

Conrad Weir Run-off Measurements

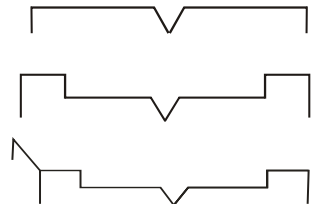
(Last rev. Last rev. 03/10/2024)

The Conrad weir catchment is estimated to be 42.5ha in area. The catchment drains much of the flat, central part of BCI (see Figures 1 & 2).

History

The Conrad weir was built in several stages starting in Aug. 1992 and ending in Oct. 1997. The final configuration is shown in Figure 2.

1. August 1992
 - Simple weir made out of rocks
2. September 1993
 - Weir rebuilt using cement and rocks
3. April 1994
 - Add rocks and concrete around 'V' to seal holes
4. September 1994
 - 'V' notched aluminum plate added (this is also the current 'V')
 - Sides of plate supported by combination of rocks and cement
5. May 1996
 - Wings (concrete blocks and cement), added to each side of the 'V' notch
6. April 24, 1997
 - Added addition wings to the end of each side of weir at angle.
 - Increased height at the ends of each side of weir
 - Extended left hand wing (facing weir) out at an angle by about 1m
 - Cleared rocks just below 'V' and downstream to guarantee free flow of water at all stages
7. August 14, 1997
 - Added aluminum angle bar to top of weir on both sides of 'V'
 - Aug. 26 – Continued work on leveling bar
 - Sept. 2 – Work on bar finished. New level of 'V' = 413 mm
 - Oct. 21 – Filed bar so that it is now level to within 1mm along entire length



Methods

Stage data were originally measured using a ISCO 3230 Bubble Flow Meter (recording at 5-minute intervals) In June 2018, the ISCO was replaced with a Troll 100 sensor (Figure 6).

Calibration weir-height measurements are taken manually by a technician approximately monthly. These data are used to check the calibration of the sensor.

Discharge Calculations

Because of the changing weir configurations, for the period 21 July 1993 to 4 February 2000, the Conrad Trail Stream stage data were cleaned using a spreadsheet-based approach and many more anchor points. To establish an initial stage-discharge relation, which involved open-flow modeling through a stable boulder bed after a pool, the US Forest Service program Cross Section Pro was used, first XSPRO (Grant et al., 1992), then MS Windows XSPRO (Hardy et al. 2005). This program requires a measured cross section, an estimate of overall river slope, and an estimate of stream roughness across the cross section.

Stage-discharge relations were developed for the constructed weir and for stages above the height of the constructed weir for each modification (see Rantz et al. 1982). Each stage-discharge relation (see data archive) was predicted using a cubic spline of the stage-discharge relation and forced through zero.

The errors in the discharge estimates are substantially greater for the part of the stage-discharge relation that exceeds the depth of the constructed weirs, 10% versus 2%. Discharges were estimated using Cross Section Pro for all stages from 21 July 1993 to 22 September 1994 (428 days). Between 22 September 1994 and 14 May 1996 (566 days), the stage was above the 20 cm V-notch only 7.09% of the time, representing 38.4% of the runoff. After 14 May 1996, when the 40 cm V-notch weir was installed, stages were greater than 40 cm only 0.37% of the time, representing 12.21 % of total runoff (the lowest value for runoff was 0 % in 2015 and the highest was 30.9 % in 2012). In 2010, the stage was above 40 cm 1.62 % of the time, the greatest on record.

Quality Control

All data are visually inspected using custom-built software that allows the visualization of the data. The program permits the correction of a number of known issues:

- recorder pen reading low due to build-up of dust on recorder parts
- obstruction of weir 'V' by vegetation
- immersion of large animals in still pond
- small gaps in the data

The original data are maintained, however only the corrected data are published.

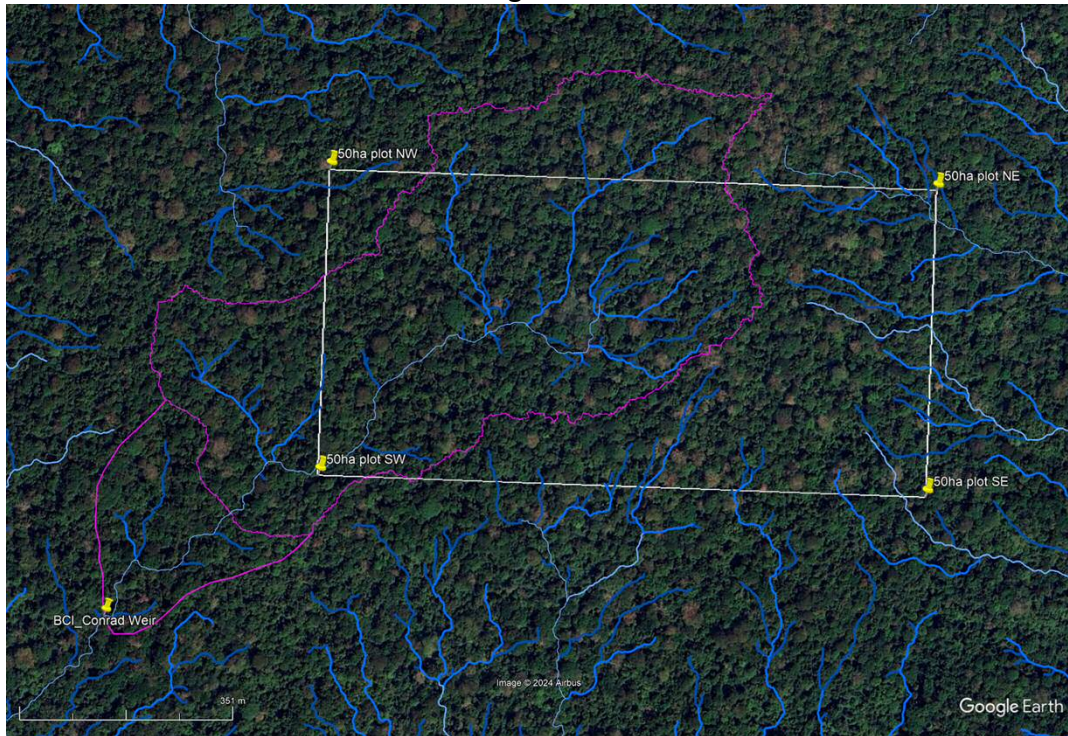
Records are provided with two Quality Control flags. Flag one indicates the fitness for use of each record. Possible values are: good, bad, doubtful, missing. Records are marked as bad if they fail one or more QC tests. Likewise, records are marked as doubtful if they are potentially bad, but without sufficiently strong evidence to be marked as bad. The second QC variable provides that reason for marking a variable as bad or doubtful. Potential values are: range, step, persistence, drift. At this time, only range tests have been applied.

Figure 1



Barro Colorado Island showing location of Conrad stream Catchment.

Figure 2



Conrad stream catchment, near-by streams and the 50ha plot boundaries

Figure 3



Final configuration of Conrad weir

Figure 4



ISCO 3230 Bubbler

Figure 6



Troll 100 sensor