Executive Summary

Erosion and associated sedimentation are one of the primary threats to Guam's terrestrial and aquatic environments. Erosion is will be increased by any activity that reduces vegetation cover. On Guam, anthropogenic fire burns up to 10% of the island's area, mostly in the island's tropical savanna. The complex interactions of fire, vegetation, erosion and sedimentation, while conceptually well understood, have not been investigated on Guam with sufficient detail to inform resource managers.

In the Asan sub-watershed, four fires burned approximately 9% of War in the Pacific NHP between June 2003 and May 2005. In the subsequent wet seasons, erosion from burned savanna was nearly six fold higher than vegetated savanna. This rate was comparable to erosion off badland areas in the same watershed. Even 18 months following a burn, after vegetation had returned to pre-burn levels of biomass, soil loss from burned savanna was twice as high compared to unburned savanna. This was attributed to changes in the species composition of the savanna vegetation community. Fire promoted the spread and establishment of invasive grasses such as *Dicanthium bladhii* and *Pennisetum polystachion.* Both species are capable of altering an area's fire regime by promoting increased fire frequency and intensity. The presence of these species may promote a grass-fire cycle in which the native savanna species (e.g., *Dimeria chloridiformis*) are systematically replaced by fire tolerant invasive grasses.

Erosion was highest is badland areas and recently burned savanna. With burned savanna, timing of rain events appeared important to the overall erosion. Erosion rates on plots burned near the start of the wet season was higher than on plots burned early in the dry season. No differences were observed in the soil loss rates for mixed and fern savanna vegetation subtypes. Erosion rates on swordgrass were not successfully measure in this project.

Sedimentation collection rates were among the highest found in the literature. Sediments showed a distinct pattern associated with point sources. Sedimentation collect also showed distinct seasonal patterns, with sediment collection rates higher in the wet season than the dry. Modeling of the sediment dynamics in the Asan sub-watershed suggested that a sediment flush happened at the start of the wet season. Large storm events were also significant predictors of sediment collection.

Watershed estimates of soil loss showed that badlands and burning near the current rate increase the soil loss by 35% over a habitat without burning and in which badlands are restored to savanna vegetation.

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Mr. Dave Limtiaco (Guam Division of Forestry) allowed the erosion flumes to be installed on land under the control of the Department of Agriculture. Fire crews from GFD conducted the controlled burns on the flumes (Chapter 5). Mr. Limtiaco also provided fire statistics for the island and shared his considerable knowledge about the island's wildfires and their effects on savanna vegetation and erosion.

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