**Table C.1 - Non-calibrated parameters for Baker Creek MESH modelling**

| Name | Description | Unit | Land-cover^ | Value | Scenario(s) | Rationale | Source(s) |
|---|---|---|---|---|---|---|---|
| **ZBLD** | Height for aggregating surface roughness | m | | 40 | | | Spence and Hedstrom, 2018 |
| **FCAN** | Annual max fraction of the grid cell occupied by the land cover | -- | NL | 0.2078 | 1, 1-P | Coniferous hillslope landcover | |
| | | | BL | 0.0075 | | Deciduous hillslope landcover | |
| | | | G | 0.1592 | | Wetlands and peatlands | |
| | | | U | 0.6255 | | Water and bedrock | |
| | | | NL | 1 | 2, 3, 2-P | Needleleaf landcover type | |
| | | | BL | 1 | | Broadleaf landcover type | |
| | | | WL | 1 | | Grass landcover type | |
| | | | PL | 1 | | Grass landcover type | |
| | | | W | 1 | | Barren landcover type | |
| | | | BR | 1 | | Barren landcover type | |
| **QA50** | Reference value of shortwave radiation used in calculation of stomatal resistance of the vegetation canopy | W m-2 | NL | 30 | 1, 2, 3, 1-P, 2-P | QA50, VPDA, VPDB, PSGA, and PSGB are part of the same equation as RSMN; therefore, only calibrating RSMN | Verseghy, 2012 |
| | | | BL | 40 | | | |
| | | | G | 30 | 1, 1-P | | |
| | | | WL | 30 | 2, 3, 2-P | | |
| | | | PL | 30 | | | |
| **VPDA** | Vapour pressure deficit coefficient "A" (calc. stomatal resistance of canopy) | -- | NL | 0.65 | 1, 2, 3, 1-P, 2-P | | |
| | | | BL | 0.5 | | | |
| | | | G | 0.5 | 1, 1-P | | |
| | | | WL | 0.5 | 2, 3, 2-P | | |
| | | | PL | 0.5 | | | |
| **VPDB** | Vapour pressure deficit coefficient "B" (calc. stomatal resistance of canopy) | -- | NL | 1.05 | 1, 2, 3, 1-P, 2-P | | |
| | | | BL | 0.6 | | | |
| | | | G | 1 | 1, 1-P | | |
| | | | WL | 1 | 2, 3, 2-P | | |
| | | | PL | 1 | | | |
| **PSGA** | Soil moisture suction coefficient "A") (calc. stomatal resistance of canopy) | -- | NL | 100 | 1, 2, 3, 1-P, 2-P | | |
| | | | BL | 100 | | | |
| | | | G | 100 | 1, 1-P | | |
| | | | WL | 100 | 2, 3, 2-P | | |
| | | | PL | 100 | | | |
| **PSGB** | Soil moisture suction coefficient "B") (calc. stomatal resistance of canopy) | -- | NL | 5 | 1, 2, 3, 1-P, 2-P | | |
| | | | BL | 5 | | | |
| | | | G | 5 | 1, 1-P | | |
| | | | WL | 5 | 2, 3, 2-P | | |
| | | | PL | 5 | | | |
| **DRN, XDRAIN** | Drainage index - controls water seepage from bottom of soil column (fraction from 0-1) | -- | All | 1 | 1, 1-P | | |
| | | | NL, BL, BR | 1 | 2, 3, 2-P | | |
| | | | WL, PL, W | 0.25 | 2, 3, 2-P | | |
| **FARE** | Active fraction of grid cell | -- | | 1 | 1, 2, 3, 1-P, 2-P | | University of Saskatchewan, 2019 |
| **DD, DDEN** | Estaimated drainage density of the GRU | km km-2 | All | 0.0036 | 1, 1-P | | |
| | | | NL, WL, W | 2 | 2, 3, 2-P | | |
| | | | BL, PL, BR | 0.0036 | 2, 3, 2-P | | |
| **XSLP, XSLOPE** | Est. avg. slope of GRU; see "Notes on Interflow" doc (wiki) | -- | All | 0.06 | 1 | 0.06 is the estimated. avg. slope of the land based on slope analysis and then zonal raster statistics in QGIS | |
| | | | NL, BL, BR | 0.06 | 2, 3 | Based on slope analysis and then zonal raster statistics in QGIS | |
| | | | WL, PL | 0.005 | | | |
| | | | W | 0.002 | | | |
| **WFCI, KS, KSAT** | Saturated surface soil conductivity | m s-1 | BR | 1.00E-09 | 2, 3 | See Dingman Figure 7.9 - between unfractured and fractured rock | Dingman, 2015 |
| **MID** | Set the mosaic tile ID > 0 | -- | All | 1 | 1, 2, 3, 1-P, 2-P | | |
| **SAND - Layer 1** | | % | All | 0 | 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 |
| **CLAY - Layer 1** | | % | All | 39.92 | 1, 1-P | | |
| **ORGM - Layer 1** | | % | All | 60.08 | 1, 1-P | | |
| **ORGM - Layer 2** | | | | 39.6265 | | | |
| **ORGM - Layer 3** | | | | 10.07 | | | |
| **ORGM - Layer 4** | | | | 0 | | | |
| **SAND - Layer 1** | Percent content of sand in the mineral soil; -2=organic soil, -3=rock | % | NL | -2 | 2, 3, 2-P | | Guan, Spence, & Westbrook, 2010; Guan, Westbrook, & Spence, 2010; Spence and Hedstrom 2018; and Dingman, 2015 |
| **SAND - Layer 1** | | | BL | -2 | | | |
| **SAND - Layer 1** | | | WL | -2 | | | |
| **SAND - Layer 1** | | | PL | -2 | | | |
| **SAND - Layer 1** | | | W | -2 | | | |
| **SAND - Layer 1** | | | BR | -3 | | | |
| **SAND - Layer 2** | | | WL | -2 | | | |
| **SAND - Layer 2** | | | PL | -2 | | | |
| **SAND - Layer 2** | | | W | -2 | | | |
| **SAND - Layer 2** | | | BR | -3 | | | |
| **SAND - Layer 3** | | | PL | -2 | | | |
| **SAND - Layer 3** | | | BR | -3 | | | |
| **SAND - Layer 4** | | | PL | -3 | | | |
| **SAND - Layer 4** | | | BR | -3 | | | |

