set A, version 1, current version, original flume 1952-1956
2 GSWS01, Equation set B, version 1, current version, main flume 1956-Present
3 GSWS01, Equation set C, version 1, current version, v-notch 1999-Present summers only
4 GSWS02, Equation set A, version 1, current version, main flume 1952-Present
5 GSWS02, Equation set B, version 1, current version, v-notch 1999-Present summers only
6 GSWS03, Equation set A, version 1, current version, main flume 1952-Present
7 GSWS03, Equation set B, version 1, current version, main flume post-flood 1964-1966
GSWS03, Equation set C, version 1, current version, v-notch 1999-Present
summers only

GSWS06, Equation set A, version 1, current version, original H-flume
1963-1997

GSWS06, Equation set B, version 1, current version, main flume 1997-Present
summers only

GSWS06, Equation set C, version 1, current version, v-notch 1998-Present
summers only

GSWS07, Equation set A, version 1, current version, original H-flume
1963-1997

GSWS07, Equation set B, version 1, current version, main flume 1997-Present
summers only

GSWS07, Equation set C, version 1, current version, v-notch 1998-Present
summers only

GSWS08, Equation set A, version 1, current version, original H-flume
1963-1987

GSWS08, Equation set B, version 1, old version, main flume 1987-Present

GSWS08, Equation set B, version 2, current version, main flume 1987-Present

GSWS08, Equation set C, version 1, current version, v-notch 1997-Present
summers only

GSWS09, Equation set A, version 1, current version, original H-flume
1968-1973

GSWS09, Equation set B, version 1, old version, original v-notch 1973-1979
summers only

GSWS09, Equation set B, version 2, current version, original v-notch 1973-1979
summers only

GSWS09, Equation set C, version 1, old version, main flume 1973-Present

GSWS09, Equation set C, version 2, current version, main flume 1973-Present

GSWS09, Equation set D, version 1, current version, v-notch 1997-Present
summers only

GSWS10, Equation set A, version 1, current version, original H-flume
1968-1973

GSWS10, Equation set B, version 1, current version, original v-notch 1973-1979
summers only

GSWS10, Equation set C, version 1, old version, main flume 1973-Present

GSWS10, Equation set C, version 2, current version, main flume 1973-Present

GSWSMA, Equation set A, version 1, older version, main flume 1979-1995

GSWSMA, Equation set A, version 2, old version, main flume 1979-1995

GSWSMA, Equation set A, version 3, old version, main flume 1979-1995 prior
to fish ladder

GSWSMF, Equation set A, version 1, old version, fish ladder 1995-Present

GSWSMF, Equation set A, version 2, current version, fish ladder 1995-Present

GSWSMA, Equation set A, version 4, current version, main flume 1995-Present
represents concurrent fish ladder operation; equations are the same as version 3

GSWSMC, combined Mack Creek main flume + fish ladder (sum of eqn sets
34-35)

GSLOOK, USGS rating tables for Lookout Creek near Blue River (14161500)

GSTIDB, USGS rating tables for Blue River below Tidbits Creek (14161100)

GSLOOK, USGS rating table a for Lookout Creek near Blue River (14161500);
reconstructed rating curve 0

GSLOOK, USGS rating table b for Lookout Creek near Blue River (14161500);
reconstructed rating curve 1
GSLOOK, USGS rating table c for Lookout Creek near Blue River (14161500); reconstructed rating curve 2
GSLOOK, USGS rating table d for Lookout Creek near Blue River (14161500); reconstructed rating curve 3
GSLOOK, USGS rating table e for Lookout Creek near Blue River (14161500); reconstructed rating curve 4
GSLOOK, USGS rating table f for Lookout Creek near Blue River (14161500); original version; extended forward through WY 1956
GSLOOK, USGS rating table f for Lookout Creek near Blue River (14161500); reconstructed rating curve 5; extended forward through WY 1956
GSLOOK, USGS rating table g for Lookout Creek near Blue River (14161500); original version
GSLOOK, USGS rating table g for Lookout Creek near Blue River (14161500); reconstructed rating curve 6
GSLOOK, USFS rating table h for Lookout Creek near Blue River (14161500); original version
GSLOOK, USFS rating table h for Lookout Creek near Blue River (14161500); reconstructed rating curve 6
GSLOOK, USGS rating table i for Lookout Creek near Blue River (14161500); original version; extended backward to include WY 1963
GSLOOK, USGS rating table i for Lookout Creek near Blue River (14161500); reconstructed rating curve 7; extended backward to include WY 1963
GSLOOK, USGS rating table j for Lookout Creek near Blue River (14161500); reconstructed rating curve 8
GSLOOK, USGS rating table j for Lookout Creek near Blue River (14161500); reconstructed rating curve 9
GSLOOK, USGS rating table k for Lookout Creek near Blue River (14161500); reconstructed rating curve 10
GSLOOK, USGS rating table k for Lookout Creek near Blue River (14161500); reconstructed rating curve 11
GSLOOK, USGS rating table k for Lookout Creek near Blue River (14161500); reconstructed rating curve 12
GSLOOK, USGS rating table l for Lookout Creek near Blue River (14161500); reconstructed rating curve 13
GSLOOK, USGS rating table l for Lookout Creek near Blue River (14161500); reconstructed rating curve 14
GSLOOK, USGS rating table l for Lookout Creek near Blue River (14161500); reconstructed rating curve 15
GSLOOK, USGS rating table m for Lookout Creek near Blue River (14161500); reconstructed rating curve 16
GSLOOK, USGS rating table m for Lookout Creek near Blue River (14161500); reconstructed rating curve 17
GSLOOK, USGS rating table n for Lookout Creek near Blue River (14161500); reconstructed rating curve 18
GSLOOK, USGS rating table n for Lookout Creek near Blue River (14161500); reconstructed rating curve 19
GSLOOK, USGS rating table o for Lookout Creek near Blue River (14161500); reconstructed rating curve 20
GSLOOK, USGS rating table o for Lookout Creek near Blue River (14161500); reconstructed rating curve 21
GSLOOK, USGS rating table o for Lookout Creek near Blue River (14161500); reconstructed rating curve 22
GSLOOK, USGS rating table o for Lookout Creek near Blue River (14161500); reconstructed rating curve 23
GSLOOK, USGS rating table o for Lookout Creek near Blue River (14161500); reconstructed rating curve 24
GSWS01, Equation set D, version 1, current version, main flume 1999-Present (replacement for eqn_set_code='2')
GSWS02, Equation set C, version 1, current version, main flume 1999-Present (replacement for eqn_set_code='4')
GSWS03, Equation set D, version 1, current version, main flume 1999-Present (replacement for eqn_set_code='6')
GSWS08, Equation set D, version 1, current version, main flume 1999-Present (replacement for eqn_set_code='17')
GSWS10, Equation set E, version 1, current version, main flume 1999-Present (replacement for eqn_set_code='28')

Enumerated Domain for Attribute: EVENT_CODE
NA No event is reported (not applicable)
INSREM Installation or removal of a v-notch weir, or a change in rating equations applied
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAINTE</td>
<td>A maintenance event has occurred (e.g., site visit)</td>
</tr>
<tr>
<td>WEATHR</td>
<td>A weather event is affecting the stream discharge measurement</td>
</tr>
</tbody>
</table>