Abstract. The Lahontan Reservoir in western Nevada has among the highest mercury (Hg) concentrations recorded in water, sediments and biota. The QWASI fugacity/aquivalence multispecies model was applied to examine Hg dynamics through a steady-state analysis of high loading conditions. The analysis indicated that the Carson River supplies most Hg in the water and upper sediments, with minimal inputs from the atmosphere and the Truckee Canal. Model estimates suggest that more than 90% of Hg entering the system from the Carson River at high flow is retained in the sediment of the reservoir, with export removing the remainder. Losses due to volatilization are negligible. The amount of methylmercury (MeHg) in the reservoir can be accounted for by inputs from the Carson River with minimal methylation occurring in the reservoir. The lack of species conversion and high retention rate appear to be due to the unreactive mineralogy of particulate Hg. Thus, we suggest that Hg dynamics are similar to that of other highly particle-reactive metals where fate is determined by particle movement. Finally, model results suggest an additional source of Hg to the system, which we hypothesize is from deep contaminated sediment that enters the system through sediment mixing caused by seasonal wet and dry cycles and sediment resuspension.

Keywords: mercury, particle movement, sediments

1. Introduction

As part of the Carson River system in west central Nevada, the Lahontan Reservoir (Figure 1) has experienced elevated mercury (Hg) loadings for over 100 yr as a result of mining and mineral processing activities in the Virginia City area (e.g., Cooper et al., 1985; Bonzongo et al., 1996). In 1915 the reservoir was created by damming the river, resulting in the reservoir becoming the main repository of Hg contaminated particles transported by the river. The reservoir is notable in having among the highest Hg concentrations in surface waters and biota reported in the literature (Cooper et al., 1985; Gustin et al., 1994). However, the reservoir is also notable for having the lowest reported proportion of methylmercury among natural
and contaminated systems (Table I). The Carson River-Lahontan Reservoir area is naturally mercuriferous (Gustin et al., 1994). It remains a major challenge to control the movement and biotic exposure to the estimated 7500 t of Hg released to the surrounding environment due to anthropogenic activities (Smith, 1943 in Bonzongo et al., 1996).

This paper details the development and application of a multispecies mass balance model for Hg in the Lahontan Reservoir. From model results, we deduce the relative importance of sources of Hg and its dominant forms, and potential sources not previously characterized. Secondly, we use the model to identify the dominant