Table C.2 - Calibrated parameters for Baker Creek MESH modelling

Name	Description	Unit	Land-cover^	Lower Limit	Upper Limit	Scenario(s)	Rationale	Source(s)
WF-R2	River roughness factor combining channel shape, width to depth ratio, and Manning's n		N/A	0.3	3	1, 2, 3, 1-P, 2-P	Same range as Mkandla 2017 and Davison et al 2016	Davison et al, 2016
ZSNL	Limiting snow depth below which coverage is <100%	m	All	0.001	0.2	1, 2, 3, 1-P, 2-P		Davison et al, 2016
ZPLS	Maximum water ponding depth for snow-covered areas	m	All	0.005	0.5	1, 2, 3, 1-P, 2-P		Davison et al, 2016
ZPLG	Maximum water ponding depth for snow-free areas	m	All	0.005	0.75	1, 1-P	Weighted value based on Scenario 1 is 1.35m but bump up to 1.5m; Herbert didn't calibrate, but we should (was calibrated in Davison, 2016), especially for lumped version; Note: Lichen on bedrock can hold ~8mm of water (as per Chris); Chris' file was for NL only	Davison et al, 2016
			NL	0.005	0.7	2, 3, 2-P		
			BL	0.005	0.5			
			WL	0.005	0.75			
			PL	0.005	0.5			
			W	0.005	0.75			
			BR	0.005	0.75			
LAMX	Annual maximum leaf-area index (LAI)	--	NL	1.8	3	1, 2, 3, 1-P, 2-P		Verseghy, 2012
			BL	2	4			Bonan, 1992
			G	0.5	3	1, 1-P	Verseghy: 1.5 swamp, 4.0 grass, Dingman: 0.7-2.6 (grassland), 0.6-6 (open shrubland); In Baker, "grass" is used for peatland/wetland	Verseghy, 2012; Dingman, 2015
			WL	0.5	3	2, 3, 2-P		
			PL	0.5	3			
LNZ0	Natural log of the veroughness length of the vegetation / land surface	ln(m)	NL	-0.8	0	1, 2, 3, 1-P, 2-P	Corresponding tree heights (assuming z0=0.1*zveg) range: 4.5m - 10.0m	Spence, 2019
			BL	-0.7	0		Corresponding tree heights (assuming z0=0.1*zveg) range: 5 m-10m	Spence, 2019
			G	-3.689	-2.12	1, 1-P	Assuming long grass, 0.25-1.2 m, and z0=0.1*zveg	Verseghy, 2012
			U	-8.111	-1.6094		Range of LNZ0 for water and bedrock for Scenario 2	Verseghy, 2012
			WL	-3.689	-2.12	2, 3, 2-P	Assuming long grass, 0.25-1.2 m, and z0=0.1*zveg	Verseghy, 2012
			PL	-3.689	-2.12			
			W	-8.111	-3.689		0.25m;	(z0=0.0001-0.0005)
			BR	-5.298	-1.609		0.05m-2.0m	Verseghy, 2012
LAMN	Annual minimum leaf-area index (LAI)	--	NL	1.6	3	1, 2, 3, 1-P, 2-P		Verseghy, 2012; Spence, 2019
			BL	0.4	1.2	1, 2, 3, 1-P, 2-P		
			G	0.3	3	1, 1-P		
			WL	0.3	3	2, 3, 2-P		
			PL	0.3	3	2, 3, 2-P		
ALVC	Avgerage visible albedo of vegetation when fully-leafed	--	NL	0.02	0.05	1, 2, 3, 1-P, 2-P	From Verseghy, 2012, visible albedo is approx. 2/3 of total	Verseghy, 2012; Dingman, 2015
			BL	0.04	0.07			
			G	0.02	0.08	1, 1-P	Dingman: open shrubland; Verseghy: swamp	
			U	0.04	0.3		Range of water and bedrock from scenario 2	
			WL	0.02	0.08	2, 3, 2-P	Dingman: open shrubland; Verseghy: swamp	
			PL	0.02	0.08			
			W	0.04	0.3		Dingman: water total, Verseghy: swamp	
			BR	0.07	0.2		Verseghy: rock; Dingman: bare ground or urban	
CMAS	Annual maximum vegegation canopy mass	kg m-2	NL	9	12	1, 2, 3, 1-P, 2-P		Verseghy, 2012; Spence, 2019
			BL	15	22	1, 2, 3, 1-P, 2-P		Verseghy, 2012
			G	1	4	1, 1-P	Swamp/long grass	
			WL	1	4	2, 3, 2-P		
			PL	1	4	2, 3, 2-P		
ALIC	Avgerage near-infrared (NIR) albedo of fully-leafed vegetation	--	NL	0.18	0.2	1, 2, 3, 1-P, 2-P	Varied Versegy Appendix A values by 0.01 either way	Verseghy, 2012
			BL	0.28	0.3			
			G	0.24	0.26	1, 1-P	Verseghy: NIR albedo = 2x total albedo; Dingman: 2x open shrubland; Verseghy: swamp	
			U	0.13	0.6		Range of water and bedrock from scenario 2	
			WL	0.24	0.26	2, 3, 2-P	Dingman: 2x open shrubland; Verseghy: swamp	
			PL	0.24	0.26			
			W	0.13	0.15		Dingman: 0.070 water total x2=0.14	
			BR	0.2	0.6		Verseghy: albedo of rock x2; Dingman: urban x2	
ROOT	Annual maximum rooting depth	m	NL	0.3	1	1, 2, 3, 1-P, 2-P	Due to frozen subsurface (permafrost) and/or bedrock	Verseghy, 2012; Spence, 2019
			BL					
			G					
			WL					
			PL					
RSMN	Minimum stomatal resistance of vegetation canopy	s m-1	NL	150	250	1, 2, 3, 1-P, 2-P	Only RSMN and not the next 5 parameters calibrated as they are all part of the same equation; +/- 50 from the table for cal; same as Davison and Mkandla	Verseghy, 2012
			BL	75	175			
			G	50	150			
			WL	50	150			
			PL	50	150			
SDEP	Permeable depth of soil column	m	All	0	4	1, 1-P	Across the site, either depth to bedrock or depth to permafrost; see also Morse et al 2016	Spence and Hedstrom, 2018; Morse et al, 2016
			NL	1	4	2, 3, 2-P		
			BL	1	4			
			WL	0.4	1			
			PL	0.4	4			
			W	0.4	1			
			BR	0	0.5			

