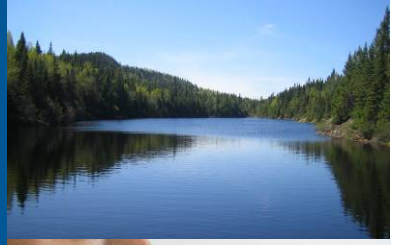
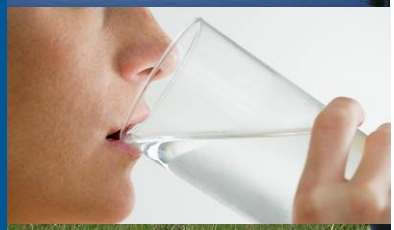



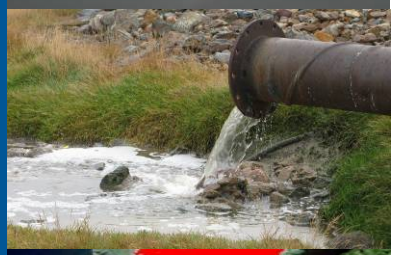


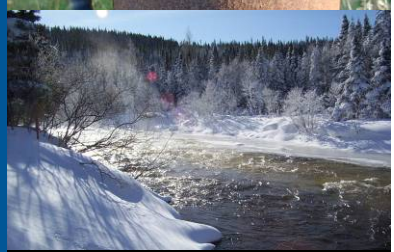

Real Time Water Quality Report Southwest Brook below Southwest Pond

Deployment Period 2011-02-13 to 2011-03-21

2011-03-31

Newfoundland Labrador

Government of Newfoundland & Labrador
Department of Environment and Conservation
Water Resources Management Division

General

- This station is operated cooperatively with the Miawapukek First Nation (Conne River) as a Pilot Project for Drinking Water Source Monitoring. This is the only known application of Real Time Water Quality Monitoring for a drinking water source for any First Nations community in Canada.
- The Water Resources Management Division (WRMD) staff monitors the real-time web page on a daily basis. Any unusual observations are investigated, with site visits being carried out as warranted.
- Operators at Conne River are informed of any significant water quality events or instrumentation problems by WRMD.
- Site visits for QA/QC purposes are conducted by WRMD approximately four times per year.
- Monthly calibration and maintenance is undertaken by Cyrus Lambert at the Conne River Water Treatment Plant.
- The graphs below may sometimes show vertical lines from the data string to zero or the bottom of the graph. These lines should be ignored, as they are an artefact of individual missing data points. We are working to resolve this issue.

Maintenance and Calibration of Instrumentation

- After being cleaned and freshly calibrated the regular **DataSonde®** (s/n 44422) was installed on February 13, 2011, and remained deployed continuously until March 22, 2011, a 36 day period.

Quality Assurance / Quality Control (QA/QC) Measures

- As part of the QA/QC protocol, an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey. See **Table 1**.

	Rank				
Parameter	**Excellent**	**Good**	**Fair**	**Marginal**	**Poor**
Temperature (oC)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	<+/-1
pH (unit)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Sp. Conductance (µS/cm)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Sp. Conductance > 35 µS/cm (%)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Dissolved Oxygen (mg/L)	<=+/-0.3	>+/-0.3 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Turbidity <40 NTU (NTU)	<=+/-2	>+/-2 to 5	>+/-5 to 8	>+/-8 to 10	>+/-10
Turbidity > 40 NTU (%)	<=+/-5	>+/-5 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20

Table 1

- Upon deployment and removal, a QA/QC **MiniSonde®** is temporarily deployed along side the Field **DataSonde®**. Values for each recorded parameter are compared between the two instruments. Based on the difference between parameters recorded by the Field **DataSonde®**, QAQC **MiniSonde®** a qualitative statement (Ranking) is usually made on the data.
- The ranking at the beginning and end of the deployment period are shown in **Table 2**.

- The 'Marginal' ranking for Dissolved Oxygen at the end of the deployment period is likely due to the DO cap needing to be replaced.
- With the exception of water quantity data (Stage), all data used in the preparation of the graphs and subsequent discussion below adhere to this stringent Quality Assurance and Quality Control (QA/QC) protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request. Where appropriate, corrected data for water quality parameters are indicated.

