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BEE 6740: Week 10 Assignment
Ecohydrologic Processes and Model Transferability

Purpose:
Ecohydrological modeling relies on multiple parameters to the describe the area of analysis. Every model requires calibration to some dataset that fits with the desired use of the model; models designed for the northeast US are calibrated differently from models designed for the southwest US because the hydrologic and meteorological conditions are very different. However, even within a specific watershed, yearly conditions may change and can impact model calibration. A particularly wet, dry, warm or cold year may change how the model works. These considerations are especially important when considering how climate change may impact hydrologic cycles and our ability to model future conditions.

Methods:
Four periods were analyzed for the Fall Creek watershed: 1964-1965, 1993-1994, 1994-1995, and 2010-2011. USGS and meteorological data were obtained to compare to modeled results for flow. The DDS Algorithm provided was used to determine model parameters by iterating over multiple runs with stochastic modeling methodology. The model parameters solved for were forest cover, time to peak of hydrograph (Tp), cutoff for maximum PET allowed per day (PETcap), baseflow recession coefficient (rec_coef), minimal daily curve number (CN) value (Se_min), coefficient relating daily CN value to soil water (C1), and initial abstraction coefficient (Ia_coef), along with NSE.

Conclusion:
Analysis showed that model calibration to the different periods provided different results in coefficient determination. Table 1 shows the range of values and how they compare. Some of the parameters remain similar or on the same order of magnitude across the different years, but none of them remain constant across periods. Sensitivity analyses would help determine what the most important parameters are in the simulations.

Table 1: Four periods of analysis for hydrologic model calibration.

	warm year 1964-1965	cool year 1993-1994	dry year 1994-1995	wet year 2010-2011
Forest Cover	0.74917	0.56137	0.11381	0.23594
Tp	9.37231	5.15148	5.69700	5.19925
PETcap	4.44846	5.79042	4.26276	5.03332
rec_coef	0.15723	0.18350	0.10304	0.12408
Se_min	74.88747	71.67507	66.52128	7.35057
C1	1.68978	1.24296	1.01671	3.94846
la_coef	0.05751	0.05546	0.05230	0.10116
NSE_best	0.44843	0.66781	0.64348	0.63253

The four periods were plotted to show how the “best” model simulation compares to the observed data for flow. Figures 1-4 show the comparisons. When calibrated specifically to the period of interest, the model performs well and closely follows the observed flows. However, running the model with parameters calibrated outside of the period of interest would return results that do not follow the observed data as well.

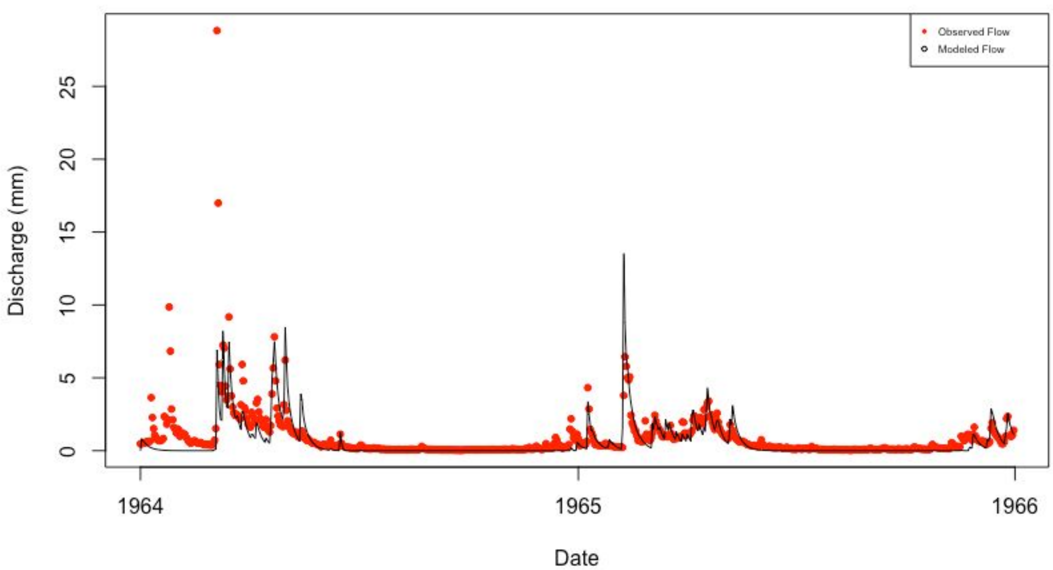

Figure 1: 1964-1966 discharge values for observed and simulated flow.

