

WASHINGTON DEPARTMENT OF ECOLOGY
ENVIRONMENTAL ASSESSMENT PROGRAM
FRESHWATER MONITORING UNIT
STREAM DISCHARGE TECHNICAL NOTES

STATION ID: 45B070
STATION NAME: Icicle Creek near Leavenworth, WA
WATER YEAR: 2013
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Introduction

Watershed Description

Icicle Creek originates in the snowfields of the eastern slopes of the central Cascade Mountain range and flows into the Wenatchee River at the City of Leavenworth. The watershed is bounded by both the Stuart Range and the Chiwaukum Mountains. Land cover above the gage consists of predominantly coniferous forest but also includes alpine shrubland, montane grassland, bedrock/talus slopes, and riparian woodlands of the Wenatchee National Forest and Alpine Lakes Wilderness Area. Mean annual precipitation across the watershed above this gage location is approximately 82 inches.

Gage Location

The gage is located at the East Leavenworth Road bridge on the right bank, approximately 1/2 mile downstream of the Leavenworth National Fish Hatchery Complex at river mile 2.5.

Table 1. Basin Area and Legal Description

Drainage Area (square miles)	211
Latitude (degrees, minutes, seconds)	47° 33' 49" N
Longitude (degrees, minutes, seconds)	120° 40' 04" W

Table 2. Discharge Statistics.

Mean Annual Discharge (cfs)	623
Median Annual Discharge (cfs)	352
Maximum Daily Mean Discharge (cfs)	3,770
Minimum Daily Mean Discharge (cfs)	80
Maximum Instantaneous Discharge (cfs)	3,960
Minimum Instantaneous Discharge (cfs)	79
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	1,462
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	157
Number of Days Discharge is Greater Than Range of Ratings	0
Number of Days Discharge is Less Than Range of Ratings	11
Number of Un-Reported Days	23
Number of Days Qualified as Estimates	29
Number of Modeled Days	0

Note: Statistics displayed in Table 2 may not include values in which the predicted discharge exceeds the range of ratings.

Table 2 Discussion (Discharge Statistics)

Six discharge measurements were conducted at this site during Water Year 2013, ranging from 2,480 cfs on May 15 to 93 cfs on August 26. Peak flows were related to runoff from snowmelt beginning in March and reaching their maximum values in May. Minimum discharges were observed during baseflow conditions in late August. Flows were higher in September due to a series of early-autumn storm events.

Twenty-three day of discharge were unreported due to ice in the channel, which affected the stage-discharge relationship. Twenty-nine days were qualified as estimates because they fell between ice-impacted periods and verified ice-free conditions. Eight days of flow dropped below the lowest observed discharge on the rating, but were within the extrapolated range.

Table 3. Error Analysis Summary.

Potential Logger Drift Error (% of discharge)	2.0
Potential Weighted Rating Error (% of discharge)	9.3
Total Potential Error (% of discharge)	11.3

Table 3 Discussion (Error Analysis)

The majority of the uncertainty in the reported discharge for this water year is from potential rating error. Potential rating error is based on the difference between the discharge predicted by the rating table and the measured discharge adjusted to the maximum degree of possible error based on the measurement quality. The potential error at this site is a result of some measurements being assigned "fair" or "poor" quality ratings based on quality assurance/quality control data and professional judgement. At this station, "fair" and "poor" rated measurements are usually due to an eddy near the right edge making edge extrapolation difficult when using the ADCP. Less than ideal velocity at lower flows also contributes to less than ideal measurement conditions at times.

Table 4. Stage Record Summary

Minimum Recorded Stage (feet)	1.89
Maximum Recorded Stage (feet)	9.23
Range of Recorded Stage (feet)	7.34

Table 4 Discussion (Stage Record)

Peak stage occurred during the spring runoff on May 13, 2013. The lowest recorded stage was observed several times on October 11-13, 2012.

Table 5. Rating Table Summary

Rating Table No.	1		
Period of Ratings	10/01/2012-09/30/2013		
Range of Ratings (cfs)	47-9,230		
No. of Defining Measurements	61		
Rating Error (%)	9.3		

Rating Table No.			
Period of Ratings			
Range of Ratings (cfs)			
No. of Defining Measurements			
Rating Error (%)			

Rating Table No.			
Period of Ratings			
Range of Ratings (cfs)			
No. of Defining Measurements			
Rating Error (%)			

Table 5 Discussion (Rating Tables)

Rating Table 1 describes the stage-discharge relationship at this station for the entirety of Water Year 2013. It is a well-established rating that has been valid since observations began in 2007.
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Table 6. Model Summary

Model Type (Slope conveyance, other, none)	None
Range of Modeled Stage (feet)	N/A
Range of Modeled Discharge (cfs)	N/A
Valid Period for Model	N/A
Model Confidence	N/A

Table 6 Discussion (Modeled Data)

N/A

Table 7. Survey Type and Date (station, cross section, longitudinal)

Type	Date
None	N/A

Table 7 Discussion (Surveys)

N/A

Activities Completed

None

Appendix