

Table S1. HL-RDHM parameters and their sampled ranges for sensitivity analysis.

| Parameter | Description | Lower Bound | Upper Bound |
|-----------|--|-------------|-------------|
| LZFPM | Lower zone free water primary maximum storage | 8.8 | 58.8 |
| LZFSM | Lower zone free water supplemental maximum storage | 19.2 | 193.2 |
| LZPK | Lower zone primary withdrawal rate | 0.0408 | 0.264 |
| LZSK | Lower zone supplemental withdrawal rate | 0.00168 | 0.0175 |
| LZTWM | Lower zone tension water maximum storage | 61.6 | 249.6 |
| PCTIM | Permanent impervious area (%) | 0 | 0.05 |
| PFREE | Percolation to lower zone (%) | 0.16 | 0.55 |
| REXP | Percolation equation exponent | 1.69 | 3.47 |
| UZFWM | Upper zone free water maximum storage | 8.8 | 64.8 |
| UZK | Upper zone free water withdrawal rate | 0.19 | 0.76 |
| UZTWM | Upper zone tension water maximum storage | 19.2 | 78 |
| ZPERC | Maximum percolation rate under dry conditions | 27.2 | 140.4 |
| ADIMP | Saturated impervious area (%) | 0 | 0.2 |
| RIVA | Riparian vegetation area (%) | 0 | 0.2 |

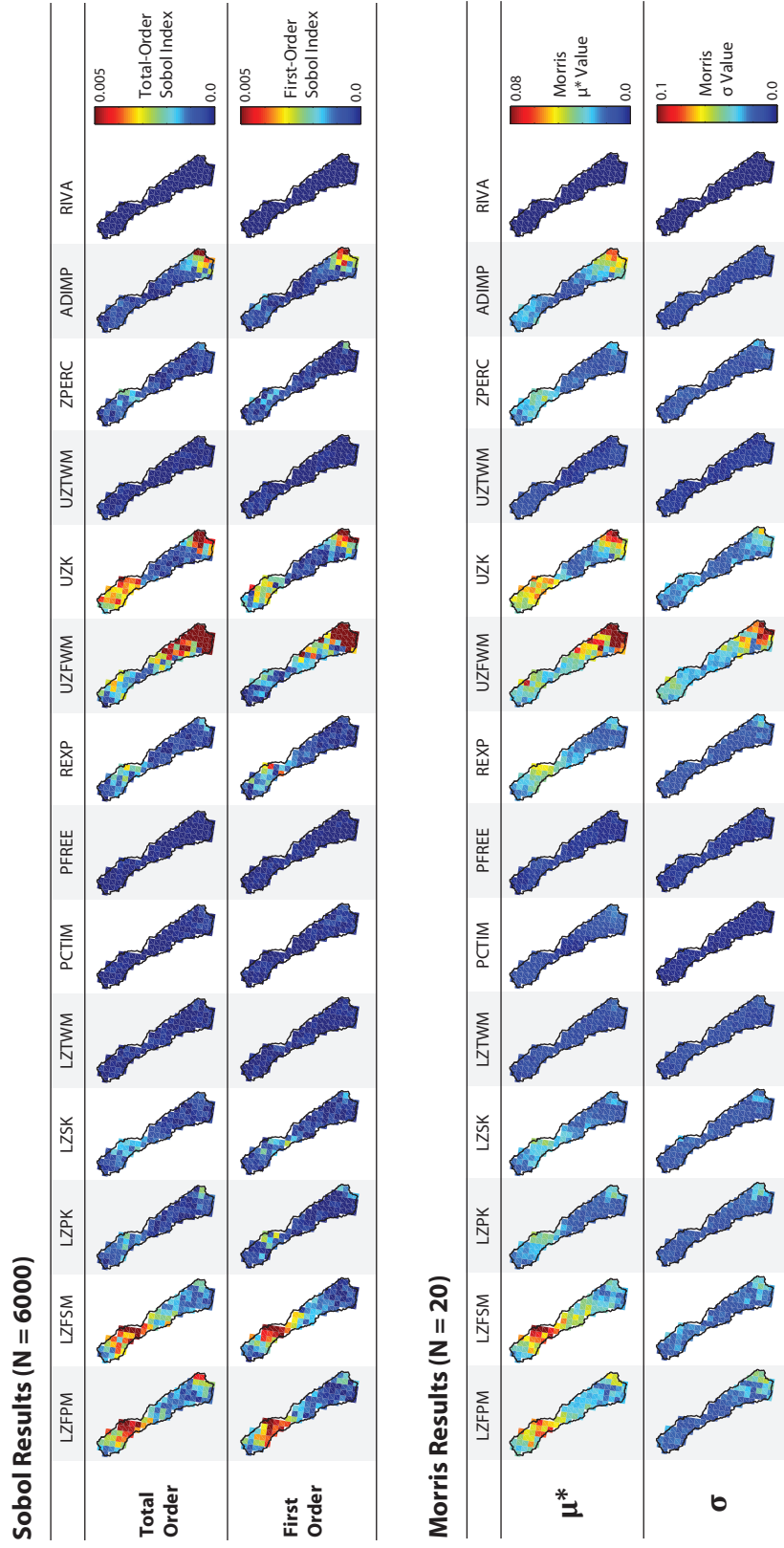


Fig. S1. Results from the Sobol' and Morris methods, including the first-order Sobol' indices and the Morris standard deviation values (σ). The first-order Sobol' indices appear quite similar to the corresponding total-order indices, suggesting that individual parameters may be more important than their interactions. For the method of Morris, the σ values are most apparent in cells with high μ^* values.