^ 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.1 - Non-calibrated parameters for Baker Creek MESH modelling**

| Name | Description | Unit | Land-cover^ | Value | Scenario(s) | Rationale | Source(s) |
|---|---|---|---|---|---|---|---|
| **CLAY - Layer 1** | Percent content of clay in the mineral soil | % | NL | 0 | 2, 3, 2-P | | Guan, Spence, & Westbrook, 2010; Guan, Westbrook, & Spence, 2010; Spence and Hedstrom 2018; Dingman, 2015 |
| **CLAY - Layer 1** | | | BL | 0 | | | |
| **CLAY - Layer 1** | | | WL | 0 | | Wetland: 0.2-0.6m peat over impervious lacustrine clay | |
| **CLAY - Layer 1** | | | PL | 0 | | | |
| **CLAY - Layer 1** | | | W | 0 | | | |
| **CLAY - Layer 1** | | | BR | 0 | | | |
| **CLAY - Layer 2** | | | WL | 0 | | Wetland: 0.2-0.6m peat over impervious lacustrine clay | |
| **CLAY - Layer 2** | | | PL | 0 | | | |
| **CLAY - Layer 2** | | | W | 0 | | | |
| **CLAY - Layer 2** | | | BR | 0 | | | |
| **CLAY - Layer 3** | | | PL | 0 | | | |
| **CLAY - Layer 3** | | | BR | 0 | | | |
| **CLAY - Layer 4** | | | PL | 0 | | | |
| **CLAY - Layer 4** | | | BR | 0 | | | |
| **ORGM - Layer 1** | Percent content of organic matter in the mineral soil; if sand=-2, 1.0=fibric, 2.0=hemic, 3.0=sapric | % | NL | 1 | 2, 3, 2-P | | Guan, Spence, & Westbrook, 2010; Guan, Westbrook, & Spence, 2010; Spence and Hedstrom 2018; and Dingman, 2015 |
| **ORGM - Layer 1** | | | BL | 1 | | | |
| **ORGM - Layer 1** | | | WL | 1 | | Wetland: 0.2-0.6m peat over impervious lacustrine clay | |
| **ORGM - Layer 1** | | | PL | 1 | | Peatland: 1.2m peat overlying bedrock | |
| **ORGM - Layer 1** | | | W | 1 | | | |
| **ORGM - Layer 1** | | | BR | 0 | | | |
| **ORGM - Layer 2** | | | NL | 5 | | | |
| **ORGM - Layer 2** | | | BL | 5 | | | |
| **ORGM - Layer 2** | | | WL | 2 | | Wetland: 0.2-0.6m peat over impervious lacustrine clay | |
| **ORGM - Layer 2** | | | PL | 2 | | Peatland: 1.2m peat overlying bedrock | |
| **ORGM - Layer 2** | | | W | 2 | | | |
| **ORGM - Layer 2** | | | BR | 0 | | | |
| **ORGM - Layer 3** | | | NL | 0 | | | |
| **ORGM - Layer 3** | | | BL | 0 | | | |
| **ORGM - Layer 3** | | | WL | 0 | | Wetland: 0.2-0.6m peat over impervious lacustrine clay | |
| **ORGM - Layer 3** | | | PL | 3 | | Peatland: 1.2m peat overlying bedrock | |
| **ORGM - Layer 3** | | | W | 0 | | | |
| **ORGM - Layer 3** | | | BR | 0 | | | |
| **ORGM - Layer 4** | | | NL | 0 | | | |
| **ORGM - Layer 4** | | | BL | 0 | | | |
| **ORGM - Layer 4** | | | WL | 0 | | Wetland: 0.2-0.6m peat over impervious lacustrine clay | |
| **ORGM - Layer 4** | | | PL | 0 | | Peatland: 1.2m peat overlying bedrock | |
| **ORGM - Layer 4** | | | W | 0 | | | |
| **ORGM - Layer 4** | | | BR | 0 | | | |
| **TBAR - Layer 1** | Temperature of the soil layer | deg C | All | 4.5 | 1, 1-P | | Spence and Hedstrom, 2018; Morse et al, 2016 |
| | | | NL, BL | 5.438 | 2, 3, 2-P | | |
| | | | WL, W | 4.052 | | | |
| | | | PL | 7.552 | | | |
| | | | BR | 9.261 | | | |
| **TBAR - Layer 2** | | | All | 5.5 | 1, 1-P | | |
| | | | NL | 4 | 2, 3, 2-P | | |
| | | | BL | 1 | | | |
| | | | WL | 2.821 | | | |
| | | | PL | 6.134 | | | |
| | | | W | 2.821 | | | |
| | | | BR | 10.591 | | | |
| **TBAR - Layer 3** | | | All | 4.5 | 1, 1-P | | |
| | | | NL | 2 | 2, 3, 2-P | | |
| | | | BL | 0.5 | | | |
| | | | WL | 0.5 | | | |
| | | | PL | 2.5 | | | |
| | | | W | 0.5 | | | |
| | | | BR | 8 | | | |
| **TBAR - Layer 4** | | | All | 0 | 1, 1-P | | |
| | | | NL | -0.5 | 2, 3, 2-P | | |
| | | | BL | -0.5 | | | |
| | | | WL | -0.5 | | | |
| | | | PL | -0.5 | | | |
| | | | W | -0.5 | | | |
| | | | BR | 2 | | | |
| **TCAN** | Air temperature of the canopy | deg C | All | 3.565 | 1, 2, 3, 1-P, 2-P | | Spence and Hedstrom, 2018 |
| **TSNO** | Temp. of the snow mass present on the ground surface; 0.0 if none | deg C | All | 0 | 1, 2, 3, 1-P, 2-P | | |
| **TPND** | Temp. of the liquid water stored on the ground surface; 0.0 if none | deg C | All | 4.784 | 1, 2, 3, 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

