Supplementary Materials:

Table S1. Primary WRF, Noah-MP, and WRF-Hydro parameters were used in the simulation.

Subprocess	Option Selected	Description
Microphysics	3	WSM3 Hong, Dudhia and Chen [103]
Radiation	3	CAM [104]
PBL physics	1	YSU [105]
Dynamic vegetation	4	Off (LAI from table; FVGE=maximum veg. fraction)
Stomatal resistance	1	Ball-Berry [106]
Surface layer drag coefficient calculation	1	Monin-Obukhov [107]
Soil moisture factor for stomatal resistance	1	Noah [108]
Supercooled liquid water in frozen soil	1	No Iteration [9]
Soil permeability	1	Linear Effect, More Permeable [9]
Radiative transfer	3	Two-stream applied to vegetated fraction
Ground snow surface albedo	2	CLASS [109]
Partitioning precipitation into rainfall and snowfall	1	Jordan [110]
Soil temperature lower boundary condition	2	TBOT at 8m from input file
Soil/snow temperature-time scheme	1	Semi-implicit
Glacier treatment	2	Slab ice
Channel_option	3	Diff. Wave-gridded
Baseflow	1	Exp. Bucket