Southwest Brook below Southwest Pond (NF02ZE0033)		
Date (yyyy-mm-dd)	**Parameter**	**Ranking**
2011-02-13 Deployment	Temp (^{o}C)	Excellent
	pH (units)	Excellent
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (mg/L)	Excellent
	Turbidity (NTU)	Excellent
2011-03-21 Removal	Temp (^{o}C)	Excellent
	pH (units)	Good
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (mg/L)	Marginal
	Turbidity (NTU)	Excellent

Table 2

Data Interpretation

- The water temperature (**Figure 1**) ranged from a minimum of -0.19 ˚C to a maximum of 2.08 ˚C, with temperature generally increasing throughout the deployment period.
- While there appears to be little correlation with stage, there is far less diurnal variation during periods of increased stage, presumably due to precipitation, cloud cover and lower daytime ambient air temperatures.

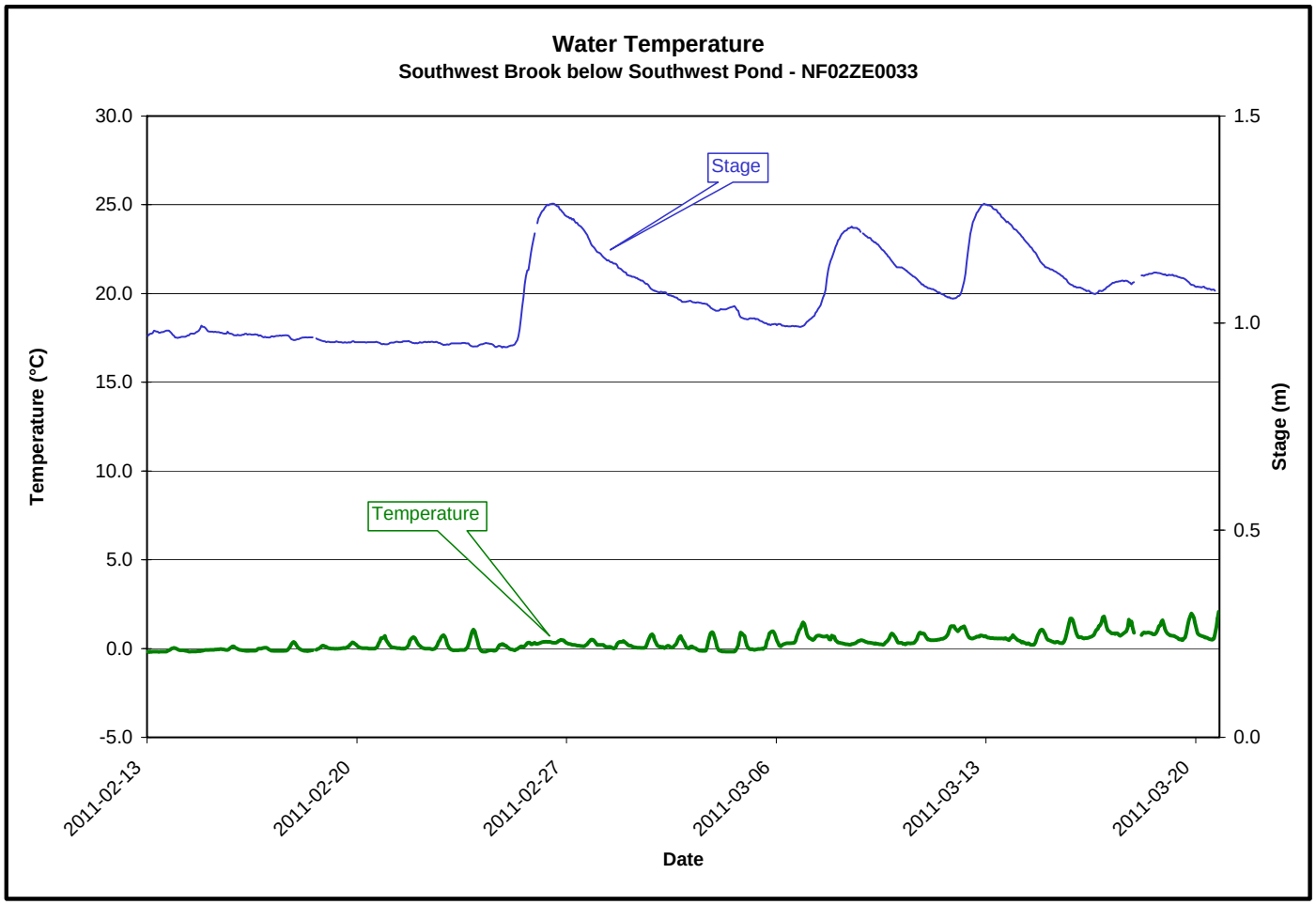

Figure 1

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 4.59 to a maximum of 5.35 with all the values falling well below the recommended range (6.5 – 9.0) for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life*.
- The background pH of this stream is normally lower than the lower limit of the recommended range.
- There appears to be in inverse correlation with stage.

