Supplementary materials:

Tab. S1 Overview of research questions, hypotheses and their rationales for the Rokytka headwater.

Topic	Process	Podzol (PZ2) Statement	Expected	Result	Peat Bog (PB3) Statement	Expected	Result
Runoff Formation	no HOF	no significant infiltration resistance	likely	**confirmed**	no significant infiltration resistance	likely	**confirmed**
	SOF1, SSF1	lateral SOF and/or biomat flow	possible	**confirmed**	lateral SOF and/or biomat flow	likely	**confirmed**
	SSF2, SSF3	lateral pipeflow/lateral matrix flow	possible	**rejected / confirmed**	lateral pipeflow/lateral matrix flow	possible	**confirmed / confirmed**
	no GWR	no phreatic zone in soil and negligible lateral flow in deeper soil horizons	likely	**confirmed**	transmissivity feedback (possible rain-on-snow, large storms)	possible	not proven
	DP	deep percolation to bedrock aquifer	likely	not proven	not connected – vertically	unlikely	**confirmed**
	GWR	bedrock aquifer/phreatic zone: lateral GW flow in bedrock fissures	likely	not proven	not connected – laterally	likely	**confirmed**
Sodium-Fluorescein (FLC)	-	Suitable tracer for mineral soils (low pH controlled/buffered by NaOH)	likely	**confirmed**	Suitable tracer for mineral soils (low pH controlled/buffered by NaOH)	likely	**rejected**
	HOF/SOF	dye identifies surface flow or lateral near-surface flow (biomat flow, Gerke et al. 2009, 2014)	likely	**confirmed**	dye identifies surface flow or lateral near-surface flow (biomat flow, Gerke et al. 2009, 2014)	likely	**rejected**
	SSF/GWR	FLC detects hydrological connectivity between irrigation test plot and spring or stream	possible	not proven	dye detects hydrological connectivity between irrigation test plot and spring or stream	possible	not proven
	no GWR	if detectable, dye identified in vadose zone (soil staining) and flowpath detection	likely	not proven	if detectable, dye likely identified in Acrotelm only	unlikely	not proven
	SSF	if detectable, slow response (days) in the stream; deep flowpath in the bedrock	possible	not proven	if detectable, possibly quick response (minutes) in the stream	possible	not proven
Brilliant Blue (BB)	-	suitable tracer for light-colored mineral soils	likely	**confirmed**	BB is likely a less suitable tracer for dark-colored peaty soils: BB difficult to detect in dark soils.	possible	**rejected**
	-	identifies vertical flow structures in soil (macropores, matrix)	likely	**confirmed**	identifies vertical flow structures (macropores, matrix)	likely	**confirmed**
	SSF/GWR	BB identifies lateral flow structures in soil (pipes, matrix)	likely	**confirmed**	dye identifies lateral flow structures (pipes, matrix)	likely	**confirmed**
	no GWR	if detectable, dye likely identified underneath the irrigation plot only	likely	**confirmed**	if detectable, dye likely identified in Acrotelm only	unlikely	**confirmed**
	SSF	if detectable, dye possibly stains major lateral pathways (soil pipes)	possible	**confirmed**	if detectable, dye possibly stains major lateral pathways (soil pipes)	possible	**confirmed**

5
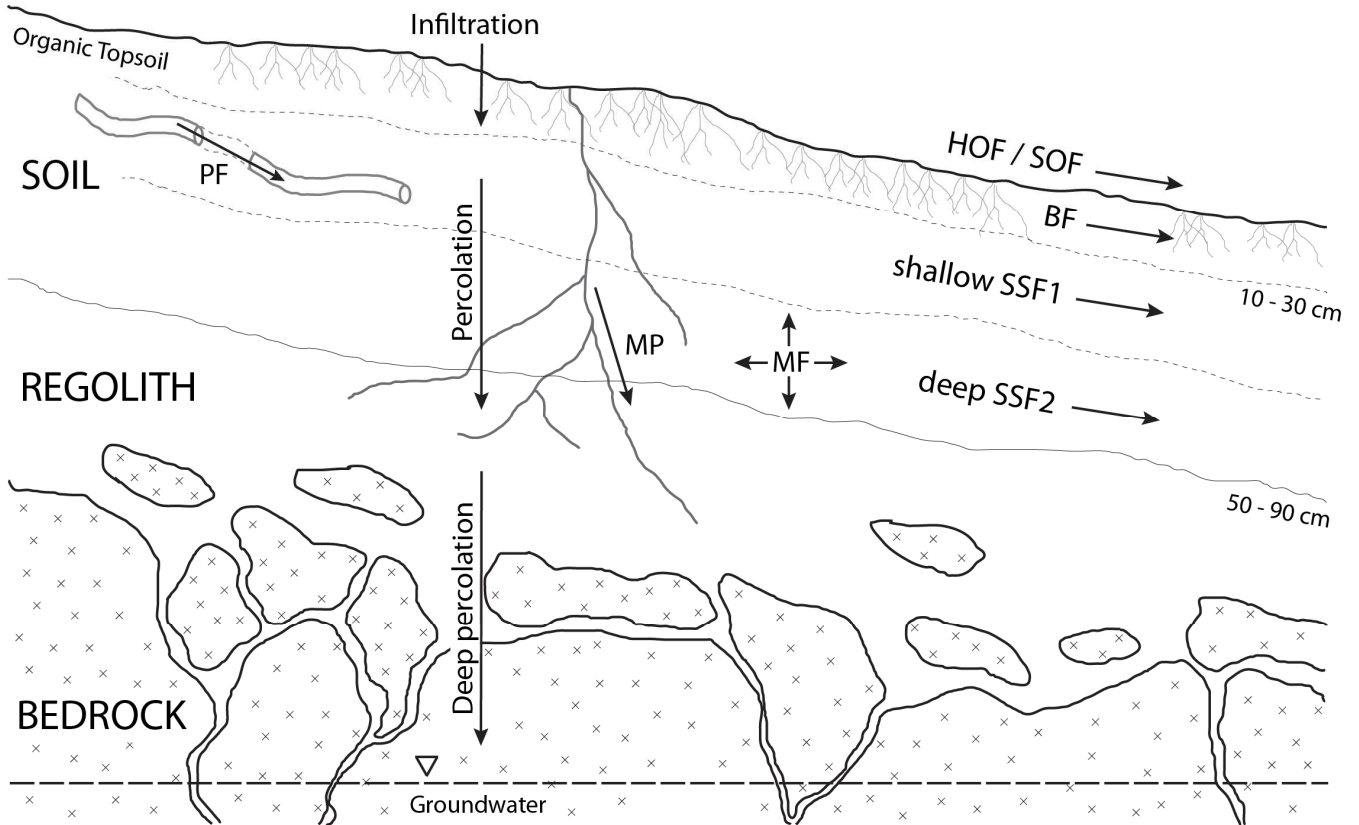
Fig. S1 Terminology of the runoff formation processes used in the Šumava hillslope hydrology study. HOF = Hortonian overland flow; SOF = Saturation overland flow; BF = Biomat flow; SSF = Subsurface stormflow; PF = Pipeflow (lateral); MP = Macropore flow

10   (vertical); MF = Matrix flow.