Using remote sensing and geospatial techniques in hydrological applications

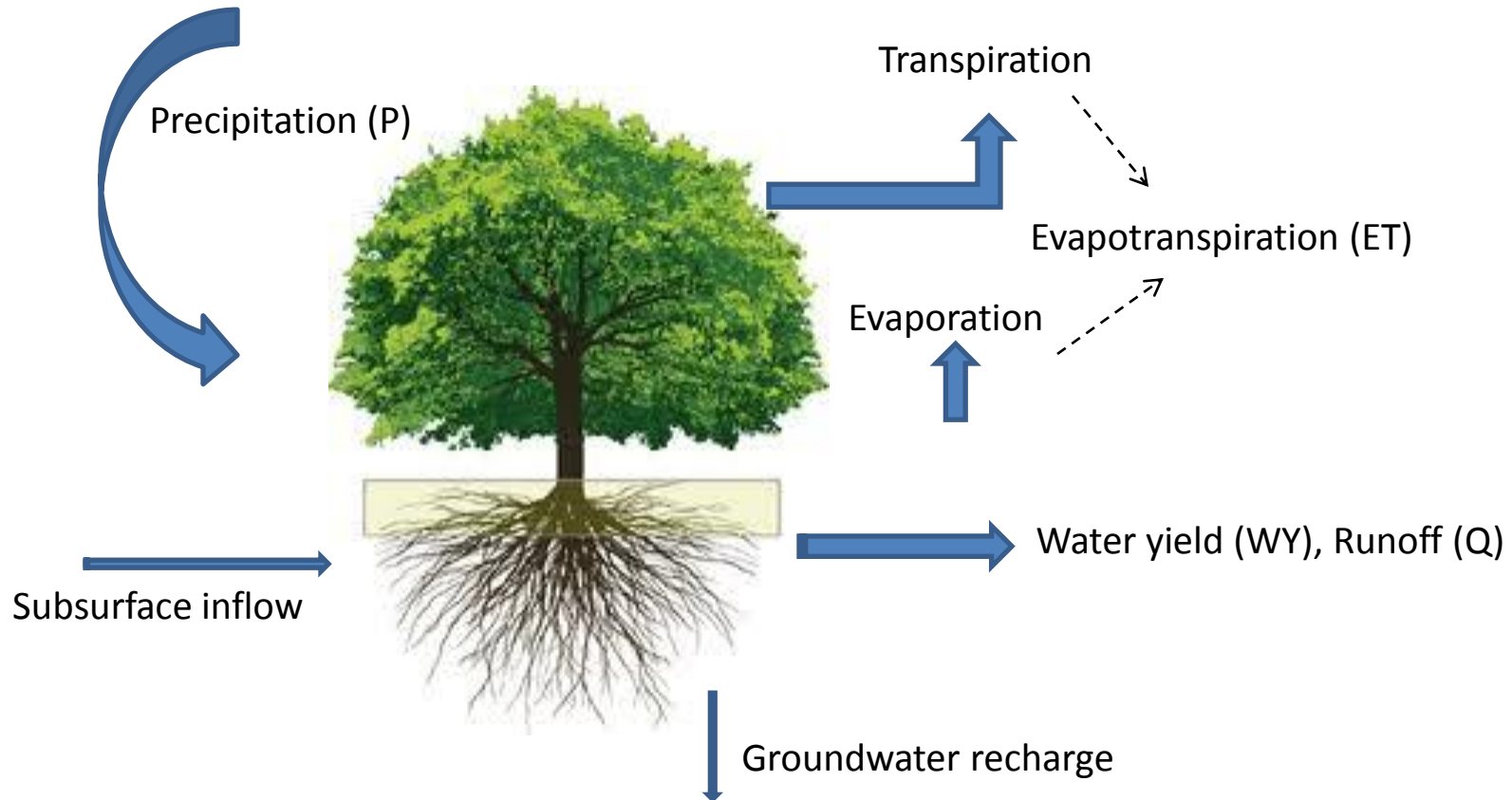Nishan Bhattarai and Lindi J. Quackenbush

