Many large basins of the world are located in developing countries where the hydrometric networks are limited and where hydrological models have the potential to contribute to water resources management. However, because of limited observational data, it is often difficult to establish models through normal calibration methods (manual or automatic). It is also difficult to ensure that models are adequately representing the dominant hydrological processes, a problem further exacerbated by spatial scale issues and the typically large size of the units (sub-basins) used within the models. If models do not satisfactorily represent the hydrological processes, they may not be representing the runoff responses from the un-gauged parts of the basin and may not be useful for investigating the impacts of water use or land use developments in the future. This paper reports on a hydrological modelling study in the Congo River Basin where the available stream flow data are limited to 16 gauging stations within the total basin area of 3,680,000 km². The initial application of the model (Pitman monthly time-step model) involved manual calibration and the identification of behavioural parameter sets through an ensemble approach using monte carlo sampling from uniform parameter distributions. The next step involved an exploration of the behavioural parameter sets in the context of all available basin physical property data (topography, drainage patterns, geology, soils, vegetation, etc.) in an attempt to constrain the plausible parameter sets to those that are conceptually realistic and consistent with real hydrological processes.