

**2020 Level Modified Streamflow
1928-2018
Correction 1, August 9, 2022**

1. Introduction

This publication includes several small but important corrections to the 2020 Level Modified Streamflow data set in the Willamette River Basin. Each correction is summarized in this document, with the affected locations shown in Figure 1.

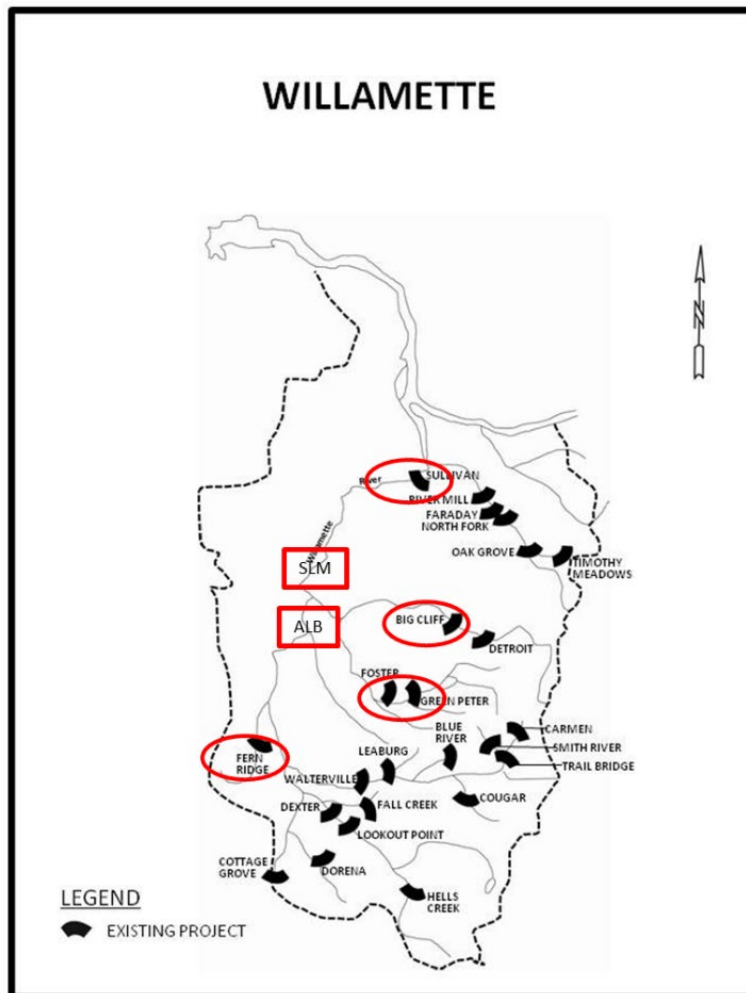


Figure 1. Corrected Willamette modified flow points.

This correction includes 41 separate files (13 daily time series, 13 monthly time series, 4 semi-monthly time series and 2 seasonal volumes and statistical summary files. The files indicated in bold/red are the data files that were impacted by upstream flow corrections:

Fern Ridge Dam - FRN (*update for two daily values in November/December 2014 data*):

Monthly	Semi-monthly	Daily
FRN6A	FRNS6M	FRN6A
FRN6H		FRN6H
FRNS6M		FRNS6M
FRN6S		FRN6S

Green Peter Dam - GPR (*corrected outflow submittal*):

Monthly	Semi-monthly	Daily
GPR6A	GPR6M	GPR6A
GPR6H		GPR6H
GPR6M		GPR6M
GPR6s		GPR6S

Foster Dam - FOS (*corrected outflow from GPR routed downstream*):

Monthly	Semi-monthly	Daily
FOS6A	FOS6M	FOS6A
FOS6ARF		FOS6ARF
FOS6H		FOS6H
FOS6L		FOS6L
FOS6M		FOS6M
FOS6s		FOS6S

Willamette River at Albany OR - ALB (*corrected outflow from FRN, GPR and FOS routed downstream*):

Monthly	Semi-monthly	Daily
ALB6ARF	ALB6M	ALB6ARF
ALB6DD		ALB6DD
ALB6H		ALB6H
ALB6L		ALB6L
ALB6M		ALB6M

Big Cliff Dam - BCL (*published incorrect time series for outflows BCL6H; data is not routed downstream*):

Monthly	Semi-monthly	Daily
BCL6ARF	BCL6M	BCL6ARF
BCL6H		BCL6H
BCL6M		BCL6M

Willamette River at Salem, OR - SLM (*corrections from GPR/FOS and FRN/ALB routed downstream*):

Monthly	Semi-monthly	Daily
SLM6ARF	SLM6M	SLM6ARF
SLM6DD		SLM6DD
SLM6H		SLM6H
SLM6L		SLM6L
SLM6M		SLM6M