Environmental Resources Engineering

SUNY College of Environmental Science and Forestry

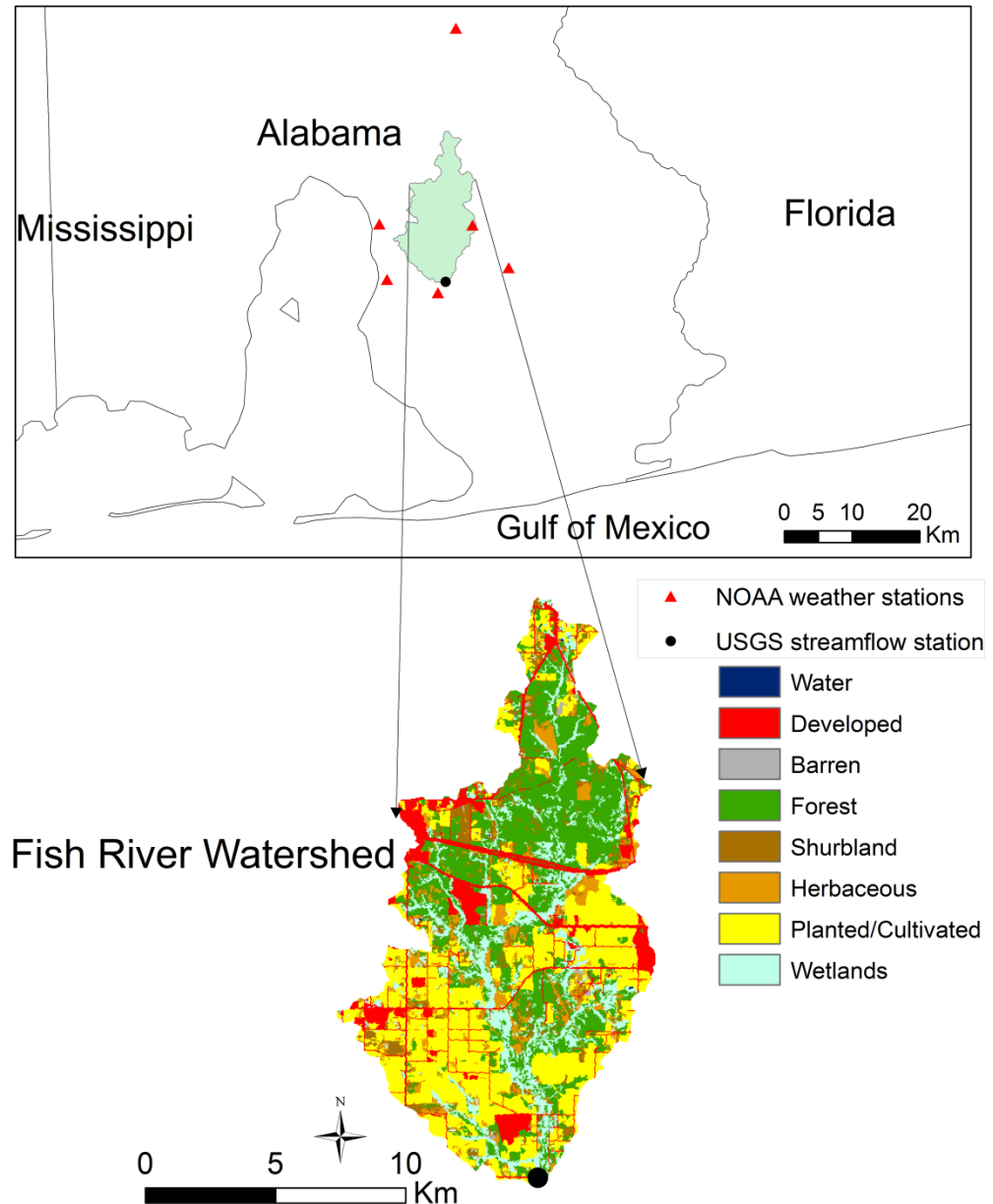Syracuse, NY

