

Calibration of a Sub-Daily SWAT Model and Validation using Different Land Use Data to Examine the Impacts of Land Use Changes

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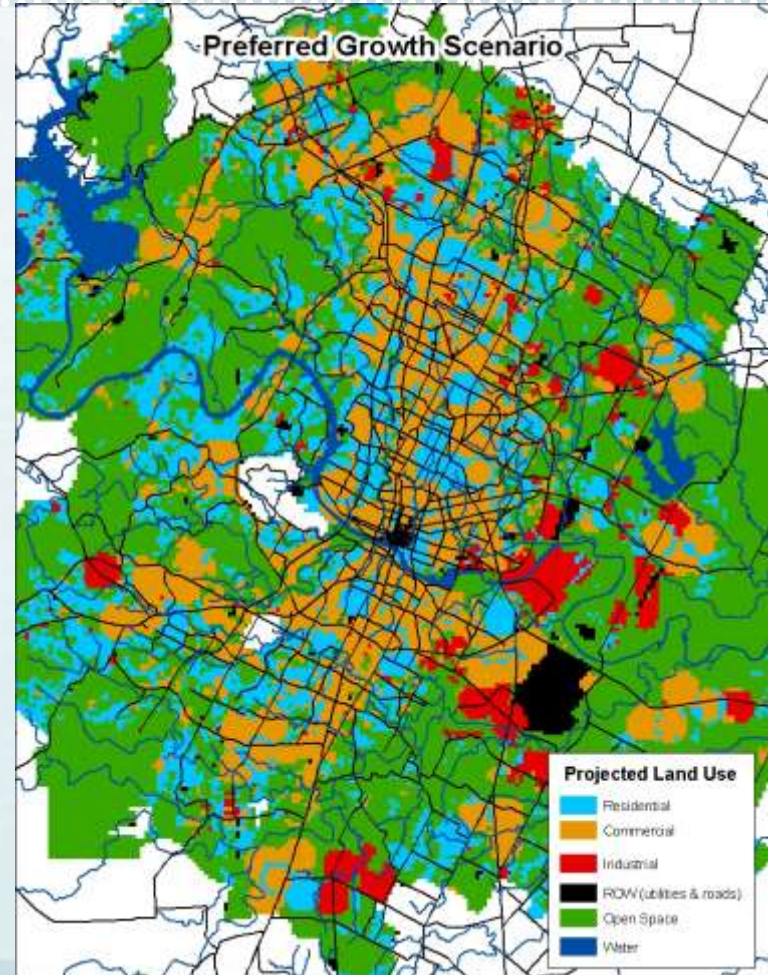
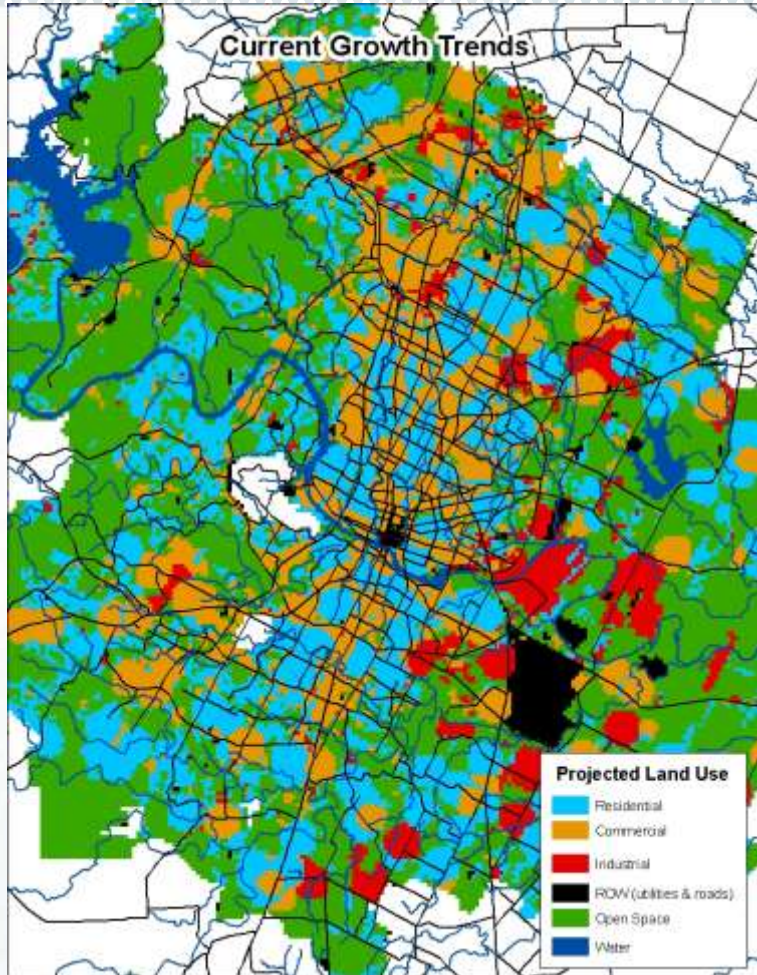
City of Austin, Texas

