

Notes on measurements of streamflow and stream temperature in Hopkins Memorial Forest, 1984-2005

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Fig. 1 Birch Brook weir

The discharge of water from Hopkins Memorial Forest has been measured along the branches of Birch Brook since July 1984 (South Branch) and January 1985 (Birch Brook – Main Stem). Stream temperature has been measured since March 1994 (Birch Brook) and March, 1997 (South Branch). Measurements are made at weirs (small dams, Fig. 1) constructed by the Civilian Conservations Corps in 1936-38 in the Birch Brook study watershed, which drains the western part of Hopkins Memorial Forest (Fig. 2). Weirs were refitted with metal v-notches in the early 1970s and were rebuilt in September 2006.

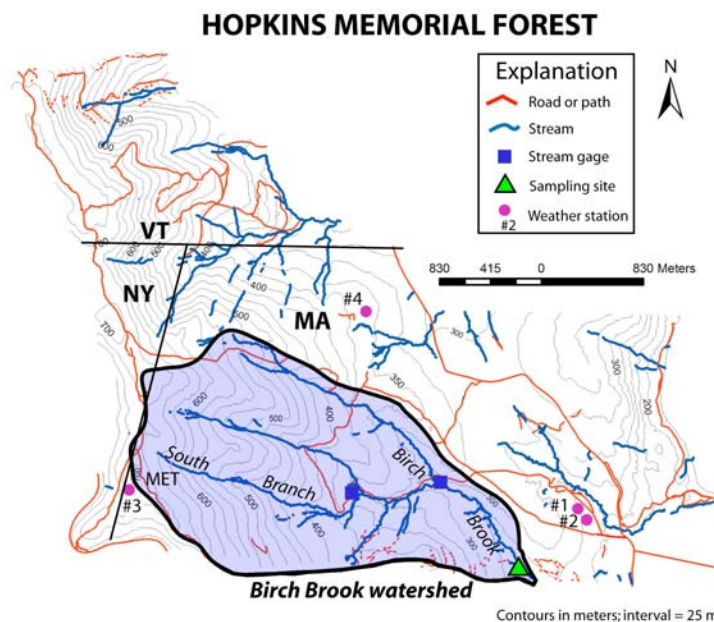


Fig. 2 Birch Brook watershed in Hopkins Memorial Forest

Birch Brook notes

Discharge (also called Q) is measured continuously using pressure transducers (Druck PDCR-1230 and/or 1830) and data loggers (Omnidata Datapod, Campbell Scientific Inc. CR10(X) or CR510) at the Birch Brook weir, constructed ~1938 by the Civilian Conservation Corps. Discharge record begins 1/1/85 as digital recording of depth at the Birch Brook weir; peak discharge is recorded after 1/24/85 (Fig. 3).

