Title: 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.

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, monthly, annual, and stream sampling 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)

Attribute List:

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2. Daily streamflow summaries

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

**Attribute List:**

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3. Monthly streamflow summaries

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

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### 4. Annual streamflow summaries by wateryear (October 1 - September 30)

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

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<td>Mean Streamflow</td>
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<td>MAX_Q</td>
<td>N Y numeric(8,3) range</td>
<td>Max Streamflow</td>
<td>0.4130  8000.0000 cfs</td>
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<tr>
<td>MIN_Q</td>
<td>N Y numeric(8,3) range</td>
<td>Min Streamflow</td>
<td>0.0000  15.0000 cfs</td>
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### 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:**

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<td>Stage</td>
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<td>Instantaneous Flow</td>
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<td>Mean Streamflow</td>
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<td>Mean Area Streamflow</td>
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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:**

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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); WS8 (WY1988-2016); and WS10 (WY1997-2016)

**Attribute List:**

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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 sumsers 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

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

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 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, current 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

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 B, version 2, 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

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
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<th>Description</th>
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<td>A maintenance event has occurred (e.g., site visit)</td>
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<tr>
<td>WEATH</td>
<td>A weather event is affecting the stream discharge measurement</td>
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**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
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
8 GSWS03, Equation set C, version 1, current version, v-notch 1999-Present summers only
9 GSWS06, Equation set A, version 1, current version, original H-flume 1963-1997
10 GSWS06, Equation set B, version 1, current version, main flume 1997-Present
12 GSWS07, Equation set A, version 1, current version, v-notch 1998-Present summers only
13 GSWS07, Equation set A, version 1, current version, v-notch 1998-Present summers only
14 GSWS08, Equation set B, version 1, current version, main flume 1987-Present
15 GSWS08, Equation set B, version 2, current version, main flume 1987-Present
16 GSWS08, Equation set C, version 1, current version, v-notch 1997-Present summers only
17 GSWS09, Equation set A, version 1, current version, v-notch 1997-Present summers only
18 GSWS09, Equation set A, version 1, current version, original H-flume 1968-1973
19 GSWS09, Equation set B, version 1, old version, original v-notch 1973-1979 summers only
20 GSWS09, Equation set B, version 2, current version, original v-notch 1973-1979 summers only
21 GSWS09, Equation set C, version 1, old version, main flume 1973-Present
22 GSWS09, Equation set C, version 2, current version, main flume 1973-Present
23 GSWS09, Equation set C, version 2, current version, main flume 1973-Present
24 GSWS10, Equation set D, version 1, current version, v-notch 1997-Present summers only
25 GSWS10, Equation set A, version 1, current version, original H-flume 1968-1973
26 GSWS10, Equation set A, version 1, current version, original v-notch 1973-1979 summers only
27 GSWS10, Equation set C, version 1, old version, main flume 1973-Present
28 GSWS10, Equation set C, version 2, current version, main flume 1973-Present
29 GSWS10, Equation set D, version 1, current version, v-notch 1997-Present summers only
30 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, 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
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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
GSLOOK, USGS rating table 16 for Lookout Creek near Blue River (14161500); reconstructed rating curve 22
GSLOOK, USGS rating table 17 for Lookout Creek near Blue River (14161500); reconstructed rating curve 23
GSLOOK, USGS rating table 18 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: 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
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
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 1, current version, main flume 1997-Present
GSWS08, Equation set C, version 1, current version, v-notch 1998-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 C, version 2, current version, main flume 1973-Present
GSWS10, 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
GSWS10, Equation 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
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<th>Description</th>
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<td>GSLOOK, USGS rating table f for Lookout Creek near Blue River (14161500); original version; extended forward through WY 1956</td>
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<td>GSLOOK, USGS rating table f for Lookout Creek near Blue River (14161500); reconstructed rating curve 5; extended forward through WY 1956</td>
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<td>GSLOOK, USFS rating table g for Lookout Creek near Blue River (14161500); original version</td>
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<td>47</td>
<td>GSLOOK, USFS rating table g for Lookout Creek near Blue River (14161500); reconstructed rating curve 6</td>
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<td>48</td>
<td>GSLOOK, USGS rating table 1 for Lookout Creek near Blue River (14161500); original version; extended backward to include WY 1963</td>
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<td>49</td>
<td>GSLOOK, USGS rating table 1 for Lookout Creek near Blue River (14161500); reconstructed rating curve 7; extended backward to include WY 1963</td>
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<td>GSLOOK, USGS rating table 5 for Lookout Creek near Blue River (14161500); reconstructed rating curve 11</td>
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<td>GSLOOK, USGS rating table 6 for Lookout Creek near Blue River (14161500); reconstructed rating curve 12</td>
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<td>GSLOOK, USGS rating table 7 for Lookout Creek near Blue River (14161500); reconstructed rating curve 13</td>
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<td>GSWS01, Equation set D, version 1, current version, main flume 1999-Present (replacement for eqn_set_code=' 4')</td>
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<td>GSWS01, Equation set D, version 1, current version, main flume 1999-Present (replacement for eqn_set_code=' 6')</td>
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<td>GSWS01, Equation set D, version 1, current version, main flume 1999-Present (replacement for eqn_set_code=' 17')</td>
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<td>71</td>
<td>GSWS01, Equation set D, version 1, current version, main flume 1999-Present (replacement for eqn_set_code=' 28')</td>
</tr>
</tbody>
</table>

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>Abbreviation</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>WEATHER</td>
<td>A weather event is affecting the stream discharge measurement</td>
</tr>
</tbody>
</table>