Presented at

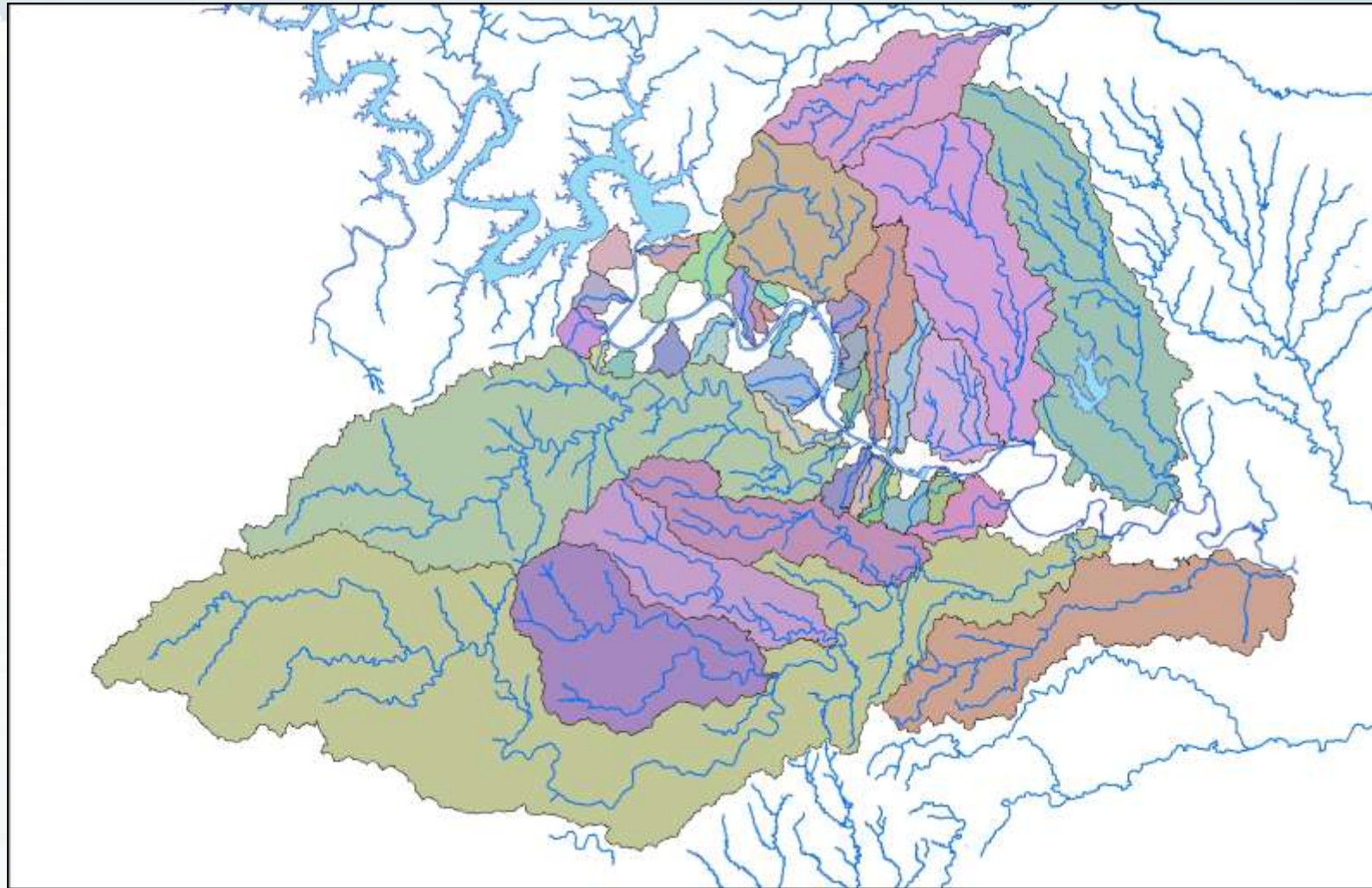
2011 International SWAT Conference

Toledo, Spain

Differing Growth Scenarios



Project Area – Austin, Texas

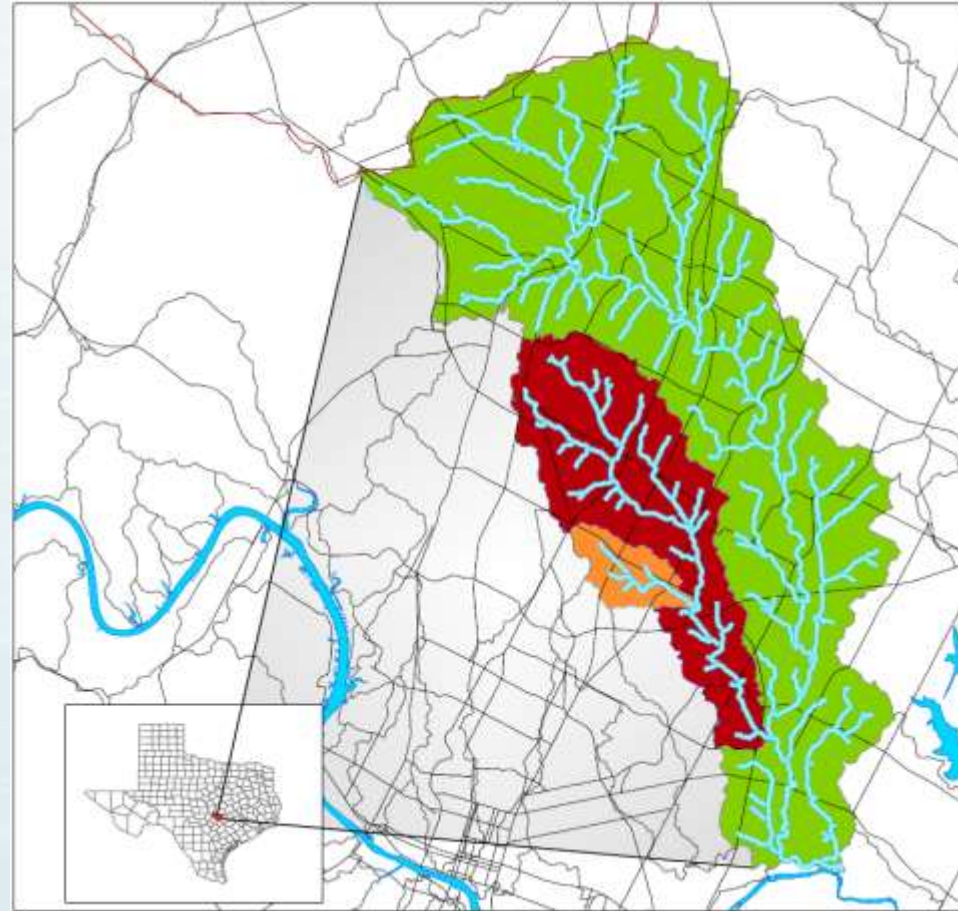


Purpose and Objectives

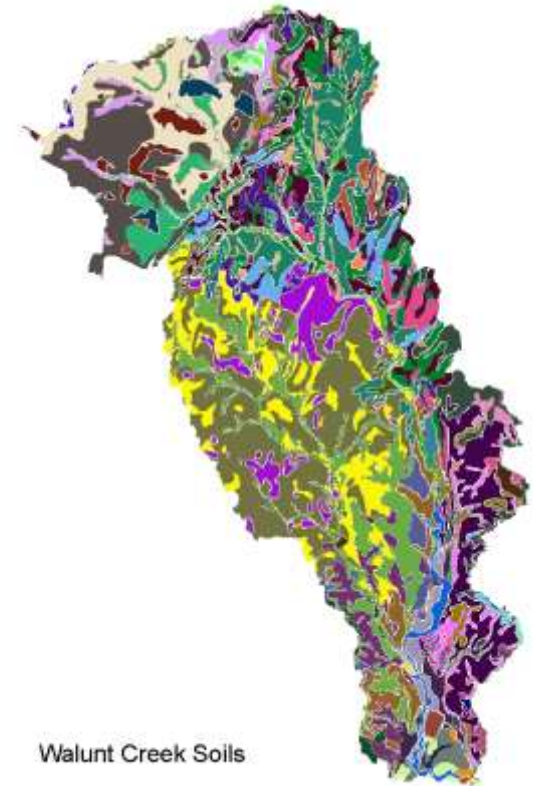