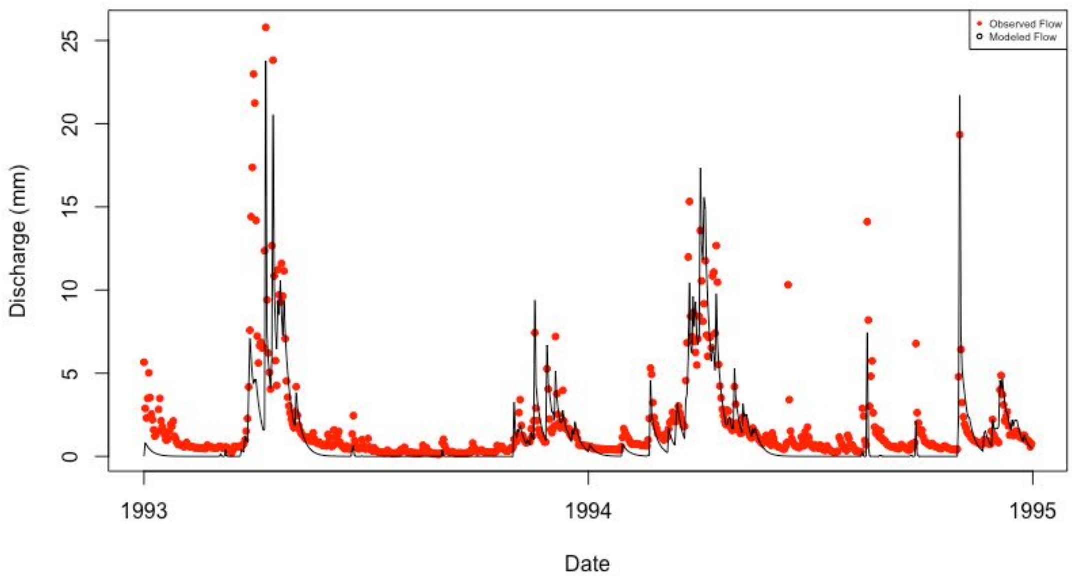

Figure 2: 1993-1995 discharge values for observed and simulated flow.

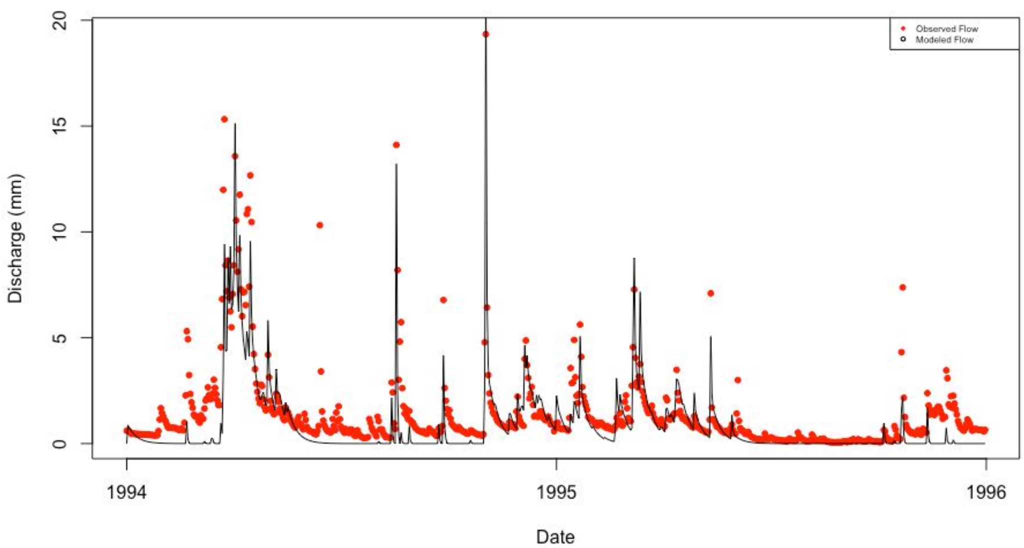

Figure 3: 1994-1996 discharge values for observed and simulated flow.

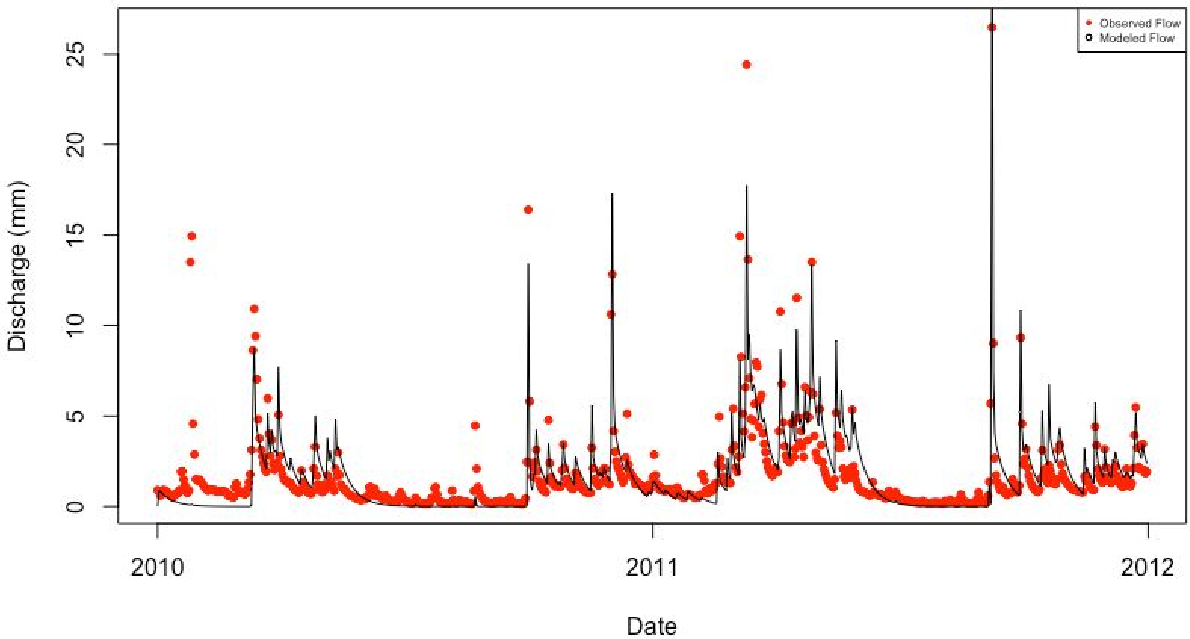

Figure 4: 2010-2012 discharge values for observed and simulated flow.