^ Landcover types are: NL=needleaf / coniferous trees; BL=broadleaf / deciduous trees; G=grass (represents wetlands and peatlands in Scenario 1/1-P); U=urban (represents

Table C.2 - Calibrated parameters for Baker Creek MESH modelling

Name	Description	Unit	Land-cover^	Lower Limit	Upper Limit	Scenario(s)	Rationale	Source(s)
GRKF	Fraction of saturated surface soil conductivity moving horizontal	--	All	0.01	0.5	1		Spence, 2019; user-defined
			NL			2, 3		
			BL					
			WL					
			PL					
			W					
			BR					
MANN	Manning's n (overland flow)	s m-1/3	All	0.016	0.2	1	Range of all Scenario 2 landcover	Chow, 1959 (obtained from Fish Crossing, 2019)
			NL	0.16	0.2	2, 3	Range of floodplain: light to medium to dense brush and trees, in summer	
			BL	0.16	0.2			
			WL	0.03	0.08		Natural channel, winding, sliggish b.-g. range	
			PL	0.03	0.08		Floodplains: pasture high grass to light brush and trees in summer	
			W	0.033	0.05		Range of main channels c and d	
			BR	0.016	0.035		Rough asphalt to short grass pasture floodplain	
WFCI / KSAT	Saturated surface soil conductivity	m s-1	All	1.00E-07	1.00E-04	1	Range of non-bedrock values for Scenario 2	Guan, Spence, & Westbrook, 2010
			NL	1.00E-07	1.00E-05	2, 3	Shallow values for Valley	
			BL	1.00E-07	1.00E-05		Shallow values for Valley	
			WL	1.00E-07	1.00E-06		Shallow values at wetland site	
			PL	1.00E-06	1.00E-04		Shallow value at peatland site (1 value given, so don't calibrate)	
			W	1.00E-07	1.00E-06		Same as wetlands	
SAND - Layer 2	Percent content of sand in the mineral soil	%	All	0	13.995	1, 1-P	Ranges for each layer are the areal weighted average by landcover type of the Scenario 2 soil texture ranges; soil layers are 0-0.15m, 0.15-0.4m, 0.4m-1.1m, and 1.1-4.1m depth.	Guan, Spence, & Westbrook, 2010; Guan, Westbrook, & Spence, 2010; Spence and Hedstrom 2018; and Dingman, 2015
SAND - Layer 3			All	0	25.387			
SAND - Layer 4			All	4.306	20.004			
CLAY - Layer 2	Percent content of clay in the mineral soil	%	All	39.92	42.073	1, 1-P		
CLAY - Layer 3			All	65.62	82.395			
CLAY - Layer 4			All	79.996	100			
SAND - Layer 2	Percent content of sand in the mineral soil	%	NL	0	65	2, 3, 2-P		Guan, Spence, & Westbrook, 2010; Guan, Westbrook, & Spence, 2010; Spence and Hedstrom 2018; and Dingman, 2015
SAND - Layer 2			BL	0	65			
SAND - Layer 3			NL	0	65			
SAND - Layer 3			BL	0	65			
SAND - Layer 3			WL	0	40			
SAND - Layer 3			W	0	40			
SAND - Layer 4			NL	20	40			
SAND - Layer 4			BL	20	40			
SAND - Layer 4			WL	0	40			
SAND - Layer 4			W	0	40			
CLAY - Layer 2	Percent content of clay in the mineral soil	%	NL	0	10	2, 3, 2-P		Guan, Spence, & Westbrook, 2010; Guan, Westbrook, & Spence, 2010; Spence and Hedstrom 2018; and Dingman, 2015
CLAY - Layer 2			BL	0	10			
CLAY - Layer 3			NL	40	65			
CLAY - Layer 3			BL	40	65			
CLAY - Layer 3			WL	60	100			
CLAY - Layer 3			W	60	100			
CLAY - Layer 4			NL	60	100			
CLAY - Layer 4			BL	60	100			
CLAY - Layer 4			WL	60	100			
CLAY - Layer 4			W	60	100			
Cmax	PDMROF Maximum storage	m	All	0	20	1-P, 2-P		Mengistu & Spence, 2016
B	PDMROF Shape factor	--	All	0.01	10	1-P, 2-P		

^ Landcover types are: NL=needleaf / coniferous trees; BL=broadleaf / deciduous trees; G=grass (represents wetlands and peatlands in Scenario 1/1-P); U=urban (represents