In situ experiments were conducted at various depths in the water column to determine the effects of solar ultraviolet radiation (UVR, 280–400 nm) on photosynthesis of natural phytoplankton assemblages from the subtropical Lake La Angostura (Argentina, 26°45' S; 65°37° W, 1980 m asl.). Water samples were taken daily and incubated under three radiation treatments: (a) Samples exposed to UVR + Photosynthetic Available Radiation (PAR) – PAB treatment (280–700 nm); (b) Samples exposed to ultraviolet-A radiation (UV-A) + PAR – PA treatment (320–700 nm), and, (c) Samples exposed to PAR only – P treatment (400–700 nm). Additionally, depth profiles were done to determine different physical (i.e., temperature and underwater radiation field) and biological characteristics of the water column – photosynthetic pigments, UV-absorbing compounds, cell concentration, deoxyribonucleic acid (DNA) and cyclobutane pyrimidine dimers (CPDs). The effects of UVR on natural phytoplankton assemblages were significant only in the first 50 cm of the water column, causing a decrease in photosynthetic rates of 36 and 20% due to UV-A and ultraviolet-B radiation (UV-B), respectively; below this depth, however, there were no significant differences between radiation treatments. Concentration of CPDs per mega base of DNA in natural phytoplankton was low, <27 CPDs MB^{-1} between 0 and 4 m. Data on net DNA damage, together with that on mixing conditions of the water column, suggest that mixing can favour phytoplankton by allowing cells to be transported to depths where active repair can take place. This mechanism to reduce UVR-induced DNA damage would be of great advantage for these assemblages dominated by small cyanobacteria and chlorophytes where UV-absorbing compounds that could act as sunscreens are virtually absent.