abstract We have performed a thorough analysis of the constraints which can be put on neutrino parameters from cosmological observations, most notably those from the WMAP satellite and the 2dF galaxy survey. For this data we find an upper limit on the sum of active neutrino mass eigenstates of $\sum m_\nu \leq 1.0$ eV (95\% conf.), but this limit is dependent on priors. We find that the WMAP and 2dF data alone cannot rule out the evidence from neutrinoless double beta decay reported by the Heidelberg-Moscow experiment. In terms of the relativistic energy density in neutrinos or other weakly interacting species we find, in units of the equivalent number of neutrino species, $N_\nu$, that $N_\nu = 4.0^{+3.0}_{-2.1}$ (95\% conf.). When BBN constraints are added, the bound on $N_\nu$ is $2.6^{+0.4}_{-0.3}$ (95\% conf.), suggesting that $N_\nu$ could possibly be lower than the standard model value of 3. This can for instance be the case in models with very low reheating temperature and incomplete neutrino thermalization. Conversely, if $N_\nu$ is fixed to 3 then the data from WMAP and 2dFGRS predicts that $0.2458 \leq Y_\nu \leq 0.2471$ (95\% conf.), which is significantly higher than the observationally measured value. The limit on relativistic energy density changes when a small $\nu_e$ chemical potential is present during BBN. In this case the upper bound on $N_\nu$ from WMAP, 2dFGRS and BBN is $N_\nu \leq 6.5$. Finally, we find that a non-zero $\sum m_\nu$ can be compensated by an increase in $N_\nu$. One result of this is that the LSND result is not yet ruled out by cosmological observations.