TW Sullivan Dam - SVN (corrections from GPR/FOS and FRN/ALB/SLM routed downstream)

Monthly	Semi-monthly	Daily
SVN6ARF	SVN6M	SVN6ARF
SVN6DD		SVN6DD
SVN6H		SVN6H
SVN6L		SVN6L
SVN6M		SVN6M

2. Foster and Green Peter Dams

In August of 2021, the US Army Corps of Engineers discovered a small data quality issue with the published 2020 Level Modified Flows for the Willamette River at Salem for the 2009-2018 period. Additional analysis traced the issue to Green Peter Dam where it was discovered that the 2020 data submittal included only a portion of the project outflow, and was not identified during the quality control phase of the 2020 Modified Flows effort.

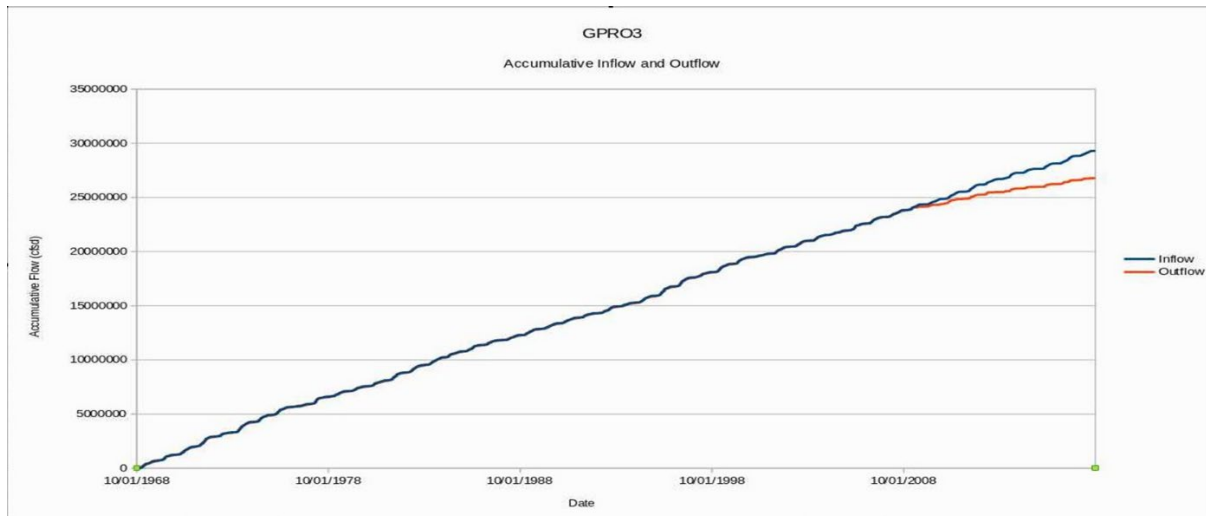


Figure 1. Accumulated Green Peter Inflow and Outflow time series from 1968 forward indicates deviation beginning in 2008.

The USACE subsequently reviewed and resubmitted inflows, outflows and project storage for both Green Peter and the downstream Foster Dams. As the updated outflow data is then propagated downstream, the Adjusted Routed Flows (ARF, and Modified Flows (M) for two downstream points were also corrected. Although the corrections mostly eliminated the volume mass balance issues, a slightly different daily flow pattern was revealed within the 2008-2018 period which departed from previous Modified Flows publications at both Green Peter (Figure 2) and Foster (Figure 3).

