Nanosecond zero kinetic energy (ZEKE) and picosecond slow electron velocity map imaging (SEVI) photoelectron spectroscopic techniques have been employed in order to investigate the vibrational levels in the ground electronic state of the toluene cation. Vibrationally-resolved photoelectron spectra have been obtained following the preparation of a range of vibrational intermediate levels in the $S_1$ electronic state. Evidence for intramolecular vibrational energy redistribution (IVR) has been observed at low $S_1$ vibrational energies.