

---TITLE: Temperature, discharge and light data (Ivishak Hot Spring, Alaska)

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---FUNDING SOURCE AND GRANT NUMBER: NSF OPP-ANS 0611995

---DATA SET OVERVIEW:

-Abstract: We investigated the productivity of a perennial, Arctic spring-stream. Ivishak Spring has the stable discharge (~131 L/s) and temperature (~4-8°C) typical for springs. It is unusual, however, in having an annual cycle of daylight from 24 hrs/d (summer) to 0 hrs/d (winter). We tested the hypothesis that stored detritus would buffer carbon limitation during winter when gross primary production (GPP) is minimized, resulting in constant rates of community respiration (CR) year-round due to constant temperatures. The data provided in this file describe annual patterns of air temperature, water temperature, stream discharge and light..

-Time period covered by the data: 8 August 2006 through 5 August 2009.

-Physical location of the measurement: 69° 1.506'N, 147° 43.240'W; elevation = ca. 396 m. Ivishak spring is a tributary of the Ivishak River, a braided river that flows through the Arctic National Wildlife Refuge (ANWR) on the North Slope of the Brooks Range, Alaska. Substrata consist of physically stable, cobble-size particles that are often covered by bryophytes (Parker and Huryn 2011). The habitat structure consists of a relatively uniform run with infrequent pools for at least 300 m downstream of the high-gradient spring orifice. Pools are infrequent. Discharge is relatively constant at  $136 \text{ L s}^{-1}$ , mean annual water temperature ranges from 7.3°C at the source to 5.8°C about 300 m below the source. The temperature at the source is constant, whereas the temperature at the bottom of the reach shows an annual fluctuation of about 3-4 °C. Summer nutrient concentrations are relatively low for headwater streams of the eastern North Slope (i.e., SRP=  $0.10 \mu\text{mol L}^{-1}$ ,  $\text{NH}_4$ =  $0.05 \mu\text{mol L}^{-1}$ ,  $\text{NO}_x$ =  $5.3 \mu\text{mol L}^{-1}$ ; Huryn et al. 2005, Parker 2004, Parker and Huryn 2011, Benstead and Huryn, in press). Riparian vegetation consists of dense thickets of willows (*Salix* spp.) 1 to 2 m in height. A grove of balsam poplar (*Populus balsamifera*) trees 3 to 4 m in height grows along one bank of the stream.

-Data source: n/a.

-World Wide Web address references: n/a

INSTRUMENT DESCRIPTION:

Air and water temperature were measured at 5-min intervals using either HOBO U20 Water Level Data Loggers (U20-001-01) or Solinst Barologgers. Light intensity was

measured using a HOBO Pendant Temp/Light Logger (UA-002-08). Discharge (Q, L/s) was estimated as a function of stream stage that was measured using a pair of HOBO U20 Water Level Data Loggers. One was deployed in a stilling well beneath the water's surface. Another was used to measure air pressure and was required to correct the submerged sensor which measured the sum of air and water pressure.

Instrument	sensor	precision	frequency
HOBO U20 - U20-001-01	temp	+/- 0.1oC	5 min
HOBO U20 - U20-001-01	depth	+/- 3 mm	5 min
Solinst Barologger	temperature	+/-0.1 oC	5 min
HOBO UA-002-08	light	n/a	60 min

#### DATA COLLECTION and PROCESSING:

Air temperature (oC) was measured in the shade about 2-m above the ground by hanging a HOBO U20 in a riparian willow thicket. Water temperature (oC) was measured using a HOBO U20 deployed in a PVC stilling well placed near the true-right hand bank of the stream. Temperature was measured at 5-minute intervals which were averaged to provide daily estimates. Stream discharge (Q, L/s) was estimated indirectly by regressing discharge (measured approximately monthly using dilution gauging based on slug additions of NaCl) against stage (stream water height in a stilling well, and using the resulting equation to estimate daily discharge as a function of daily measurements of stage. Water depth (m) was measured using a HOBO U20 deployed in a PVC stilling well placed near the true-right hand bank of the stream. Water depth was calculated as a function of water pressure using software developed by the Onset Corporation (Pocasset, MA) and provided with the instrument. Calculation of water depth required pressure data from two units—one deployed in water which measures the sum of air pressure and water pressure, the other deployed in air which measures air pressure only. Light intensity (Lux) was measured at the same location as air temperature and represents light conditions in a riparian willow thicket. Light intensity was measured at 1-hour intervals which were then averaged to provide daily estimates.

#### --DATA FORMAT

-Data file structure: column delimited ASCII.

-Data format and layout: data are provided in columns indicated by headers containing the variable name and units

-List of parameters with units, sampling intervals, frequency, range:

Parameter	units	sampling interval	frequency	range
Water temperature	oC	5-min	daily	3.7-7.8oC
Air temperature	oC	5-min	daily	-38.4-24.7oC

Light intensity	Lux	1-hr	daily	4-48925 Lux
Stream discharge	L/s	24-hr	daily	34-194 L/s

-Description of flags, codes used in the data, and definitions: n/a

--DATA REMARKS

-PI's assessment of the data: We have high confidence in these data. Missing data are indicated as an "\*".

--REFERENCES

Hury, A.D. K.A. Slavik, R.L. Lowe, S.M. Parker, D.S. Anderson & B.J. Peterson 2005. Landscape heterogeneity and the biodiversity of Arctic stream communities: a habitat template analysis. *Canadian Journal of Fisheries and Aquatic Sciences* **62**:1905-1919.

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