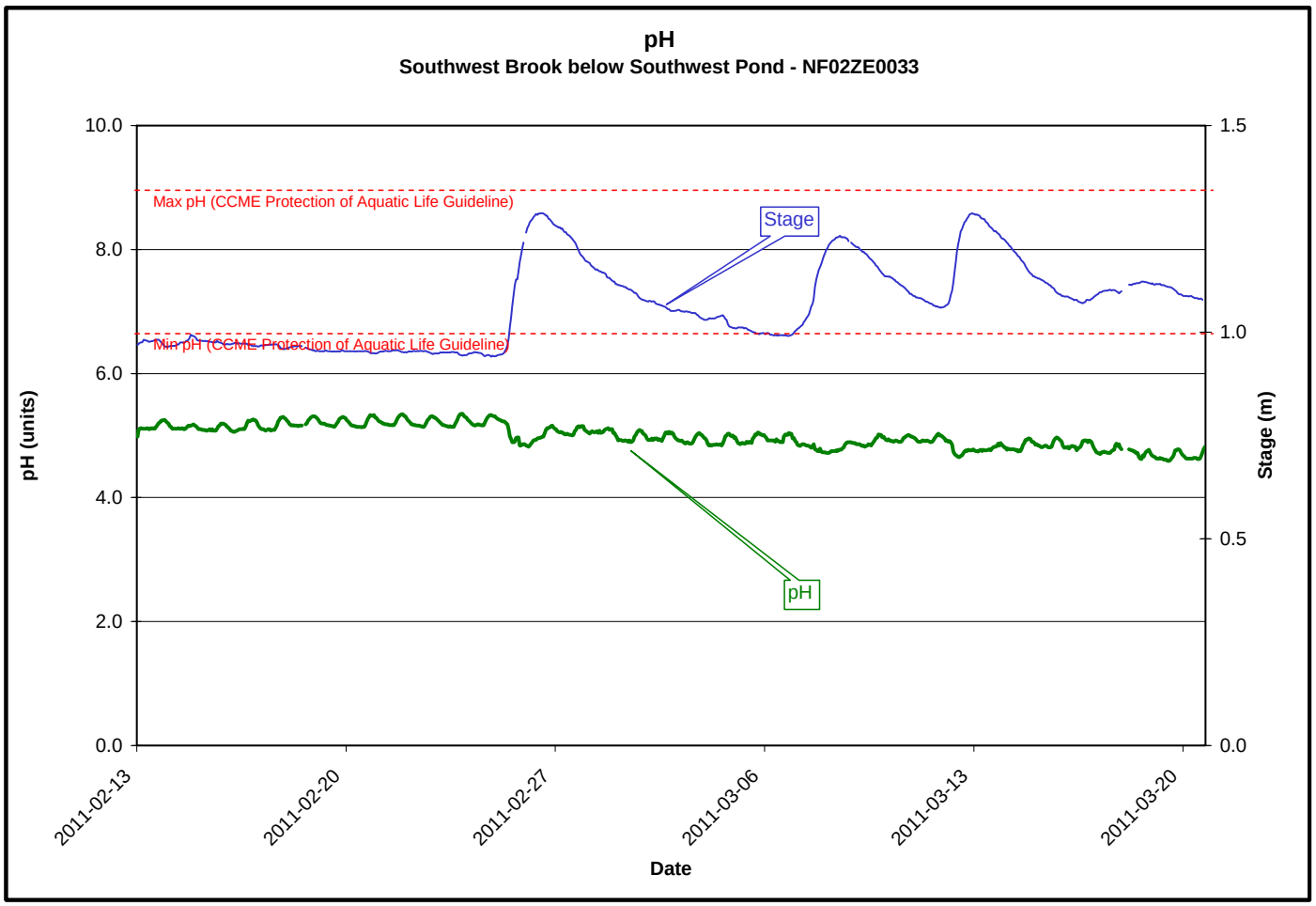

Figure 2

- The specific conductivity **(Figure 3)** ranged from a minimum of 8.2 µS/cm to a maximum of 14.3 µS/cm over the deployment period.
- It is unclear as to why there is a change in specific conductivity in the first few hours of the deployment period.
- There appears to be some correlation between specific conductivity and the beginning of the rising leg of each stage increase, suggesting that these changes were triggered by precipitation events and the onset of runoff.