Water Balance Equation

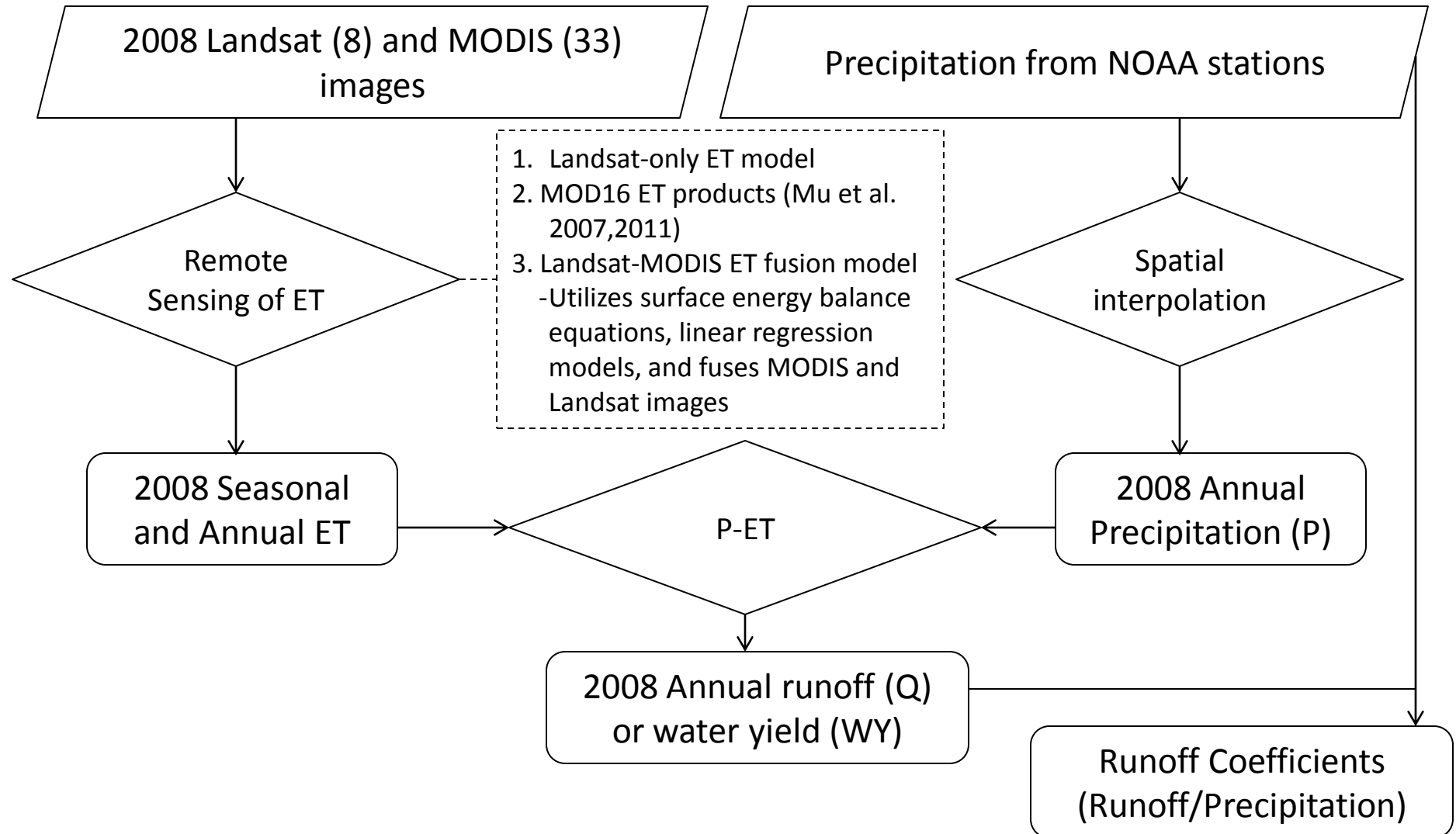$$P = ET + Q \text{ (Runoff)} + \Delta S \text{ (change in storage)}$$