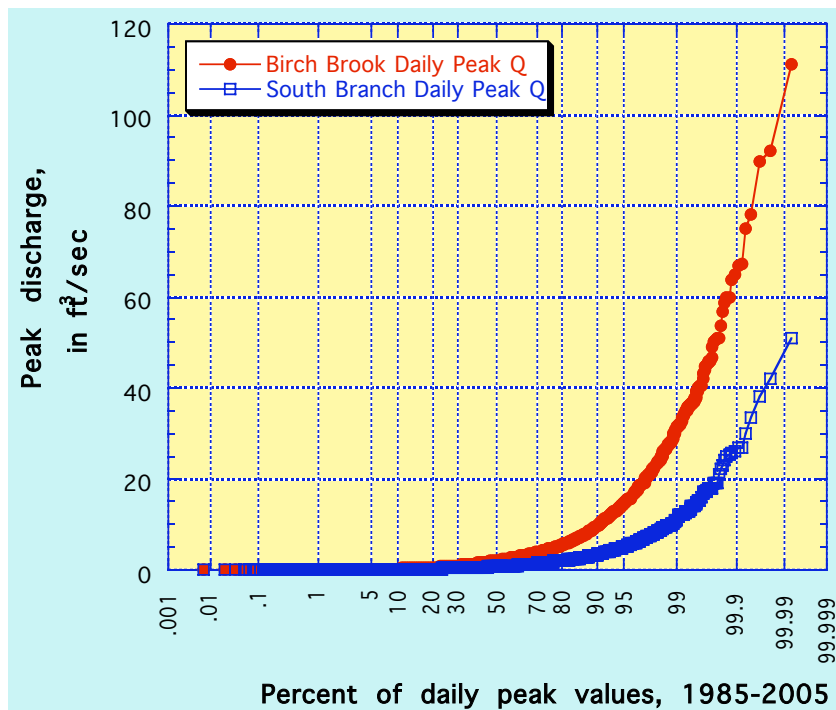


Fig. 3 Probability graph of Birch Brook peak discharge

When the weir is frozen (usually 3 to 8 days per year), average discharge is estimated (nonlinear interpolation); peak discharge estimated where record is good. Average and Peak discharge values may be too low for short periods during mid-summer days when sensors are exposed to air during weir maintenance. Missing discharge values estimated from South Branch Birch Brook records ($r^2 > 0.9$). Time of peak discharge values contain clock and date errors during some periods. Records after 1990 are composites of two transducers per site. Discharge values < 0.10 cfs are approximate before 2000.

No discharge record

3/19-3/23/85

4/17/85

No peak discharge record (usually no time of peak)

7/21-25/85

2/4-8/88

2/16-21/89

12/31/89-1/1/90

7/30/85-9/27/86

2/20-21/88

2/24-26/89

10/9-11/90

1/1-5/87

2/25/88

11/30-12/1/89

1/17-18/87

5/5-24/88

12/3-5/89

1/26-31/87

8/18-12/15/88

12/7-9/89

3/10-12/87

12/20-23/88

12/13-15/89

1/22/88

1/4-5/89

12/17/89

Miscellaneous notes

2/21/1989--Ice jam with rising stage; values estimated from Green River gage

9/1-2/92--No time of peak discharge

1/1-8/04--Gage frozen; values adjusted by interpolation

South Branch Birch Brook notes

Discharge is measured continuously using pressure transducers (Druck PDCR-1230 and/or 1830) and data loggers (Omnidata Datapod Campbell Scientific Inc CR10 and CR510) at the South Branch Birch Brook weir, constructed ~1938 by the Civilian Conservation Corps (Fig. 4).

Discharge record begins 7/11/84. Measurements were made using analog equipment (stilling-well float and weight-driven analog recorder) until 9/16/86, when digital

measurement of depth and discharge began (Fig. 5). The time of peak discharge was not measured until 3/1/1985 and values are not known with precision until 3/87. When the weir is frozen (usually 5 to 12 days per year), average discharge is estimated (nonlinear interpolation); peak discharge estimated where record is good. Average and Peak discharge values may be too low for short periods during mid-summer days when sensors are exposed to air during weir maintenance.

Missing discharge values estimated from Birch Brook records ($r^2 > 0.9$).

Records after 1990 are composites of two transducers per site.

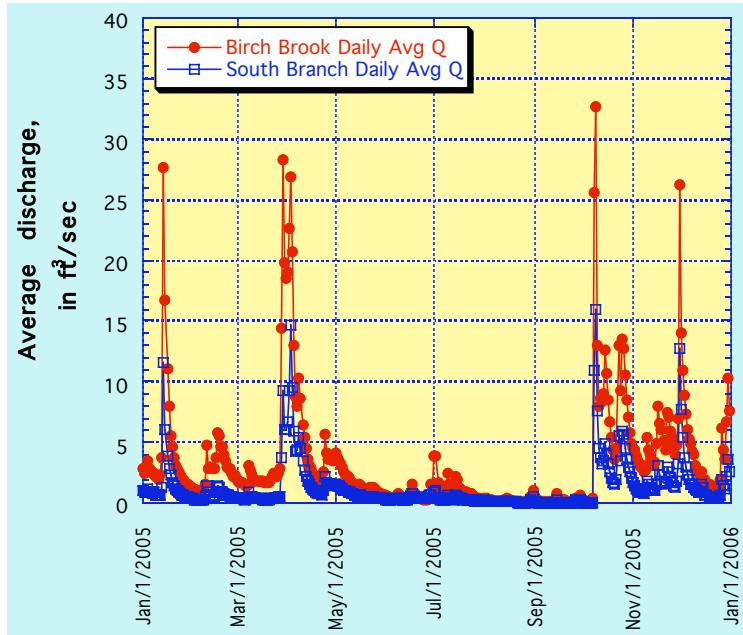


Fig. 4 Daily average discharge of both Birch Brook and the South Branch of Birch Brook (2005).