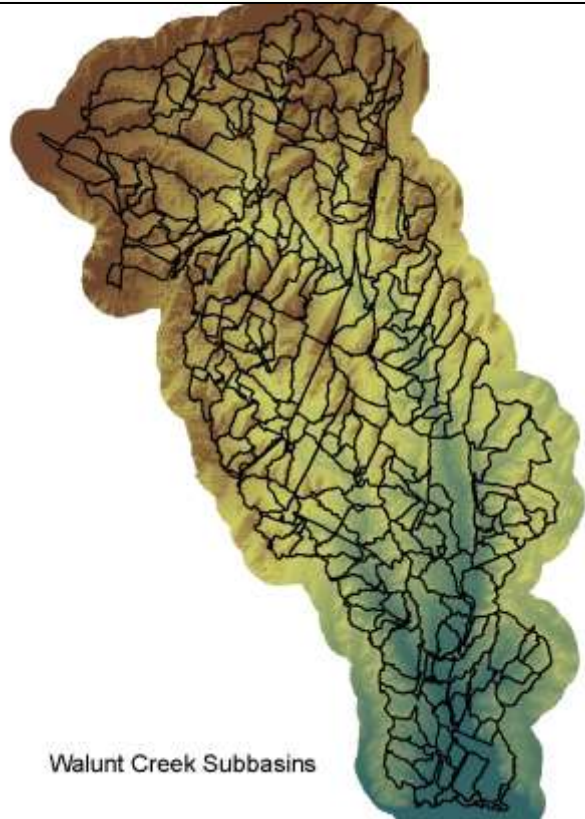
- Develop a paradigm to evaluate different growth scenarios with respect to flooding, erosion and water quality.
- Calibrate a sub-daily SWAT model using existing land use.
- Validate the model using different land use, also validating the theory that different land use can be applied in SWAT

Study Area - Walnut Creek

- 145.8 km² watershed
- USGS gage data 1967 to present
- 3-m DEMs
- SURRGO Soils
- 15-minute rainfall at 18 gauges
- Lot level land use
- 298 sub-basins
- ~4500 HRUs