Objective and Study Area

Main objective

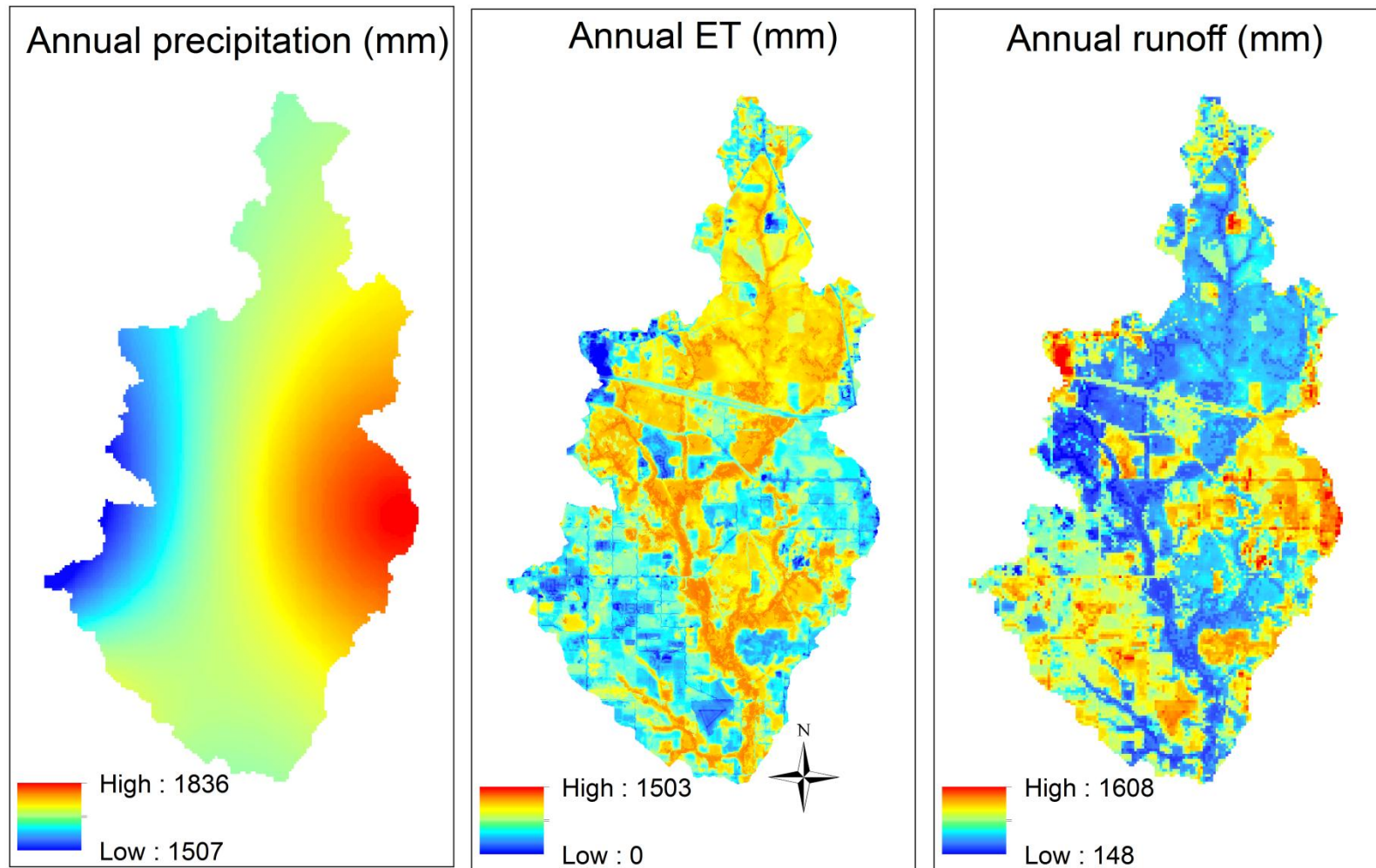Use remote sensing and geospatial techniques to estimate runoff at a watershed level

