

QUANTIFYING SEDIMENT CONTRIBUTIONS TO THE GUÁNICA BAY PUERTO RICO

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The island of Puerto Rico faces considerable challenges regarding sustainable land use and effects of land use on adjacent freshwater and marine ecosystem services. In watersheds feeding Guánica Bay (southwestern Puerto Rico), increased soil erosion and sediment loading to streams and rivers has raised concern that sediment has reduced reservoir capacity, polluted the Bay, and adversely affected coral reef condition in the coastal zone. The success of potential management options will depend partly on knowing where the sediment originates. However the hydrology in the region is very complex. Guánica Bay is fed almost exclusively by Rio Loco, but waters in Rio Loco come from as many as six different watersheds, a consequence of five reservoirs constructed in the early 1950s that are linked by tunnels. In addition, water from the lowest of these reservoirs, Lago Loco, is distributed by gravity far to the west (Lajas Valley) for agricultural irrigation and returned by drainage canal to Rio Loco before it empties into Guánica Bay. Increased sediment loading may result from increased agricultural production in the region since the 1950's, especially the growth of sun-grown coffee plantations along mountain ridges. This region has high soil erosion and soil loss which directly affects the four upstream reservoirs. The objectives of this study are to: 1) identify sediment sources; 2) quantify sediment contributions from upstream watersheds to Rio Loco; 3) to explore alternative strategies to reduce soil erosion and sediment loading to the reservoirs, Guánica Bay and the coastal zone. To achieve the above objectives and build a model for this complex interwoven watershed system, we applied the Soil and Water Assessment Tool (SWAT) and Gridded Surface Subsurface Hydrology Analysis (GSSHA). The SWAT was applied to the ridge watersheds, which are dominated by coffee plantations, to estimate soil erosion and sediment loadings to the reservoir. In addition, potential management practices to reduce soil erosion and sediment loadings to the reservoirs were evaluated. GSSHA was applied to remaining parts of the linked watershed system to simulate channel erosion and sediment transport to Guánica Bay. Preliminary modeling results by SWAT and GSSHA will be discussed in this presentation.

Keywords: SWAT, GSSHA, Soil erosion, sediment transport, conservation practices, Guánica Bay watershed.