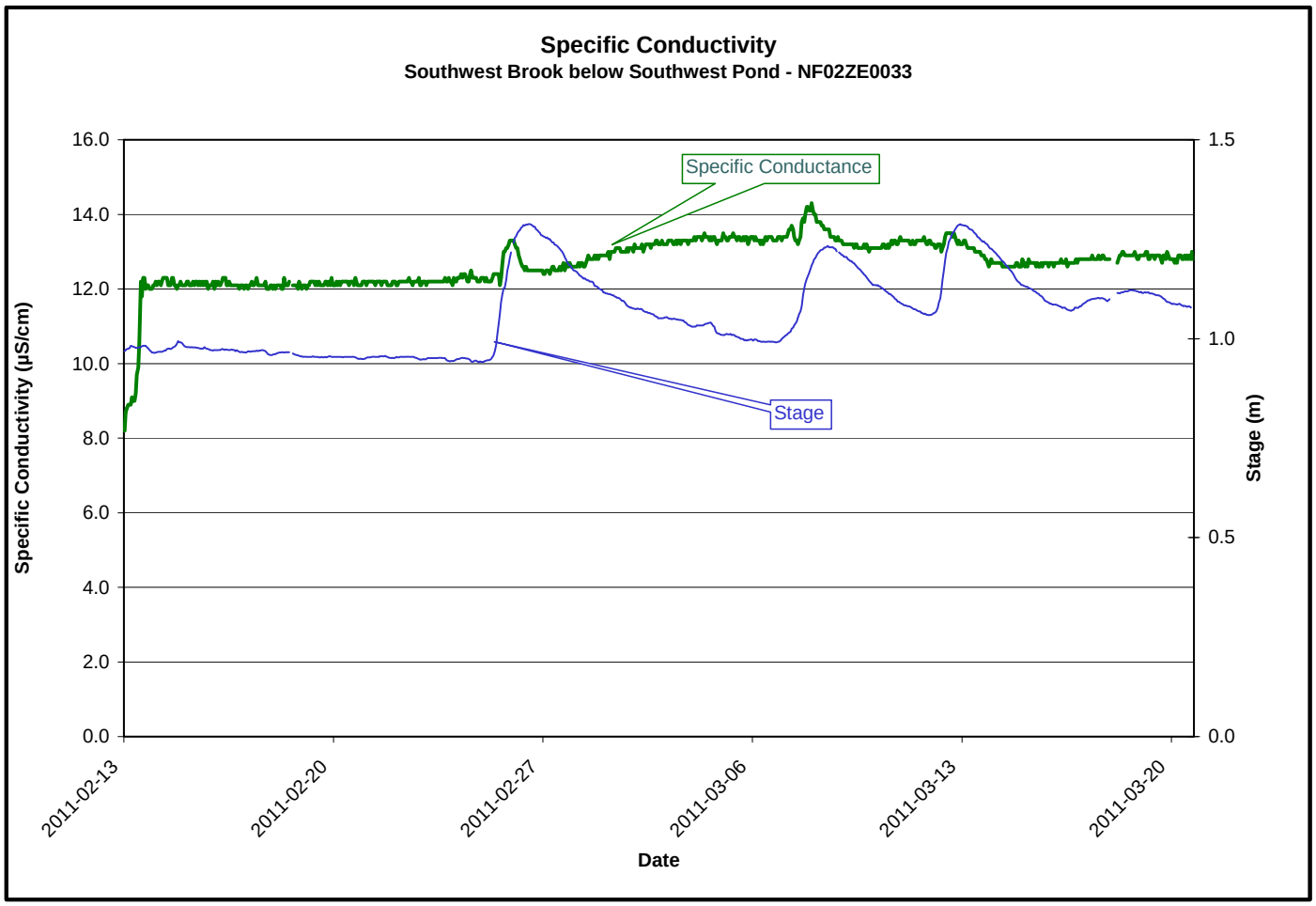

Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 12.83 mg/L to a maximum of 13.98 mg/L over the deployment period. With the percent saturation ranging between 89.3 and 98.4.
- Dissolved oxygen (mg/L) is generally inversely proportional to water temperature.
- The dip in Dissolved Oxygen during the last week of February corresponds to an increase in stage, presumably from a precipitation event.
- For the entire deployment period dissolved oxygen values fell above the upper limit recommended by CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (cold water/other life stages – above 6.5 mg/L; cold water/early life stages – above 9.5 mg/L).
- Lower dissolved oxygen values are considered to be solely a function of the naturally warmer water temperatures.
