WASHINGTON DEPARTMENT OF ECOLOGY

ENVIRONMENTAL ASSESSMENT PROGRAM

FRESHWATER MONITORING UNIT

STREAM DISCHARGE TECHNICAL NOTES

STATION ID: 19E060

STATION NAME: Deep Creek

WATER YEAR: 2010

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Introduction

Watershed Description

The Deep Creek watershed contains one of three stations in the Intensively Monitored Watersheds (IMW) project Strait of Juan de Fuca complex. The stream is approximately 7.9 miles long, the basin area is 17.3 square miles. Watershed elevations range from sea level to 3,020 feet. Precipitation falls primarily as rain between October and May, averaging 86 inches annually. Crescent formation volcanic rocks in the upper watershed, and marine sedimentary rock overlain by terraces of glacial deposits in the lower watershed, coarsely define the complex geology of the watershed. The primary land use for the last century has been commercial forestry. Three vegetation zones define the basin--Sitka spruce in the valley bottoms, Western hemlock in the low to mid elevations, and Silver fir in the headwaters. The fish species present include Coho salmon, chum salmon, steelhead or rainbow trout, cutthroat trout, Pacific lamprey, western brook lamprey, torrent sculpin,and reticulate sculpin.

Gage Location

The gaging station for Deep Creek is located in Clallam County, Washington, approximately 27 miles west of Port Angeles. Deep Creek is a tributary to the Strait of Juan de Fuca. The gage, placed on the left bank, is on the downstream side of the Highway 112 bridge at approximately river mile 0.2. The stage record is tidally influenced. Tidal spikes in the stage record are removed.

Table 1.

Drainage Area (square miles)	17.3
Latitude (degrees, minutes, seconds)	48 10 21 N
Longitude (degrees, minutes, seconds)	124 01 36 W

Discharge

Table 2. Discharge Statistics.

Mean Annual Discharge (cfs)	77
Median Annual Discharge (cfs)	46
Maximum Daily Mean Discharge (cfs)	611
Minimum Daily Mean Discharge (cfs)	2.2
Maximum Instantaneous Discharge (cfs)	841
Minimum Instantaneous Discharge (cfs)	2.2
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	203
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	4.3
Number of Days Discharge is Greater Than Range of Ratings	6
Number of Days Discharge is Less Than Range of Ratings	0

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

Narrative

Due to rating curve exceedances, six of the highest days in the predicted discharge record were excluded from some statistics in Table 2. The mean annual discharge, median annual discharge, maximum daily mean discharge, and maximum instantaneous discharge in Table 2 are less than the actual values. A series of small to moderate fall precipitation events in mid-October 2009 elevated discharge levels above baseflow. The largest storm event occurred over a four-day period from November 17 to November 21. Two smaller, but still relatively significant storms, occurred in mid-January 2010. The characteristic slow, steady decline toward baseflow conditions began in early June. Baseflow conditions were reached in August. A series of small late-summer events elevated baseflow conditions in September 2010.

Error Analysis

Table 3. Error Analysis Summary.

Logger Drift Error (% of discharge)	5.1
Weighted Rating Error (% of discharge)	8.8
Total Potential Error (% of discharge)	13.9

Rating Table(s)

Table 4. Rating Table Summary

Rating Table No.	8	9	
Period of Ratings	10/01-07/28	06/17-09/30	
Range of Ratings (cfs)	0-988	0-988	
No. of Defining Measurements	16	22	
Rating Error (%)	8.6	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 (%)			

Narrative

Discharge was predicted through rating table 8 at the beginning of the water year(WY). Rating 8 continued predicting discharge until a discharge measurement, conducted in late July, confirmed a low-end shift in the rating curve. Gradual, seasonal filling of the control during baseflow conditions resulted in the relatively small but real shift in the rating. Both ratings 8 and 9 used in WY2010 have proved to be robust over time.

Stage Record

Table 5. Stage Record Summary

Minimum Recorded Stage (feet)	0.66
Maximum Recorded Stage (feet)	7.26
Range of Recorded Stage (feet)	6.6
Number of Un-Reported Days	6
Number of Days Qualified as Estimates	2
Number of Days Qualified as Unreliable Estimates	0

Narrative

The stage record was continuous and complete for WY2010. Six days were excluded from discharge record predictions because all or some of those days recorded stage values that exceeded rating curve thresholds. Discrepancies between the logged record and the primary gage index observations were reconciled using an automated data shift procedure. Frequent tidal spikes in the stage record were manually edited. Low summer flow conditions persisted until mid-October. The largest storm event of the year occurred episodically over four days in mid-November 2009. A series of lesser storms resulted in fluctuating stage until early June.

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
station	10/14/2010

Activities Completed

Nine discharge measurements were made in WY2010.