

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

**STATION ID:** 46B060  
**STATION NAME:** Roaring Creek near Mouth  
**WATER YEAR:** 2009  
**AUTHOR:** Tyler W. Burks

**Introduction**

Watershed Description

Roaring Creek is a minor tributary, approximately 6% of the drainage area of the Entiat River, and enters the watershed at river mile 5.7. The watershed is bound at its headwaters by Chumstick Mountain (5820 ft) to the west, Roaring Ridge to the north, and Dinkleman Ridge to the south. Land cover above the gage consists of predominantly coniferous forest and shrub-steppe habitats, but also includes riparian woodlands and bedrock/talus slopes. Below the gage rangeland and fruit orchards predominate. Mean annual precipitation across the watershed above this gage location is 33 inches (U.S. Weather Bureau, 1965).

Gage Location

The telemetered stream gaging station on Roaring Creek was installed on September 27, 2002. The gage is located off Roaring Creek Road, approximately 0.80 miles upstream of its confluence with the Entiat River, on the left bank.

Table 1.

Drainage Area (square miles)	25 (USGS, 2015)
Latitude (degrees, minutes, seconds)	47°41'15" N
Longitude (degrees, minutes, seconds)	120°19'56" W

**Discharge**

Table 2. Discharge Statistics.

Mean Annual Discharge (cfs)	6.4
Median Annual Discharge (cfs)	3.7
Maximum Daily Mean Discharge (cfs)	38
Minimum Daily Mean Discharge (cfs)	0.30
Maximum Instantaneous Discharge (cfs)	42
Minimum Instantaneous Discharge (cfs)	0.20
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	18
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	0.50
Number of Days Discharge is Greater Than Range of Ratings	0
Number of Days Discharge is Less Than Range of Ratings	22

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

**Narrative**

Seven discharge measurements were taken, ranging from 0.58 to 20 cfs. Snowmelt runoff began early April, and reached its peak on April 22, 2009, after a period of warm weather. The minimum discharge was recorded during baseflow conditions on August 28, 2009. One other event of note occurred in early January that had significance locally and in western Washington. It was a "pineapple express" rain event that occurred after low elevation snowfall. This event exceeded spring runoff, causing flooding and landslides locally; and HWY 97 over Blewett Pass was closed for 10 days. Twenty-two days in mid-July through early August were below half of the lowest measured discharge, resulting in a discharge that is less than the value shown.

## Error Analysis

Table 3. Error Analysis Summary.

Logger Drift Error (% of discharge)	6.7%
Weighted Rating Error (% of discharge)	15.9%
Total Potential Error (% of discharge)	22.6%

## Rating Table(s)

Table 4. Rating Table Summary

Rating Table No.	#8	#9	#10
Period of Ratings	10/01/2008-01/07/2009	01/06/2009-08/06/2009	06/25/2009-09/30/2009
Range of Ratings (cfs)	0.01-910	2.36-910	0.01-910
No. of Defining Measurements	21	9	7
Rating Error (%)	16.9%	14.6%	17.7%

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 (%)			

## Narrative

The water year began with Table 8, carrying over from the previous water year. In early January a significant "pineapple express" rain event occurred. Table 8 was phased into Table 9 across this period in which the rapidly rising stage scoured the control. Beginning in late June, Table 9 was phased into Table 10 when deposition occurred during the falling limb of snowmelt runoff, resulting in filling of the control. Table 10 remained valid through the end of the water year.

## Stage Record

Table 5. Stage Record Summary

Minimum Recorded Stage (feet)	0.70
Maximum Recorded Stage (feet)	2.00
Range of Recorded Stage (feet)	1.30
Number of Un-Reported Days	19
Number of Days Qualified as Estimates	69
Number of Days Qualified as Unreliable Estimates	0

## Narrative

Due to the presence of strong sensitivity drift between the logger and the PGI observations, the following equation was applied to the stage record for this water year:  $0.12X - 0.141$   $r^2 = -0.82$ . Unreported days were due to an ice-impacted channel in which the stage-discharge relationship was not valid. The stage record is considered an estimate for four days during January after battery failure resulted in missing data. Discharge was estimated using stage from 46D060 Tillicum Creek at Mouth with an  $r^2 = 0.87$ . The remaining 65 days were qualified because they followed ice-impacted days prior to an ice-free observation.

## Modeled Discharge

Table 6. Model Summary

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

## Surveys

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

Type	Date

## Activities Completed

--