- Based upon the fact that Dissolved Oxygen % Saturation had minimal change over the deployment period, we can be confident that the Dissolved Oxygen mg/L values are reasonably accurate, despite a 'marginal' ranking when compared with a QA/QC instrument at the end of the deployment period.

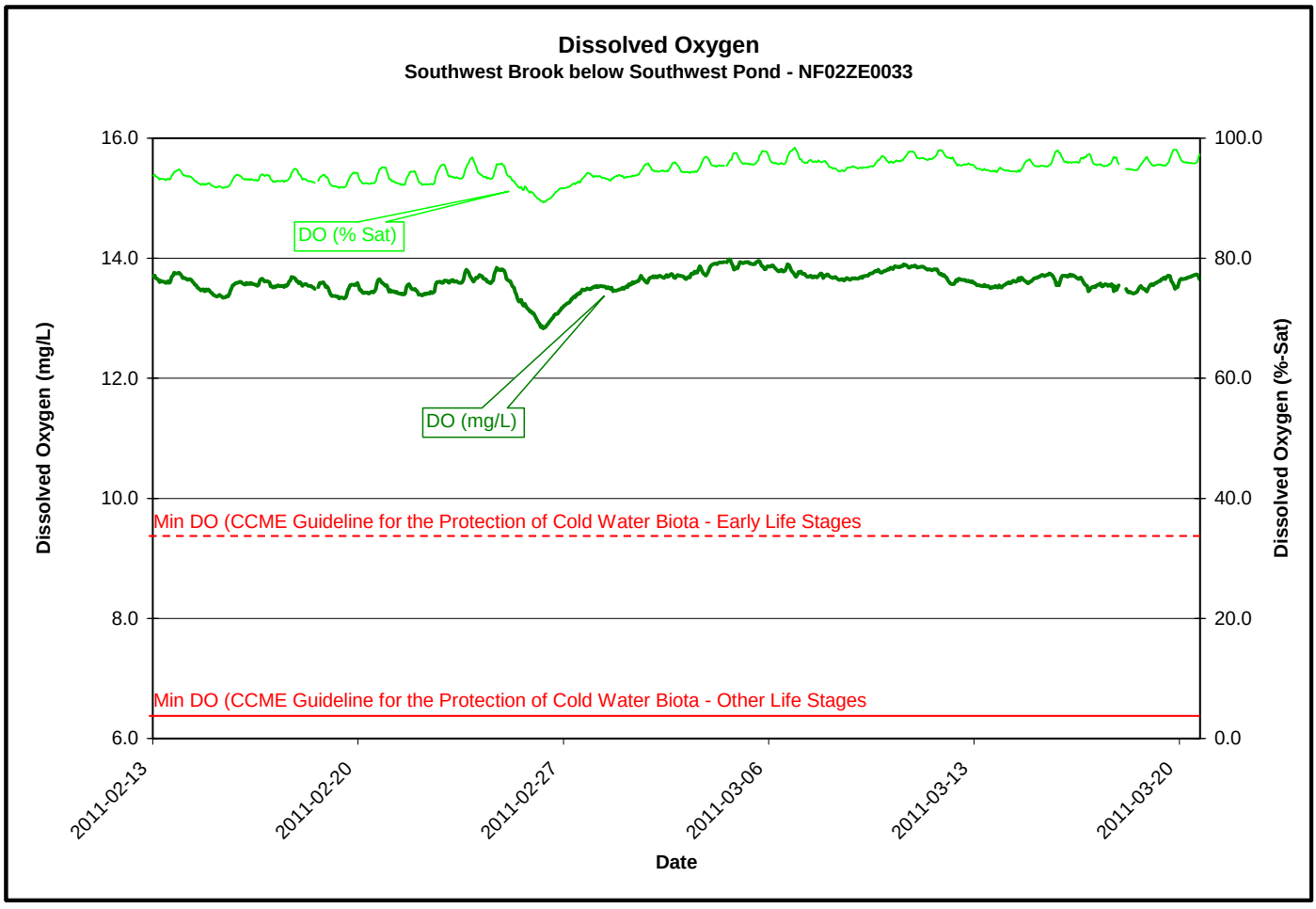

Figure 4

- The turbidity values **(Figure 5)** ranged from a minimum of 0.0 NTU to a maximum of 37.6 NTU.
- During this deployment period, an effort was made to place the instrument away from the plunge pool and the influences of turbulent water.
- The individual spikes in turbidity are insignificant short term events when natural stream debris and/or air bubbles from turbulent flow passed near the sensor. The events generally occur during the rising leg of the hydrograph, presumably resultant from precipitation events.

