

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

STATION ID: 05H070
STATION NAME: Squire Creek at Squire Creek Park
WATER YEAR: 2012
AUTHOR: Don Watt

Introduction

Watershed Description

Squire Creek drains a steep, north-facing basin covering about 20 square miles upstream of the gage at Squire Creek Park. Much of the basin lies in the Boulder River Wilderness as the stream drains the flanks of Three Fingers South and Whitehorse Mountain. Elevation in the basin ranges from 460 ft at the gage to more than 6800 ft on the higher peaks. Mean basin elevation is 2590 ft. Average basin slope is 57 percent. Over 60 percent of the area is covered in forest canopy. Mean annual precipitation is about 93 inches. Squire Creek and its tributaries provide more than 13 miles of spawning habitat for Chinook, Coho, pink and chum salmon, as well as for steelhead and resident trout.

Gage Location

The gage is on the right bank of Squire Creek, north of the Highway 530 bridge. Access for gage maintenance is through Squire Creek Park property.

Table 1. Basin Area and Legal Description

Drainage Area (square miles)	19.8 square miles
Latitude (degrees, minutes, seconds)	48, 16, 13 (NAD83)
Longitude (degrees, minutes, seconds)	-121, 40, 19(NAD83)

Table 2. Discharge Statistics.

Mean Annual Discharge (cfs)	201 cfs
Median Annual Discharge (cfs)	159 cfs
Maximum Daily Mean Discharge (cfs)	2200 cfs
Minimum Daily Mean Discharge (cfs)	15 cfs
Maximum Instantaneous Discharge (cfs)	4070 cfs
Minimum Instantaneous Discharge (cfs)	15 cfs
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	373 cfs
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	38 cfs
Number of Days Discharge is Greater Than Range of Ratings	None
Number of Days Discharge is Less Than Range of Ratings	None
Number of Un-Reported Days	None
Number of Days Qualified as Estimates	217 days
Number of Modeled Days	13 days

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)

Of the nine years of record at Squire Creek, water year 2012 ranked second highest in median annual discharge, and ranked fourth highest in mean annual discharge. Minimum flows ranked third from the highest in the period of record. There were no unusual high flow events during the year.

Table 3. Error Analysis Summary.

Potential Logger Drift Error (% of discharge)	4 %
Potential Weighted Rating Error (% of discharge)	12 %
Total Potential Error (% of discharge)	16 %

Table 3 Discussion (Error Analysis)

The potential logger drift error of 4 percent of discharge refers to the amount of instrument drift that has been corrected using a time-weighted adjustment to the stage record. The potential weighted rating error is calculated based on the quality of individual discharge measurements used to define the rating and on the degree to which those defining measurements conform to the respective rating curve.

Table 4. Stage Record Summary

Minimum Recorded Stage (feet)	3.70 ft
Maximum Recorded Stage (feet)	10.47 ft
Range of Recorded Stage (feet)	6.77 ft

Table 4 Discussion (Stage Record)

While the automated gaging equipment performed well, the staff gage was damaged and unusable for much of the year. As a result, there were 217 days qualified as estimated data due to the lack of a reliable Primary Gage Index (PGI). Loss of the staff gage left only the tapedown reference point as a gaging index for the continuous record. At this station, the tapedown measurement does not provide a stable indication of the water surface elevation at the automated gage. On September 25, new laser gage height reference points were installed and surveyed to replace the staff gage as PGI.

Table 5. Rating Table Summary

Rating Table No.	4	202	
Period of Ratings	10/1 to 10/22/2011	10/22/11 to 9/30/2012	
Range of Ratings (cfs)	15 to 9370 cfs	0.01 to 9370 cfs	
No. of Defining Measurements	19 Mmt's	41 Mmt's	
Rating Error (%)	9 %	12 %	

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)

Channel geometry in the gage reach at Squire Creek has been quite stable through the period of record for this station. The shift from rating 4 to rating 202 reflects channel scour at the low end of the rating curve.

Table 6. Model Summary

Model Type (Slope conveyance, other, none)	Slope Conveyance
Range of Modeled Stage (feet)	8.4 ft to 13.5 ft
Range of Modeled Discharge (cfs)	1900 cfs to 9370 cfs
Valid Period for Model	Oct. 1 thru Sept. 30
Model Confidence	+/- 5 %

Table 6 Discussion (Modeled Data)

The slope conveyance model for Squire Creek is based on a cross-section and longitudinal survey taken on September 16, 2010, and on data from nine channel-control discharge measurements taken between December 2006 and November 2012. Results from this model are applied throughout the period of record for the station because of the overall stability of the channel geometry.

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

Type	Date
Station surveys	7/16 & 9/25/2012

Table 7 Discussion (Surveys)

The station survey on July 16 was made to determine the amount of movement in the staff gage as the adjacent boulder shifted into the stream channel.

The station survey on September 25 was made to establish a new laser pad and reference points as the Primary Gage Index for the station. The new laser installation replaces the staff gage that was destroyed earlier in the year.

Activities Completed

Routine station maintenance and discharge measurement was conducted at six-week intervals. Established new laser pad and reference points to replace the damaged staff gage as the Primary Gage Index.