Assimilating real-time observations of stream discharge into rainfall-runoff models can improve the accuracy of the streamflow forecasts. The level of improvement, however, depends on the availability and quality of observation stations and the updating scheme used. Few studies have assimilated data from multiple sites to update state-variables in different parts of the model domain. In this work, we present an experimental study on assimilating streamflow discharge into a semi-distributed hydrological model, using the Short-term Water Information Forecasting Tools (SWIFT), developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia. Various state-update schemes are tested to evaluate their assimilation efficiencies and to examine the relationship between scheme performance and hydrometeorological conditions. Based on application to historic data, we examine the forecast improvements from assimilating discharge observations at the catchment outlet and from assimilating discharge observations at both the catchment outlet and the joint points of sub-catchments. We also compare the forecasting results based on different state updating schemes assimilating discharge observations at the catchment outlet. Finally, implications of the results for operational flood forecasting based on the continuous streamflow model are discussed.