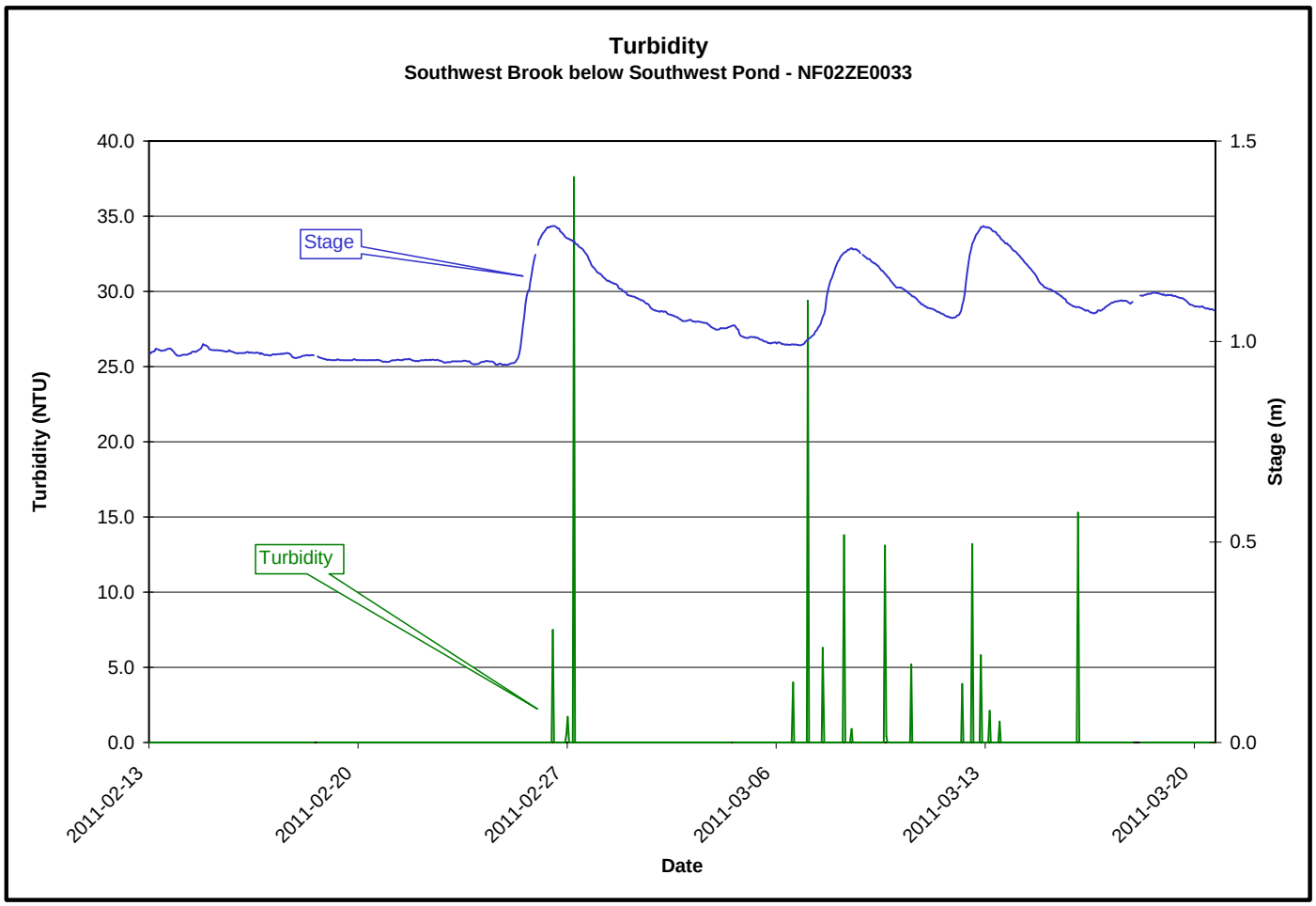

Figure 5

- The stage or water level ranged from a minimum of 0.94 m to a maximum of 1.29 m. The flow or discharge ranged from a minimum of 0.06 m^3/s to a maximum of 2.47 m^3/s (**Figure 6)**.
- The increase in stage and flow presumably result from precipitation and/or snowmelt events.
- Stream flow is within normal range.