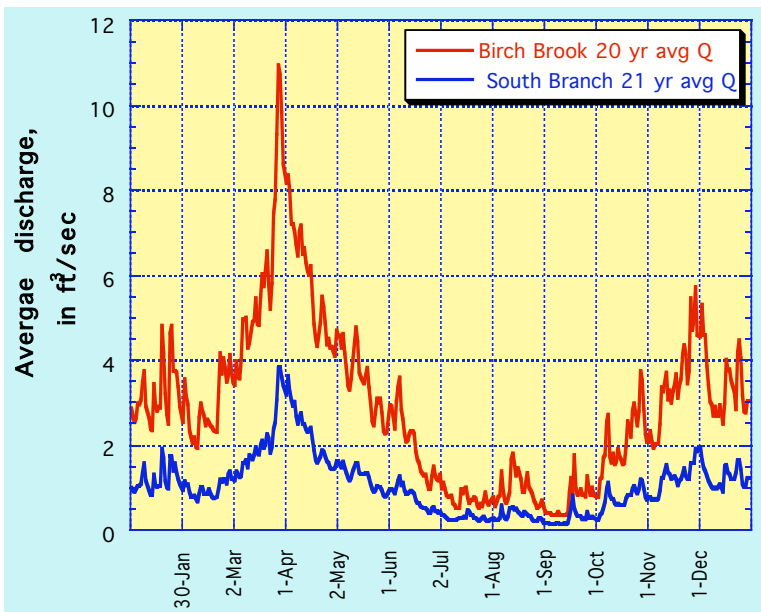


Fig. 5 Long-term (20 or 21 year) daily average discharge of Birch Brook and South Branch of Birch Brook.

Time of peak discharge values contain clock and date errors during some periods.

No discharge record

2/7-8/92

4/6/92

No peak discharge record (usually no time of peak)

11/11-16/86

8/5-6/02

1/1-3/18/87

1/7-12/04

2/18-19/89

2/24-25/89

2/27-3/1/89

12/2/89

12/14-16/89

11/7/95-1/1/96--no time of peak discharge

1/5-16/02--no time of peak discharge

1/18-2/1/03--no time of peak

discharge

2/14-21/03--no time of peak

discharge

Water Temperature Record--Birch Brook and South Branch Birch Brook

Sensors: Campbell Scientific Inc. Model 107 Temperature probes (Fenwal Electronics UUT51J1 Thermistor) placed at the same height and location as the water depth sensors (the height of the bottom of the weir v-notch, Fig. 6), generally 0.5' below the water surface behind a small impoundment. Maximum measured temperatures > 20°C may record air temperature during periods of weir maintenance; values < 0.5°C likely reflect sensors temporarily frozen in ice. Values < 1.0° C have been replaced by mean temperature for the day or -1.0° C, whichever is higher.



Fig. 6 South Branch (Birch Brook) weir.

Dataloggers: Campbell Scientific Inc. CR10 datalogger (Main Stem from 3/94-8/06 then switched to CR10X; South Branch only CR10)

Birch Brook (record begins 3/24/94, Fig. 7)

Missing data

6/17/94 - 7/4/94	3/12/96 - 4/1/96
7/16/94 - 8/1/94	8/11/97
10/24/94 - 11/22/94	10/19/00
11/27/94 - 12/3/94	3/26/01
3/1/95 - 5/15/95	7/18/01
8/22/95 - 9/7/95	11/14/01 - 11/24/01
12/12/95 - 1/1/96	12/18/02 - 12/30/02
2/12/96 - 2/29/96	10/26/03 - 11/3/03

Comments:

8/1/97 - 9/8/97--Replaced data using corrected South Branch Birch Brook record
 7/2/00 - 8/1/00--Replaced data using South Branch Birch Brook values and warm-season correlation; values probably low by 1° in late July