**Table C.1 - Non-calibrated parameters for Baker Creek MESH modelling**

| Name | Description | Unit | Land-cover^ | Value | Scenario(s) | Rationale | Source(s) |
|---|---|---|---|---|---|---|---|
| **THLQ - Layer 1** | Volumetric liquid water content stored in the soil | m3 m-3 | All | 0.4308 | 1, 1-P | | Spence and Hedstrom, 2018; Morse et al, 2016 |
| | | | NL | 0.2498 | 2, 3, 2-P | | |
| | | | BL | 0.2498 | | | |
| | | | WL | 0.5888 | | | |
| | | | PL | 0.726 | | | |
| | | | W | 1 | | | |
| | | | BR | 0.01 | | | |
| **THLQ - Layer 2** | | | All | 0.5513 | 1, 1-P | | |
| | | | NL | 0.3657 | 2, 3, 2-P | | |
| | | | BL | 0.3657 | | | |
| | | | WL | 0.7637 | | | |
| | | | PL | 0.8246 | | | |
| | | | W | 1 | | | |
| | | | BR | 0.01 | | | |
| **THLQ - Layer 3** | | | All | 0.5513 | 1, 1-P | | |
| | | | NL | 0.3657 | 2, 3, 2-P | | |
| | | | BL | 0.3657 | | | |
| | | | WL | 0.7637 | | | |
| | | | PL | 0.8246 | | | |
| | | | W | 0.7637 | | | |
| | | | BR | 0.01 | | | |
| **THLQ - Layer 4** | | | All | 0.5513 | 1, 1-P | | |
| | | | NL | 0.3657 | 2, 3, 2-P | | |
| | | | BL | 0.3657 | | | |
| | | | WL | 0.3657 | | | |
| | | | PL | 0.3657 | | | |
| | | | W | 0.3657 | | | |
| | | | BR | 0.01 | | | |
| **THIC - Layer 1** | Volumetric frozen water content stored in the soil | m3 m-3 | All | 0 | 1, 2, 3, 1-P, 2-P | Will start the model when soil is unfrozen | |
| **THIC - Layer 2** | | | All | 0 | 1, 2, 3, 1-P, 2-P | | |
| **THIC - Layer 3** | | | All | 0 | 1, 2, 3, 1-P, 2-P | | |
| **THIC - Layer 4** | | | All | 0 | 1, 2, 3, 1-P, 2-P | | |
| **ZPND** | Depth of liquid water stored on the ground surface | m | All | 0 | 1, 2, 3, 1-P, 2-P | Will start when no ponding/recent rain events | |
| **RCAN** | Liquid water component of precip. held on the veg. canopy | kg m-2 | All | 0 | 1, 2, 3, 1-P, 2-P | | |
| **SCAN** | Frozen water component of precip. held on the veg. canopy | kg m-2 | All | 0 | 1, 2, 3, 1-P, 2-P | Will start the model when soil is unfrozen | |
| **SNO** | Snow mass present on the ground surface | kg m-2 | All | 0 | 1, 2, 3, 1-P, 2-P | | |
| **ALBS** | Albedo of the snow mass present on the ground surface; 0.0 is no such mass exists | -- | All | 0.2 | 1, 2, 3, 1-P, 2-P | | |
| **RHOS** | Density of the snow mass present on the ground surface; 0.0 if no such mass exists | kg m-3 | All | 100 | 1, 2, 3, 1-P, 2-P | | |
| **GRO** | Set to 0.0 before leaf-out; 1.0 when fully-leafed; or estimate the growth index with a fraction if in between | -- | All | 1 | 1, 2, 3, 1-P, 2-P | | |
| **Cmin** | PDMROF Minimum storage capacity | m | All | 0 | 1-P, 2-P | | |
| **K1** | PDMROF Time constant for the first linear reservoir | hr | All | 0 | 1-P, 2-P | | |
| **K2** | PDMROF Time constant for the second linear reservoir | hr | All | 0 | 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

