This study presents the soil erosion and sediment deposition inferred from spatial distribution of radionuclide $^{137}$Cs in undisturbed soils on different bedrock hill slopes, underlain by granite, gneiss and sedimentary rocks in Korea. For estimating the soil erosion, both bulk and core samples were taken from various geomorphic parts along the hills including reference sites which represents the expected inventory of a site experiencing neither erosion nor deposition, i.e., where $^{137}$Cs was initially absorbed in the 1950s. The primary factors influencing the post-depositional redistribution of the radionuclide in hill slope soils have been represented as erosion by overland flow along the hill slopes and diffusion processes by throughflow within the soil profiles. Estimation of the rate of soil erosion inferred from spatial distribution of the radionuclide $^{137}$Cs shows that the soil loss from hill slopes is positively relative to loss of $^{137}$Cs in soil particles. The $^{137}$Cs inventory within soil profiles at the reference sites shows an exponential curve with soil depths regardless of the bedrock types on these hills. However, as compared with that at reference sites, the loss of the $^{137}$Cs inventory on surface soil tends to increase on the upper slopes due to erosion, whereas, redistributions of the $^{137}$Cs in soil particles take place on down slopes by deposition of sediments stripped from upper slopes.