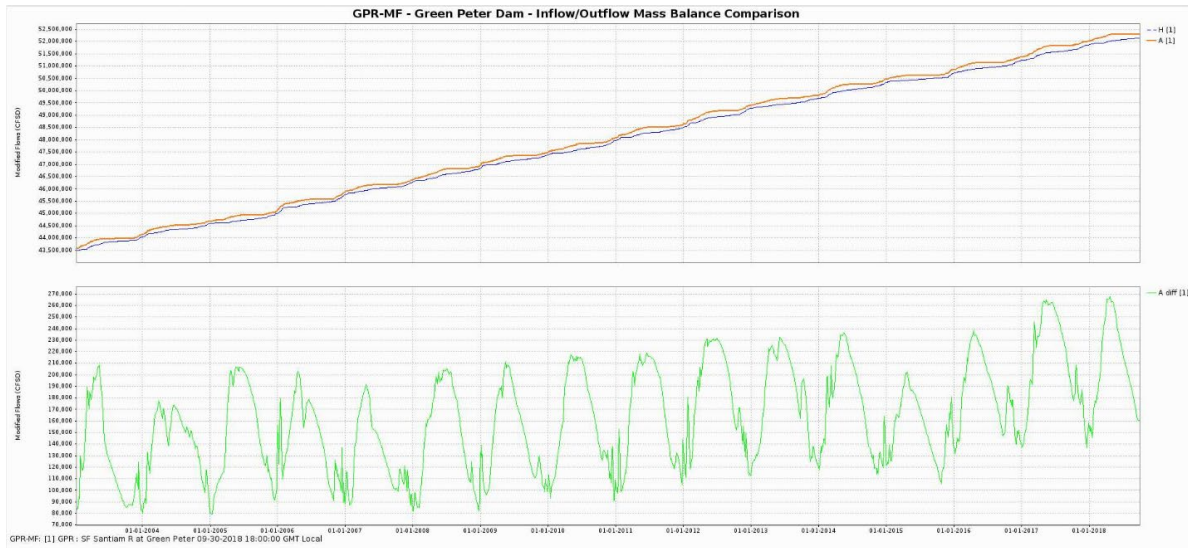


Figure 2. Updated accumulated Green Peter Inflow (A) and Outflow (H) time series from 2008 forward indicates a slight inflow increase and mass balance change starting in 2008.

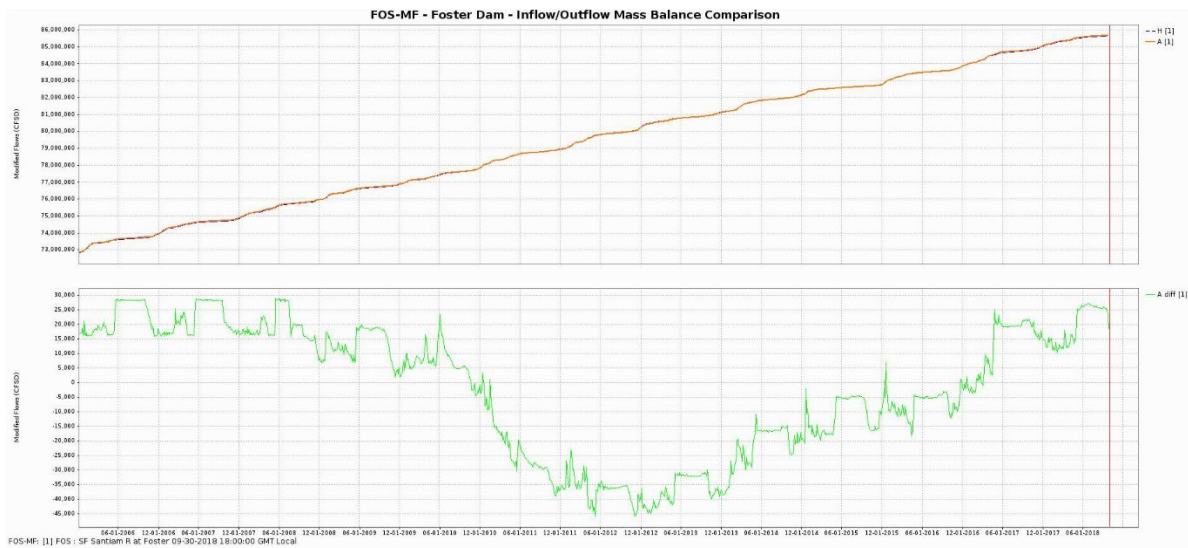


Figure 3. Updated accumulated Foster Inflow and Outflow time series from 2006–2018.

An additional quality control step was then completed by the Corps to determine whether there have recently been operational changes at these projects that may explain the small change in mass balance. Two main reasons were identified:

- Between 2006 and 2009 more water was stored at Green Peter due to fish weir requirements at Foster Dam.
- Biological Opinion flows requires a higher minimum streamflow release from the Green Peter and Foster system. These flow requirements started around 2008.

These two operational changes, while volumetrically small, explain the flow pattern change observed since 2008 (and what was published in 2010 Modified Flows).

3. Other Willamette Basin Data Corrections

When the Green Peter data error was found, BPA conducted an extensive re-review of all data submittals for 2020 Modified Flows, with emphasis on the Willamette basin. While no significant issues were found elsewhere in the Columbia Basin, two additional, but minor issues were found in the Willamette Basin.

3.1 Fern Ridge Dam

A small, daily flow issue was found at Fern Ridge Reservoir for two daily outflow measurements in Water Year 2015 (Figure 4). The errors were significant enough that they also impacted both the monthly values at Fern Ridge and the downstream flow computations at Albany, OR (Figure 5).