Study Area - Walnut Creek

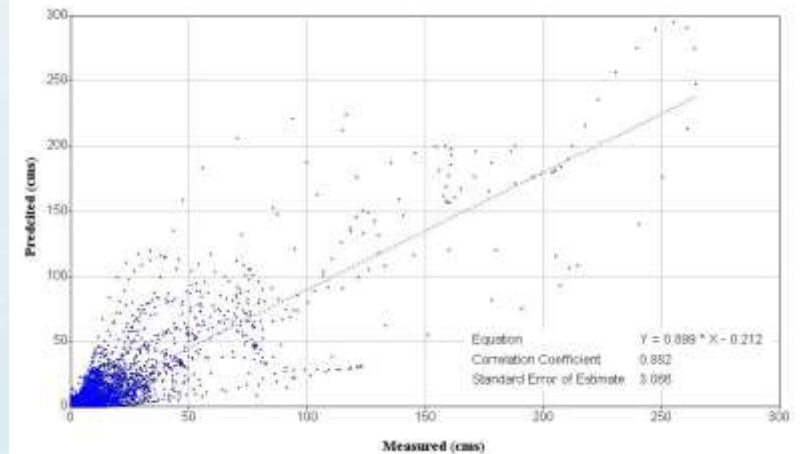
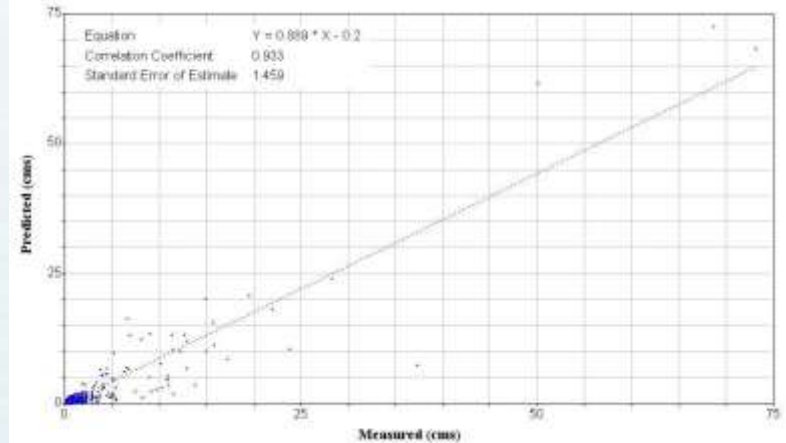


Calibration Parameters

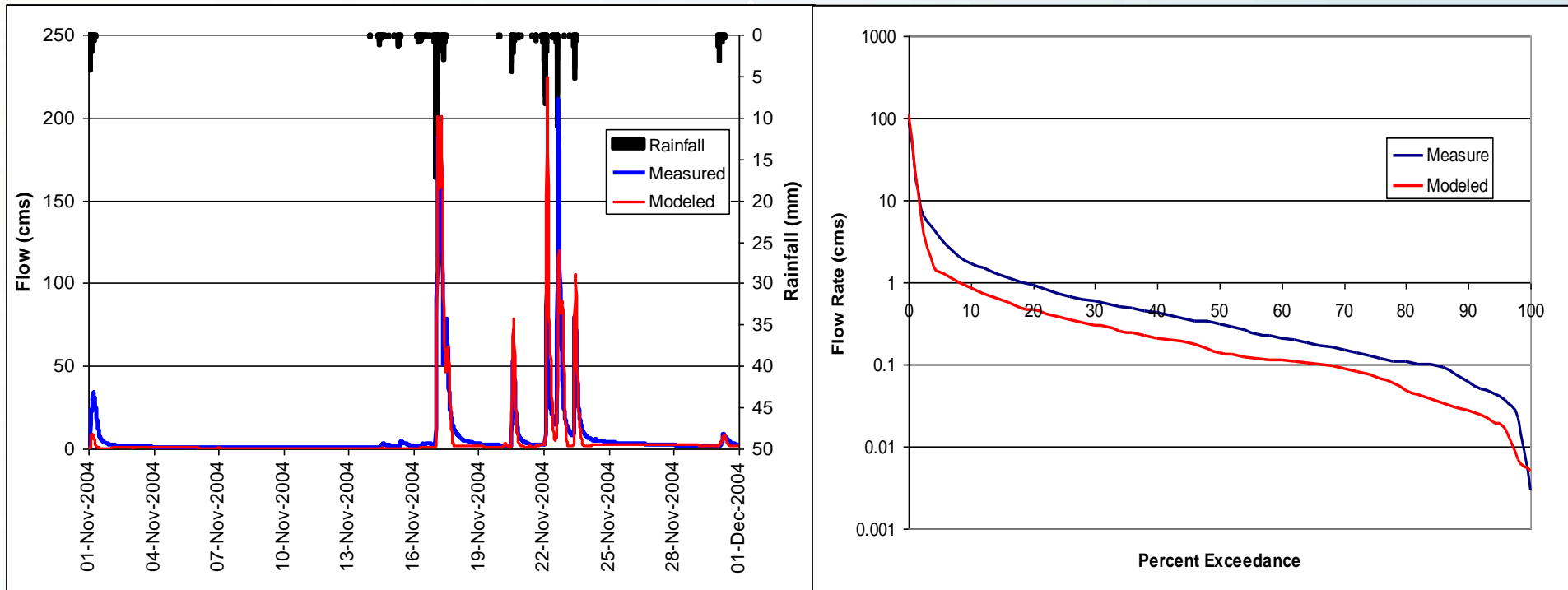
| | Daily | Sub-daily |
|----------|------------------|-----------|
| Iuh | Triangular | Gamma |
| Ualpha | n/a | 3 |
| IRTE | Variable Storage | Muskingum |
| Alpha_bf | 0.03 | 0.75 |
| GW_Delay | 60 | 10 |
| ch_n | 0.014 | 0.01 |
| ch_k2 | 0 | 10 |
| AWC | +3% | 0 |
| CN | -3 | 0 |