**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

## Ranked NSE Values for 100 Calibration Trials

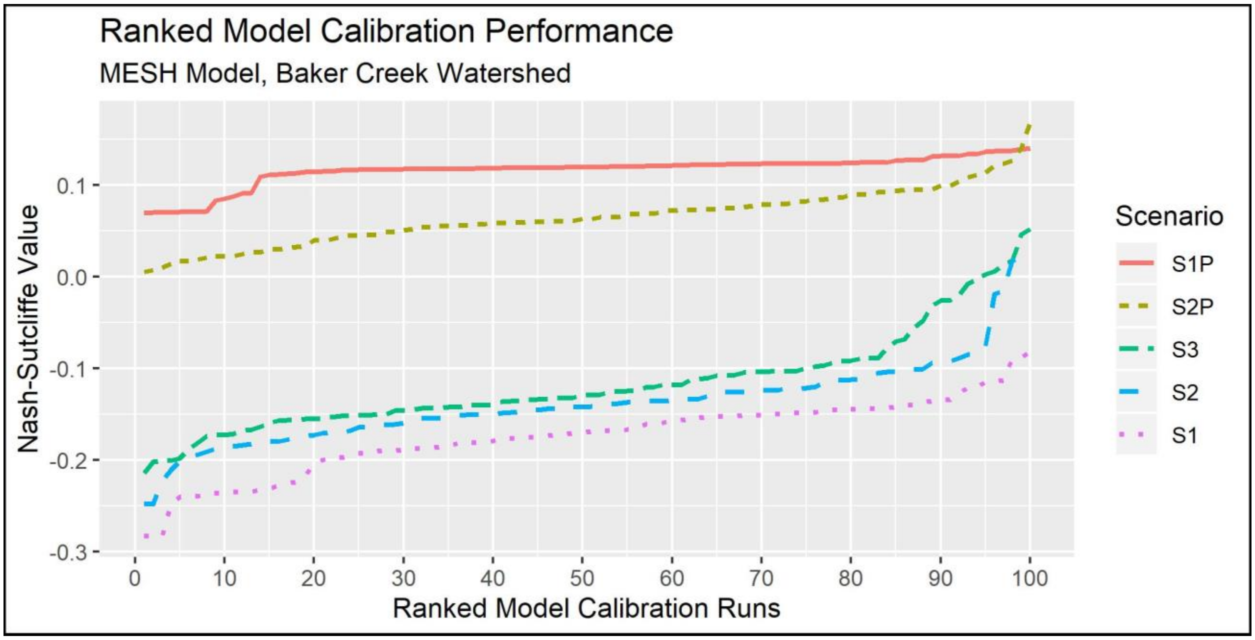
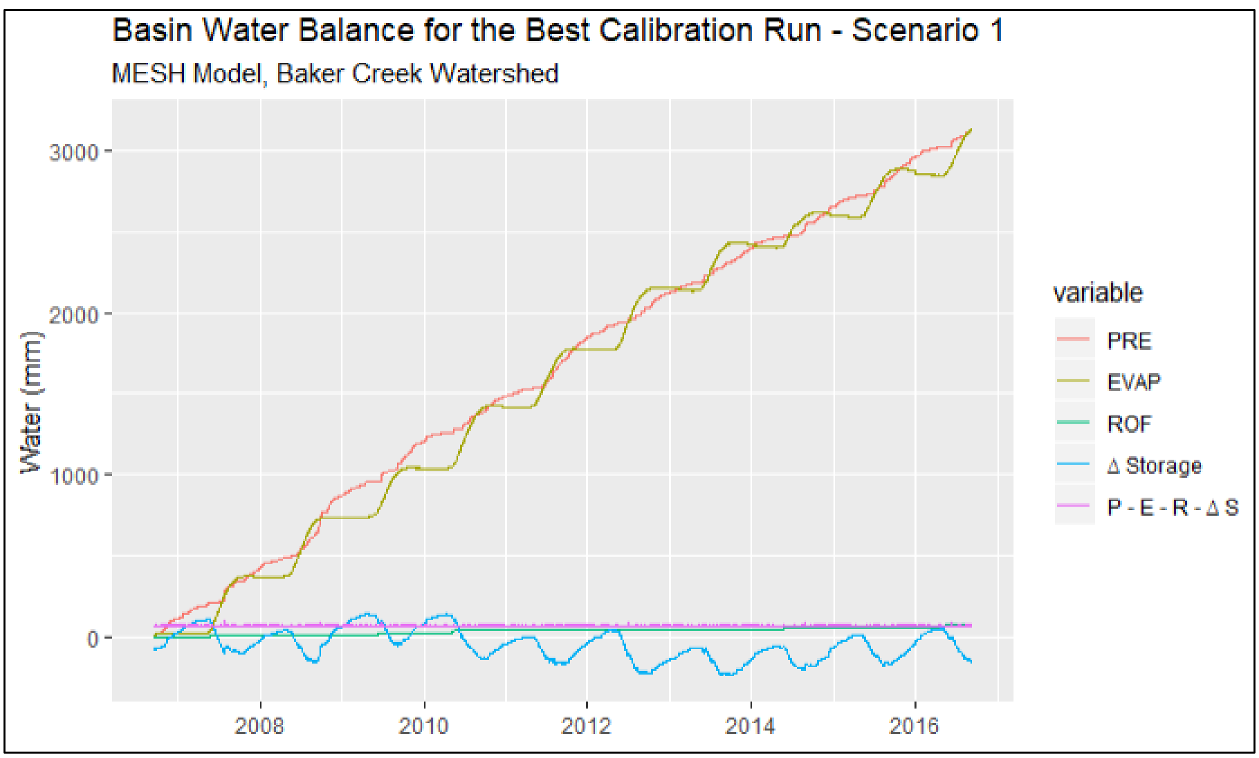