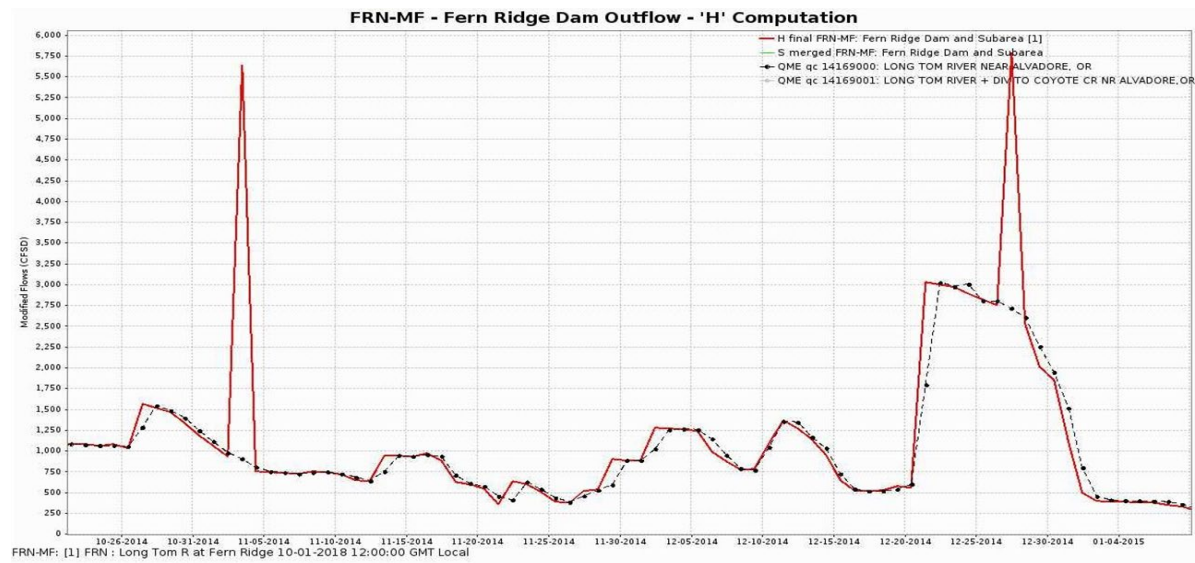


Figure 4. Fern Ridge Dam (FRN6H) files have been corrected for these two dates.

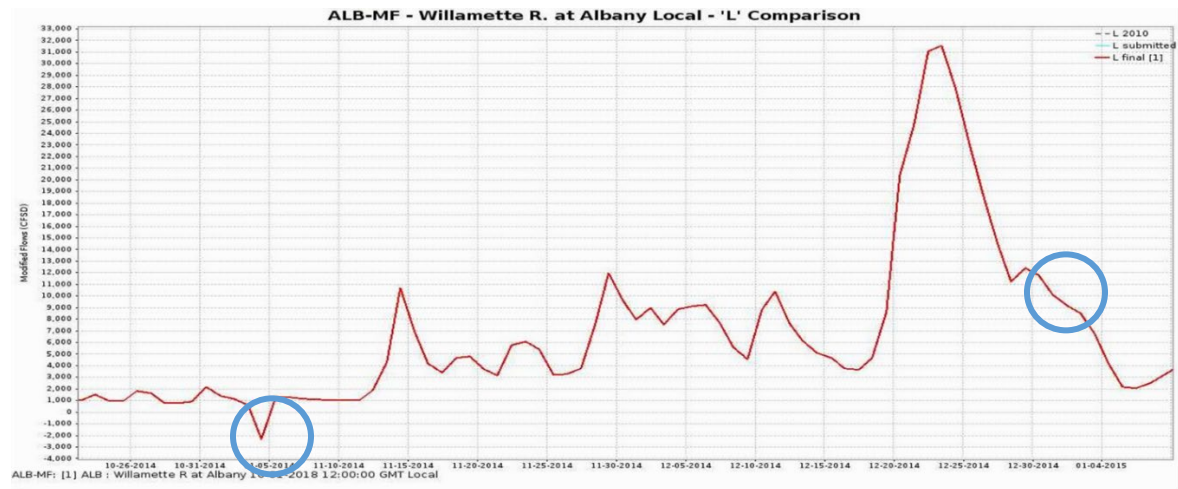


Figure 5. Willamette River at Albany Local flow (L) was impacted by the incorrect upstream Fern Ridge outflow. These perturbations have also been corrected.

3.2 Big Cliff Dam

It was also discovered that monthly and daily outflow time series for Detroit Dam (DET) were mistakenly published as Big Cliff outflow (BCL6H), and posted on the BPA external website as part of the official 2020 Modified Flows publication. The outflow time series data is not migrated downstream, so it did not impact other downstream points. However, the correct Big Cliff outflow data is included in this correction for completeness.

No other errors in the dataset have been found as of this writing.

Erik Pytlak
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