Calibration Results

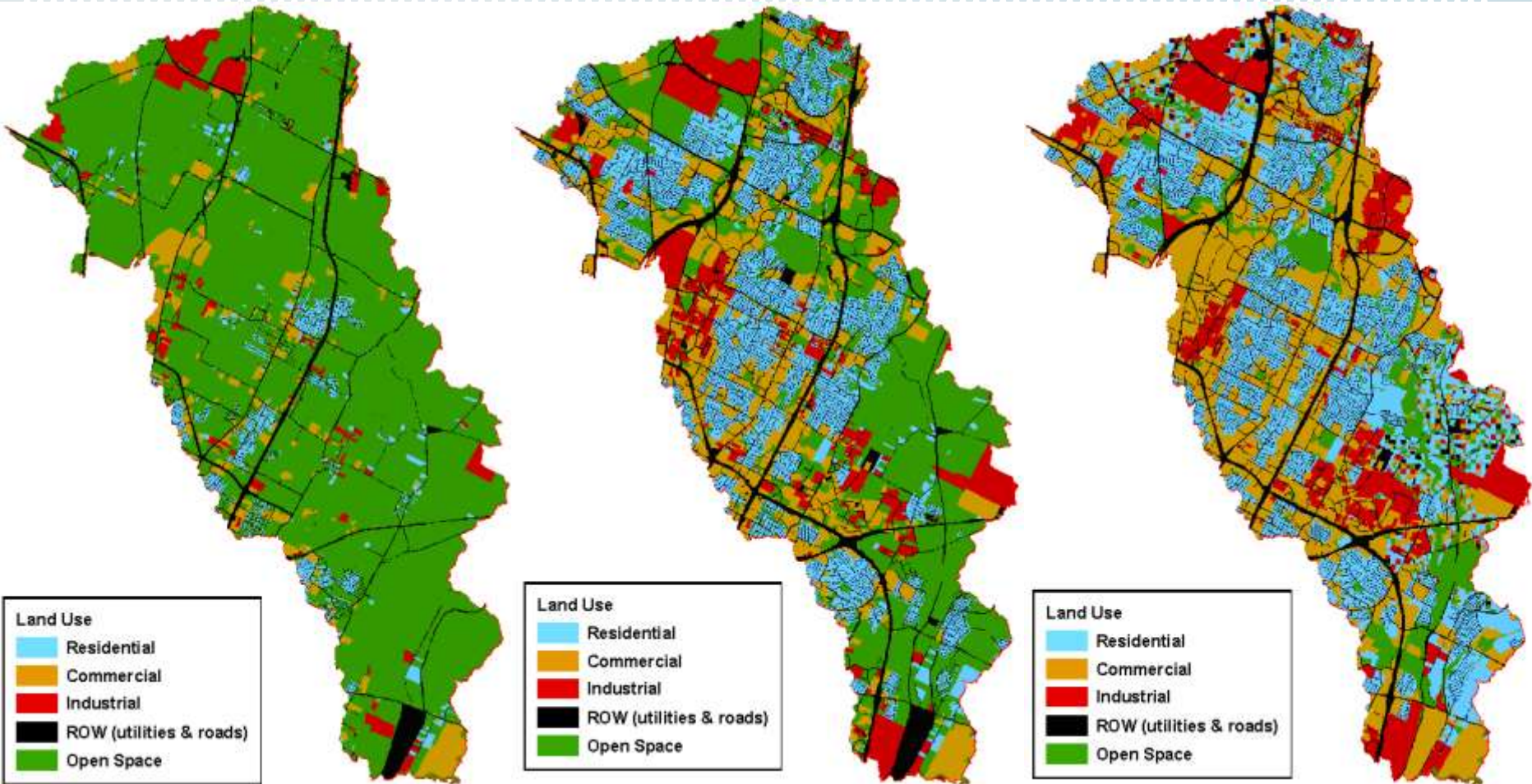
- Daily – NSE = 0.86,
 $r^2 = 0.87$
- Sub-daily – NSE = 0.74,
 $r^2 = 0.78$
- Good storm flow baseflow ratio
- Under predicts total flow on most ranges
- Better predictions of hydrology than daily CN model.



