The Congo Basin is the World's third largest in size, and second only to the Amazon River in discharge. Monitoring discharge in the main channels of rivers and upland tributaries as well as storage changes in wetland is necessary for understanding flooding hazards, methane production, sediment transport, and nutrient exchange. Here we hypothesize that although at coarse spatial resolution (~300 km, half-wavelength), the GRACE satellite gravimetry can directly estimate the spatio-temporal variation of the total terrestrial water storage within the Congo Basin. However, because of the geographic distribution of the Inter-Tropical Convergence Zone (ITCZ) and its rainfall implications for surface water flow, large rainfall signal outside of the Congo basin can leak into the basin or sub-basins. As a result, the issue of signal leakage could significantly change GRACE estimates, up to a factor of two (40 mm versus 100 mm in seasonal amplitudes). This research studies methods to improve GRACE equivalent water height (EWH) solutions in the Congo Basin, including validating various signal leakage-corrected, post-processed GRACE data products (including GRACE Tellus and other data products), and wavelet-based regional solutions. We will use simulated numerical experiments and the Hillslope River Routing (HRR) coupled Congo hydrologic and hydraulic model to attempt to assess accuracy of each of the different GRACE solutions. The ultimate goal is to improve our understanding of the storage change and towards reveal the complex hydrologic dynamics in the Congo Basin by using improved GRACE estimates and other satellite data sets.