Effectiveness of Best Management Practices in Pb Stabilization and Weathering in Shooting Ranges

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Replacing of soil berm with sand berm and removing Pb bullets from the berm periodically have been recommended as two best management practices (BMP) by the EPA. We tested the effectiveness of these two BMP by 1) comparing the weathering of Pb bullets mixed with sand and soil under high and low rainfall in a column experiment; and 2) determining Pb concentrations in berm soil before and after removing Pb bullets or Pb shot. After 4-month, although Pb concentrations in leachate from both soil and sand gradually increased under both rainfalls, Pb concentration from sand was lower than that from soil. The reduced concentration from sand was attributed to the reduced weathering of Pb bullets due to its lower organic matter and higher pH. The total Pb concentrations in the soil and sand were 131 and 11.7 mg kg^{-1} under high rainfall, and 105 and 8.2 mg kg^{-1} under low rainfall. The fact that the Pb concentration under low rainfall was significantly lower than that in under high rainfall indicate that moisture was important in controlling bullet weathering. The effectiveness of Pb recycling was different between bullet and shot. Removing Pb bullets removed sources of Pb, however, mechanic abrasion transferred metallic Pb to the soil fraction (< 2mm), with the total Pb increasing from 2,170 to 4,980 mg kg^{-1}. However, removing Pb shot also decreased the transferring of metallic Pb to soil fraction (<2 mm), with the total Pb decreasing from 3,960 to 1,110 mg kg^{-1}. The study demonstrated the importance of testing the effectiveness of BMP before using them.