Calibration Results

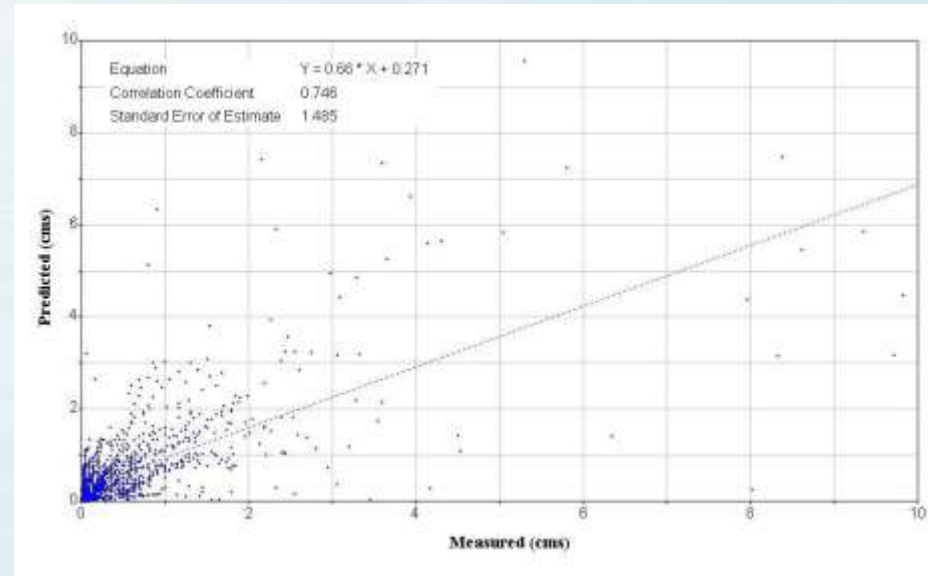


Walnut Land Use Scenarios

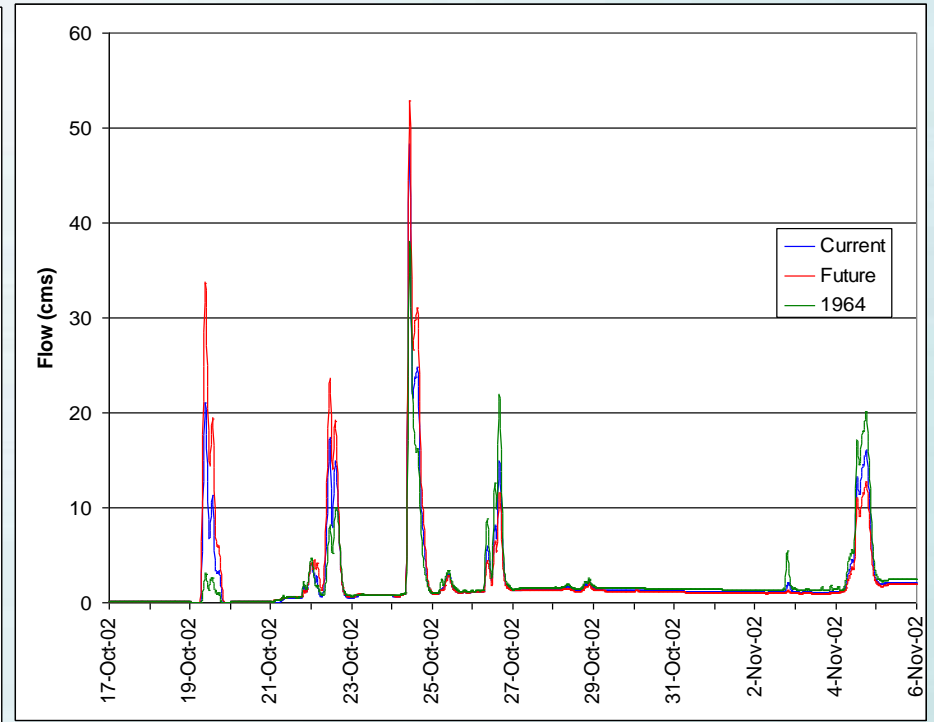
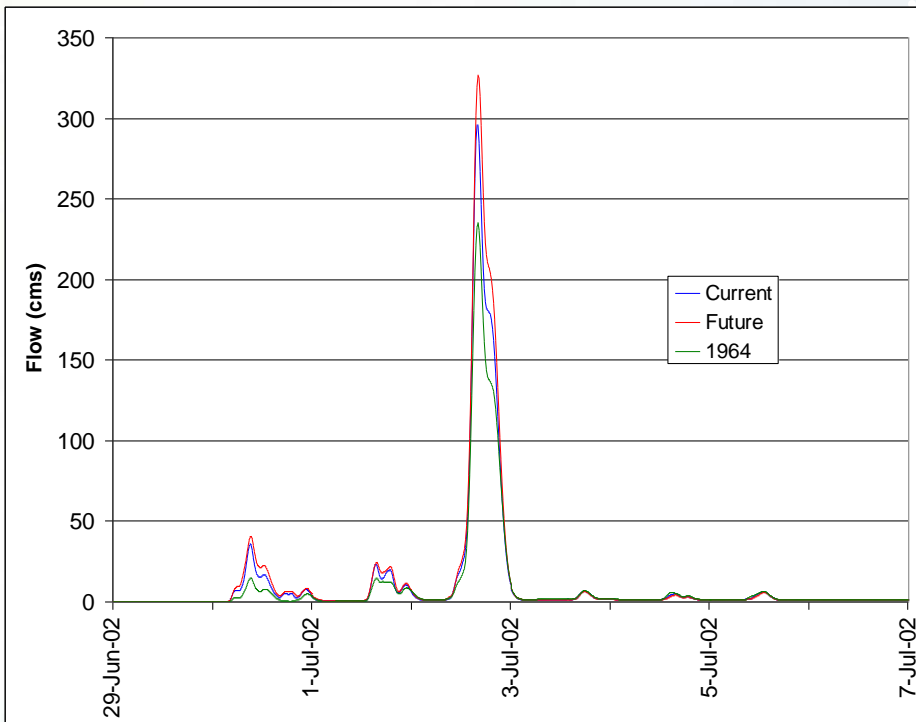


Model Validation

- Hourly rainfall
- Land use estimated from earlier period
- Daily only – NSE = 0.57, $r^2 = 0.56$
- Baseflow ratio good
- Over predicted total flow



Model Results



Conclusions

- In this case, only minor calibration adjustments in the sub-daily model were required.
- The sub-daily model results were better than the daily model results.
- Applying different land use scenarios to SWAT produces reasonable predictions of hydrology without further calibration.
- These results may be used to evaluate the impacts on flooding, erosion and water quality.

Questions?