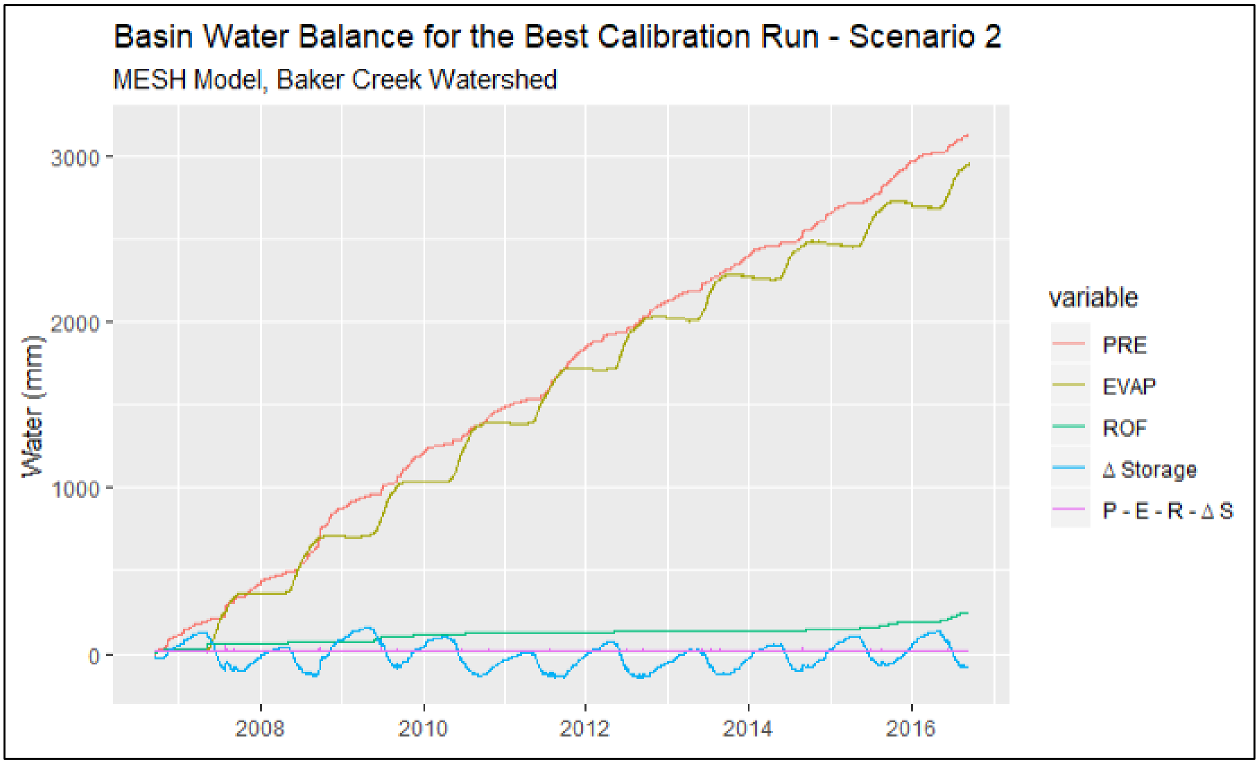
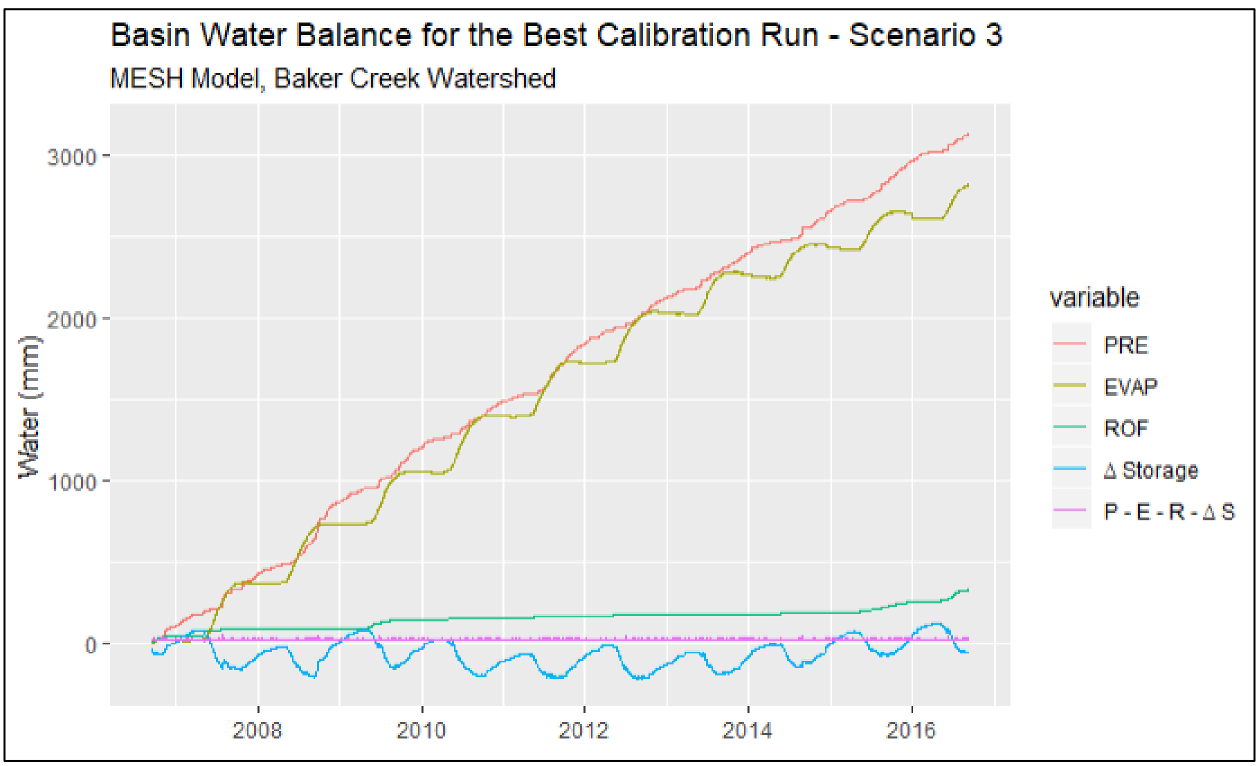


