Abstract — Ammonia toxicity data for freshwater mussels (Unionidae), a significantly imperilled taxa, were used to derive estimates of concentrations that would not likely be harmful in acute and chronic exposures and to assess the protectiveness of current U.S. Environmental Protection Agency (U.S. EPA) water quality criteria to this family of organisms. Thirty 24 to 96 h LC50s, covering ten species in eight unionid genera, were used to calculate genus mean acute values (GMAVs) ranging from 2.56 to 8.97 mg/L total ammonia as N at pH 8. Freshwater mussels are at the sensitive end of the range when added to the GMAVs from the database used to derive the U.S. EPA criteria maximum concentration (CMC). We derived two estimates of acute exposure water quality guidance for the protection of freshwater mussels (CMCFMs) by a recalculation of the CMC after adding freshwater mussel GMAVs to the U.S. EPA dataset. The CMCFMs of 1.75 and 2.50 mg/L total ammonia as N at pH 8 average 60% less than the U.S. EPA CMC of 5.62 mg/L total ammonia as N at pH 8 for application when salmonids are present. These values average about 75% less than the CMC for application when salmonids are absent. There were no chronic ammonia exposure data for unionids. Thus, we applied a range of estimated acute-chronic ratios to the acute toxicity dataset, expanded with the freshwater mussel GMAVs, to estimate continuous ammonia concentrations which may be protective of freshwater mussels (CCCFMs). These estimates ranged from 0.3 to 1.0 mg/L total ammonia as N at pH 8 – about 20 to 75% less than the U.S. EPA continuous criteria concentration (CCC) of 1.24 mg/L total ammonia as N at pH 8 and 25oC. The current numeric criteria for ammonia may not be protective of mussels, more than half of whose nearly 300 species are in decline in North America. While the CMCFM and CCCFM are not equivalent to revised U.S. EPA criteria, they are offered as interim guidance for the protection of freshwater mussels.