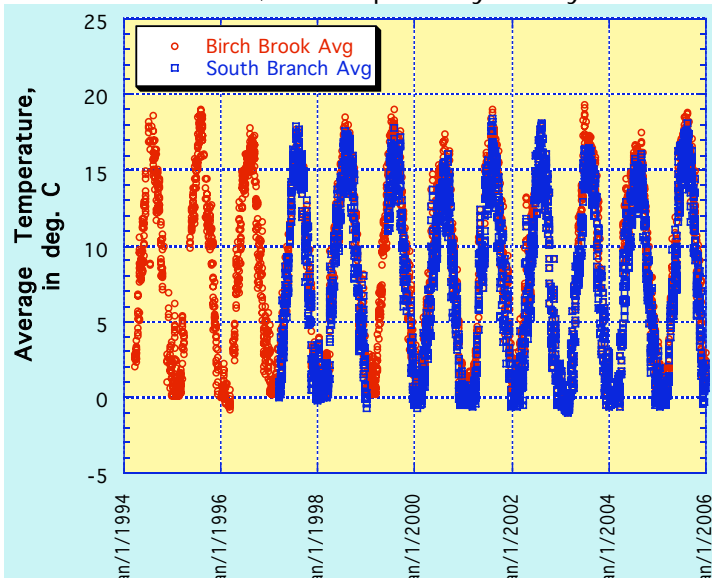


Fig. 7 Daily average water temperature of Birch Brook (1994-2005) and South Branch of Birch Brook (1997-2005).

8/28/00 - 9/4/00--replaced using South Branch Birch Brook record
 11/11/00 - 11/19/00--replaced using South Branch Birch Brook record
 1/28/00 - 2/5/00--Replaced using South Branch Birch Brook record
 5/2/01 - 6/10/01--Replaced using South Branch Birch Brook record
 6/20/02 - 4/14/03--Replaced using South Branch Birch Brook record
 2/4/03--February temperature values are from South Branch Birch Brook sensor and are likely too low by 1 °C or so
 4/15/03 - 5/15/03--replaced from South Branch Birch Brook record

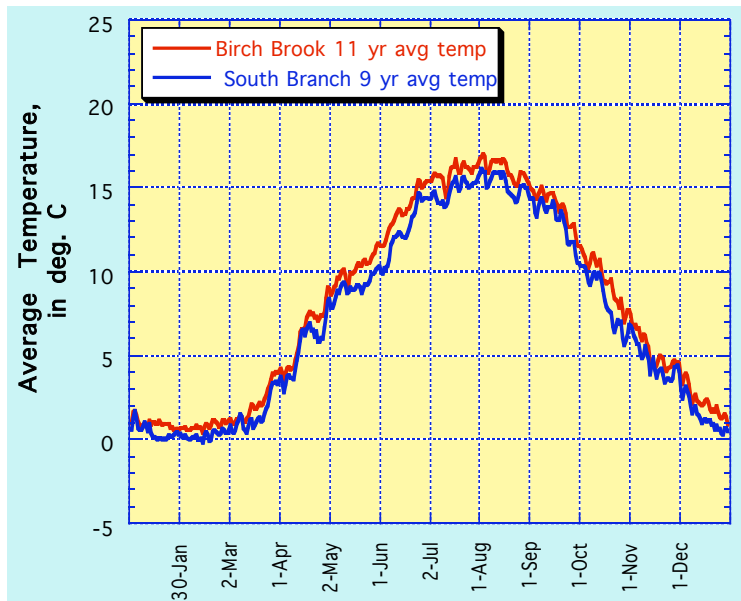
7/11/03 - 8/27/04--Replaced using South Branch Birch Brook record; 7/11-10/25 replaced by warm season correlation with S. Br. B. Br. = $0.82 \cdot SB + 3.81$, $R^2 = 0.93$
 4/18/04 - 8/26/04--Replaced using South Branch Birch Brook record and warm season correlation with South Branch Birch Brook = $0.82 \cdot SB + 3.81$, $R^2 = 0.93$
 8/27/04--New Temp sensor installed

South Branch (record begins 3/12/97, Fig. 8)

Missing data

- 1/5/99 - 6/8/99
- 11/4/99 - 11/27/99
- 11/9/01 - 11/14/01
- 11/17/01
- 11/21/01 - 11/23/01
- 1/4/02 - 1/16/02
- 12/18/02 - 12/30/02
- 10/26/03 - 11/3/03

Fig. 8 Long-term (~10 yr) daily average water temperature of Birch Brook and South Branch of Birch Brook.



Miscellaneous notes

These data provided by the Center for Environmental Studies, Williams College -- including stream temperature--are preliminary and subject to revision. Inaccuracies in the data may be present because of instrument malfunctions or database issues. Subsequent review may result in significant revisions to the data. Data users are cautioned to consider carefully the provisional nature of the information before using for decision-making. Information concerning the accuracy and appropriate uses of these and other hydrologic data from Hopkins Memorial Forest can be obtained from the station manager, Jay Racela, or from Williams College hydrologist Prof. David Dethier. Contact: jracela@williams.edu, ddethier@williams.edu