**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:** 2013

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## 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) | 211 cfs |
| Median Annual Discharge (cfs) | 143 cfs |
| Maximum Daily Mean Discharge (cfs) | 1510 cfs |
| Minimum Daily Mean Discharge (cfs) | 6 cfs |
| Maximum Instantaneous Discharge (cfs) | 4030 cfs |
| Minimum Instantaneous Discharge (cfs) | 6 cfs |
| Discharge Equaled or Exceeded 10 % of Recorded Time (cfs) | 429 cfs |
| Discharge Equaled or Exceeded 90 % of Recorded Time (cfs) | 37 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 | 41 days |
| Number of Modeled Days | 23 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)

| |
|---|
| Water year 2013 saw the third highest mean annual and median annual discharge values during the nine-year period of record from 2005 through 2013. There were no extreme high flow events during the year. Minimum flows were not extreme, but were below the mean and median values for the period of record. |

Table 3. Error Analysis Summary.

| | |
|---|---|
| Potential Logger Drift Error (% of discharge) | 5 % |
| Potential Weighted Rating Error (% of discharge) | 9 % |
| Total Potential Error (% of discharge) | 14 % |

Table 3 Discussion (Error Analysis)

The potential logger drift error of 5 percent of discharge refers to the amount of instrument drift that was corrected using time-weighted adjustments to the stage record. Data on 18 days were qualified as estimated due to logger drift great enough to result in errors in daily discharge greater than 20 percent.
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) | 3.52 ft |
| Maximum Recorded Stage (feet) | 10.44 ft |
| Range of Recorded Stage (feet) | 6.92 ft |

Table 4 Discussion (Stage Record)

| |
|---|
| Automated gaging equipment worked well throughout the water year. There were no significant gaps in the data record. Of the 41 days qualified as estimated data, 18 were the result of corrected instrument drift that potentially introduced errors greater than 20 percent of mean daily discharge. On the other 23 days the slope-conveyance model was used to estimate high flow during the day. |

Table 5. Rating Table Summary

| Rating Table No. | 202 | 401 | |
|---|---|---|---|
| Period of Ratings | 10/1 - 10/14/2012 | 10/14/2012-9/30/2013 | |
| Range of Ratings (cfs) | 0.01 to 9370 cfs | 15 to 9370 cfs | |
| No. of Defining Measurements | 41 Mmt's | 19 Mmt's | |
| Rating Error (%) | 12 % | 9 % | |

| 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 relatively stable throughout the period of record. The shift from rating 202 to rating 401 reflects minor channel fill. |
|---|

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 |
|---|---|
| None. | |

Table 7 Discussion (Surveys)

| |
|---|
| No surveys were conducted |

Activities Completed

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|---|
| Routine station maintenance and discharge measurements at six week intervals. |