Fish River Watershed

Legend:
- ▲ NOAA weather stations
- ● USGS streamflow station
- Water
- Developed
- Barren
- Forest
- Shurbland
- Herbaceous
- Planted/Cultivated
- Wetlands

Methods

2008 Landsat (8) and MODIS (33) images

Precipitation from NOAA stations

Remote Sensing of ET

1. Landsat-only ET model
2. MOD16 ET products (Mu et al. 2007,2011)
3. Landsat-MODIS ET fusion model
   -Utilizes surface energy balance equations, linear regression models, and fuses MODIS and Landsat images

Spatial interpolation

2008 Seasonal and Annual ET

P-ET

2008 Annual Precipitation (P)

2008 Annual runoff (Q) or water yield (WY)
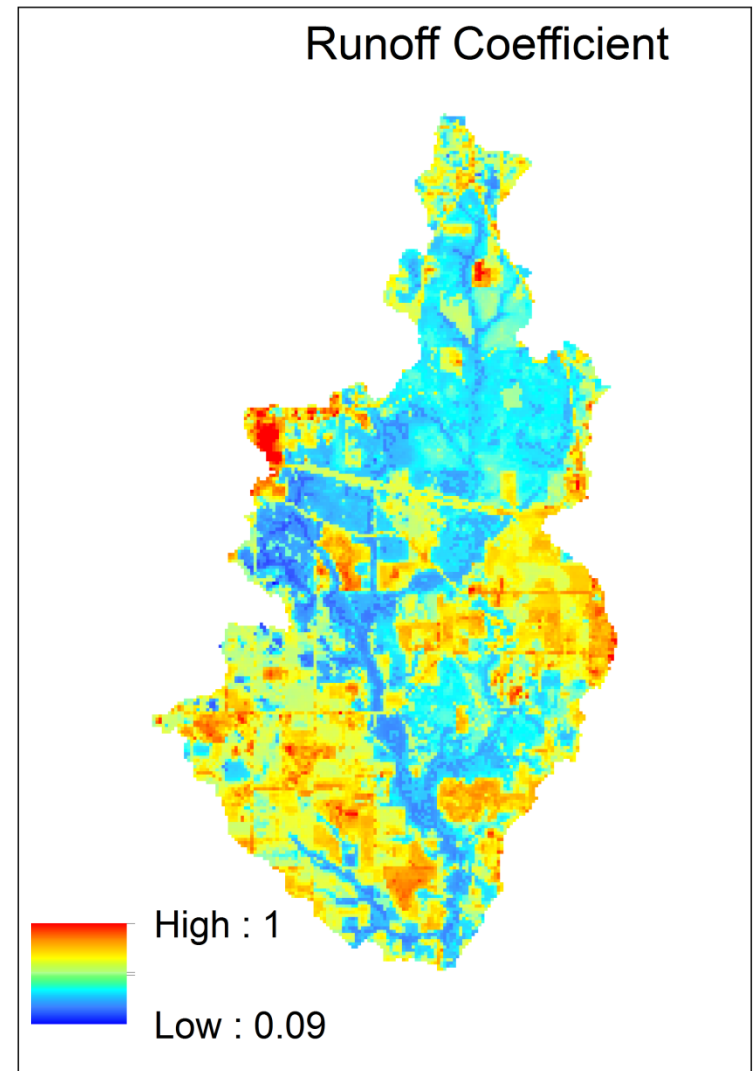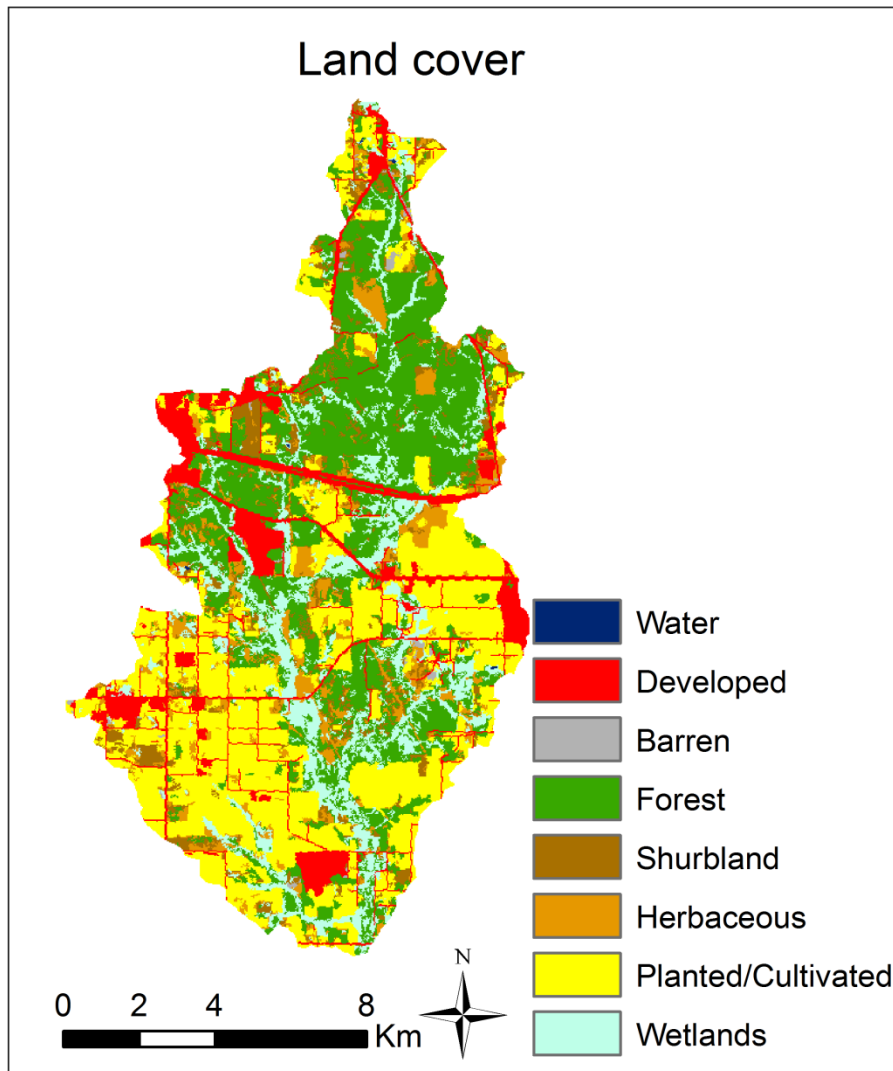
Runoff Coefficients (Runoff/Precipitation)
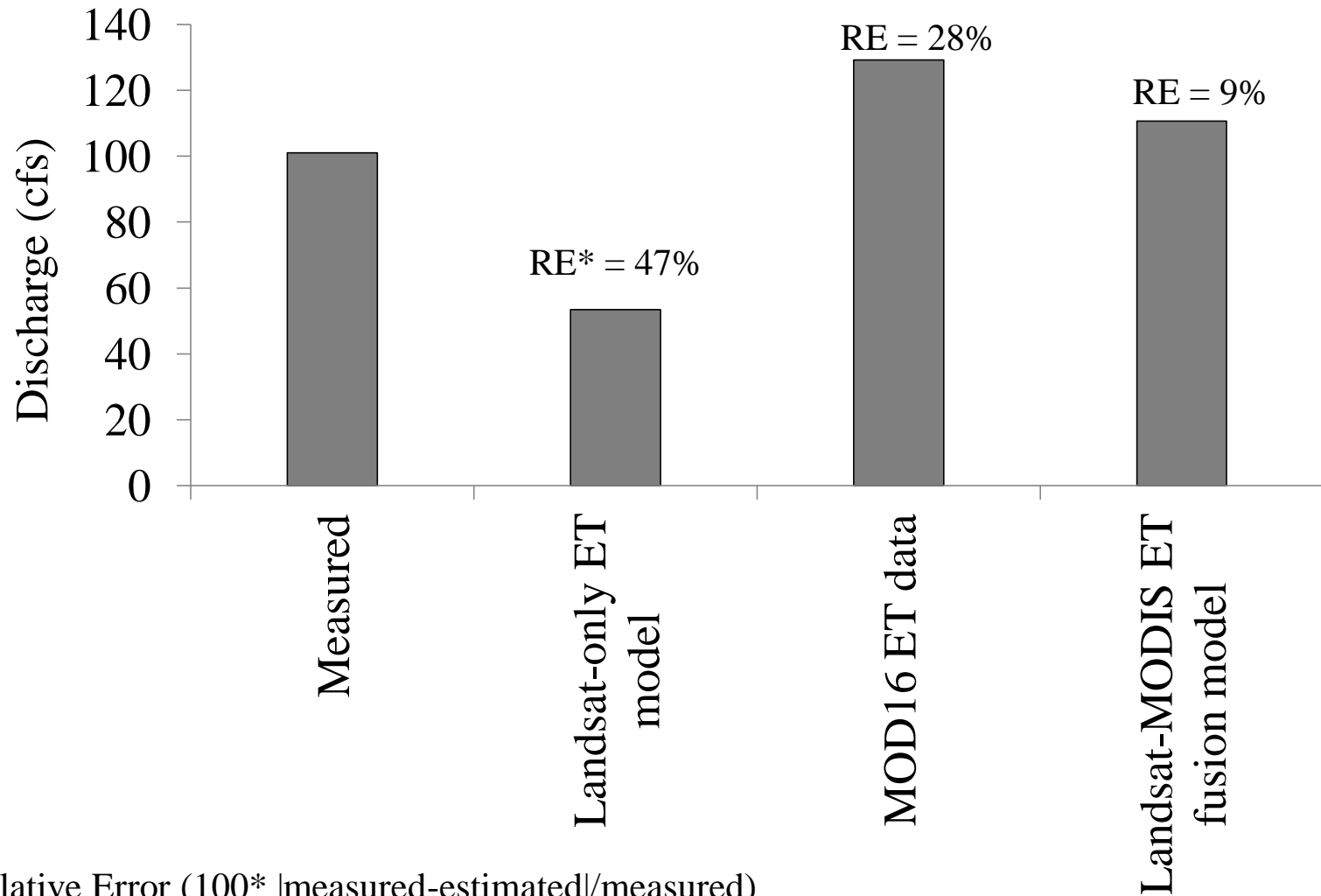
Results- ET and runoff

2008 annual precipitation; and estimated ET and runoff using Landsat-MODIS ET fusion model

Results-runoff coefficients

Annual Discharge in cubic feet per second (cfs) at the USGS station

RE* = Relative Error (100* |measured-estimated|/measured)

Conclusions

- Our Landsat-MODIS ET fusion model was found to be useful in predicting watershed annual ET and runoff with good accuracies.

- Future study will study changes in surface runoff under different Land use and land cover change scenarios.

- Future study will also cover other years and watersheds.