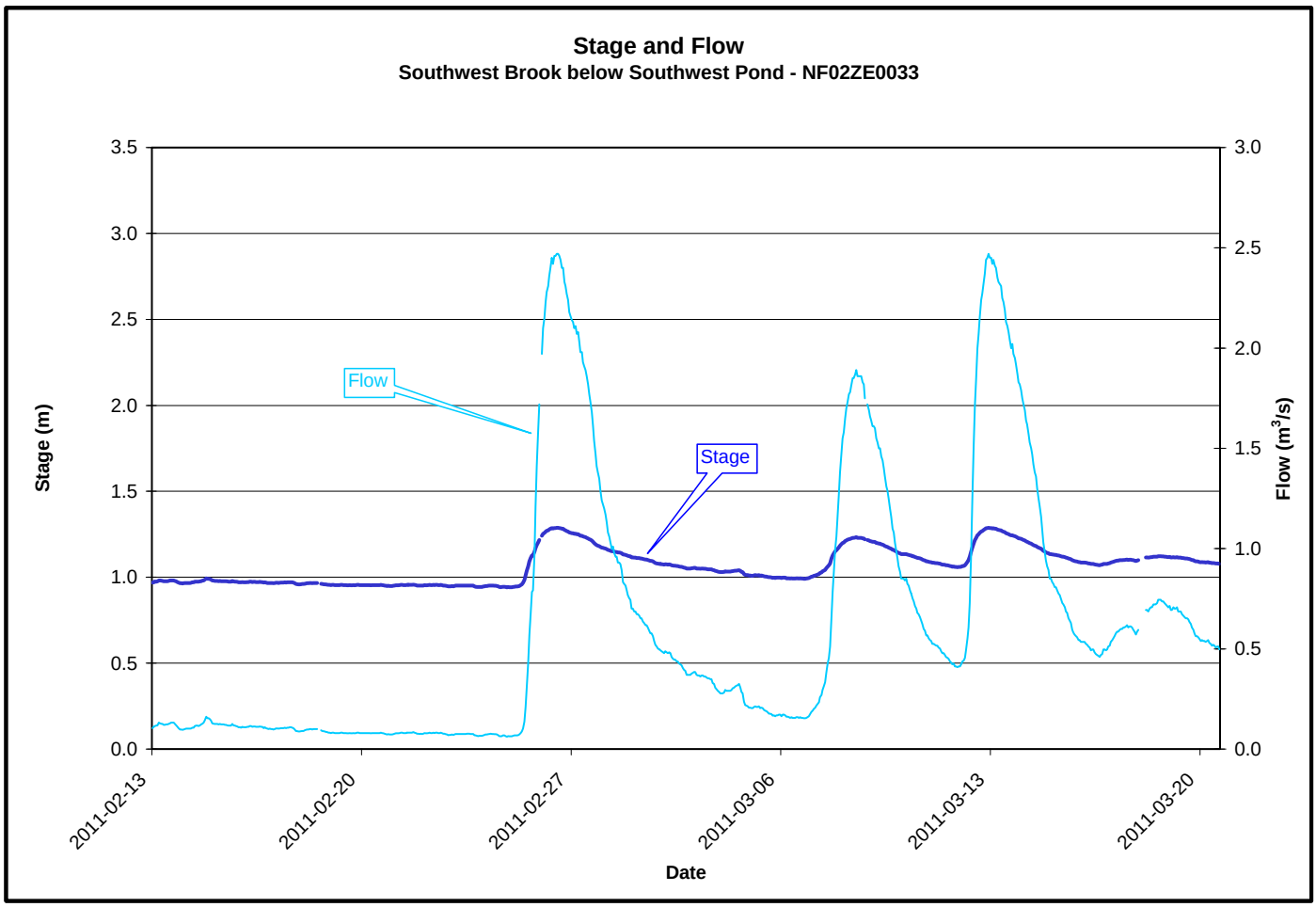

Figure 6

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