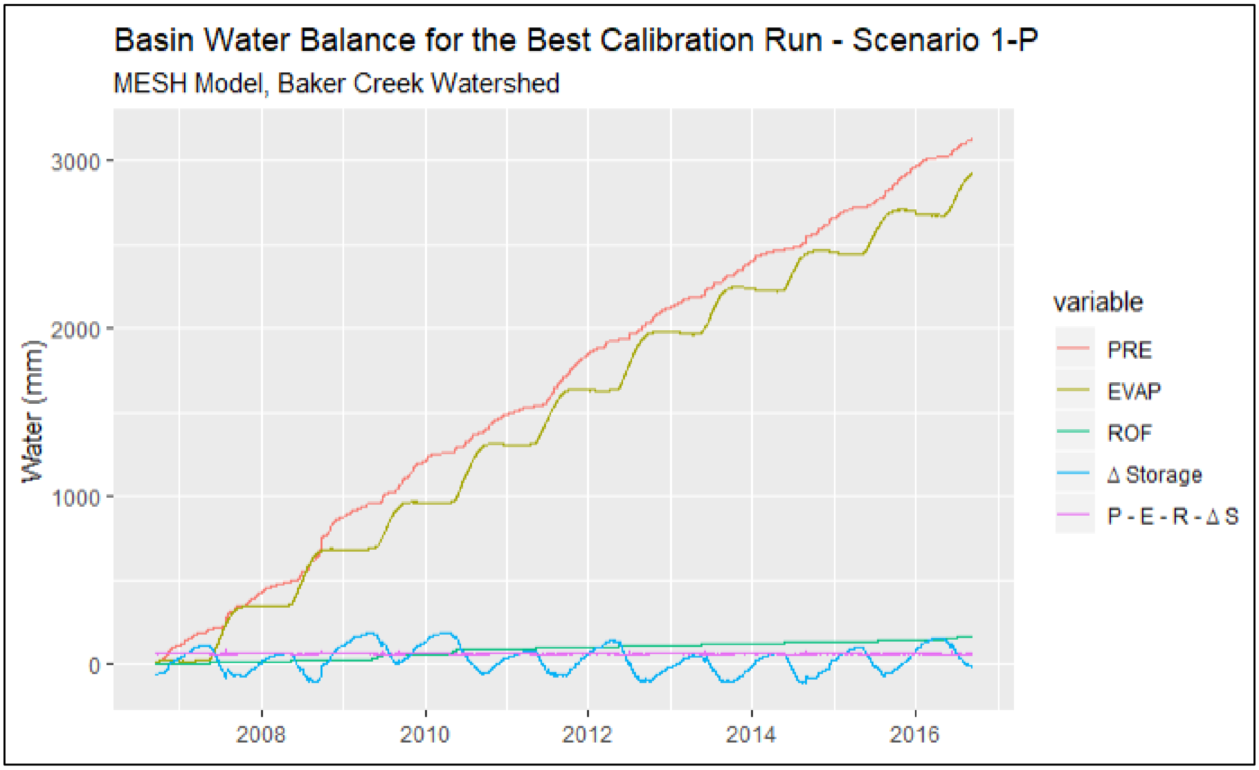

*Figure C.1 – Ranked model calibration performance for all Scenarios modelled in the Baker Creek Watershed.*

