

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: 2015
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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 ½ 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)	541
Median Annual Discharge (cfs)	547
Maximum Daily Mean Discharge (cfs)	3,010
Minimum Daily Mean Discharge (cfs)	55
Maximum Instantaneous Discharge (cfs)	3450
Minimum Instantaneous Discharge (cfs)	46
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	1,066
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	79
Number of Days Discharge is Greater Than Range of Ratings	0
Number of Days Discharge is Less Than Range of Ratings	0
Number of Un-Reported Days	17
Number of Days Qualified as Estimates	13
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)

Nine discharge measurements were conducted at this site during Water Year 2015, ranging from 1,035 cfs measured on both November 5 and May 19 to 60 cfs on August 19. Peak flows were related to runoff from a storm event in November. Warmer than normal temperatures and a series of rain-on-snow events led to low snowpack for all of the East Slopes of the Northern Cascades, including the Icicle Creek basin in 2015. As a result, spring runoff was unusually low. Drought conditions continued until a series of small storms in early September brought flows closer to seasonal norms. Minimum discharges were observed during baseflow conditions in late August.

Seventeen unreported days were due to ice in the channel which made the stage-discharge relationship invalid. Thirteen days qualified as estimates were between ice-impacted periods and verified ice-free conditions.

Table 3. Error Analysis Summary.

Potential Logger Drift Error (% of discharge)	0.9
Potential Weighted Rating Error (% of discharge)	9.3
Total Potential Error (% of discharge)	10.2

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 control/quality assurance 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. 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)	1.72
Maximum Recorded Stage (feet)	8.58
Range of Recorded Stage (feet)	6.86

Table 4 Discussion (Stage Record)

Peak stage occurred during the runoff from an autumn storm event on November 28, 2014. As a result of low snowpack over the 2014-15 winter, the spring runoff was much smaller than what has been observed in past years, and stage values were correspondingly subdued. The lowest recorded stage was observed on August 27, 2015.

Table 5. Rating Table Summary

Rating Table No.	1	2	
Period of Ratings	10/01/2014-07/01/2015	05/24/2015-09/30/2015	
Range of Ratings (cfs)	47-9,230	0.1-9,230	
No. of Defining Measurements	61	40	
Rating Error (%)	9.3	9.2	

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 early portion of Water Year 2015. It is a well-established rating that has been valid since observations began in 2007.

Rating Table 2 is a variant of Rating Table 1 that was developed to account for a fill affecting the lower end of the range of flows. Above 250 cfs, Rating Table 1 and Rating Table 2 are identical.

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