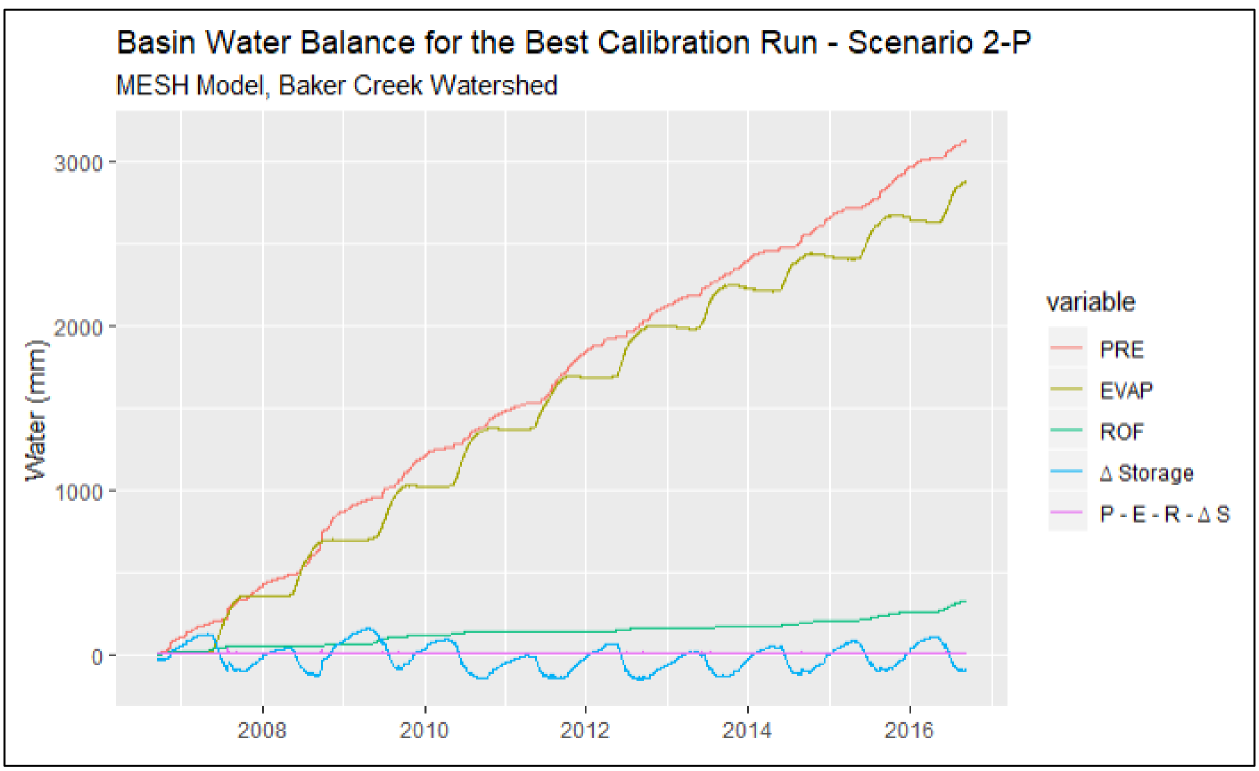
## Water Balance Plots




Basin Water Balance for the Best Calibration Run - Scenario 2
MESH Model, Baker Creek Watershed
Water (mm)
3000
2000
1000
0
2008
2010
2012
2014
2016
variable
PRE
EVAP
ROF
Δ Storage
P - E - R - Δ S


Basin Water Balance for the Best Calibration Run - Scenario 3
MESH Model, Baker Creek Watershed
Water (mm)
3000
2000
1000
0
2008
2010
2012
2014
2016
variable
PRE
EVAP
ROF
Δ Storage
P - E - R - Δ S


Basin Water Balance for the Best Calibration Run - Scenario 1-P
MESH Model, Baker Creek Watershed
Water (mm)
3000
2000
1000
0
2008
2010
2012
2014
2016
variable
PRE
EVAP
ROF
Δ Storage
P - E - R - Δ S


Basin Water Balance for the Best Calibration Run - Scenario 2-P
MESH Model, Baker Creek Watershed
Water (mm)
3000
2000
1000
0
2008
2010
2012
2014
2016
variable
PRE
EVAP
ROF
Δ Storage
P - E - R - Δ S