#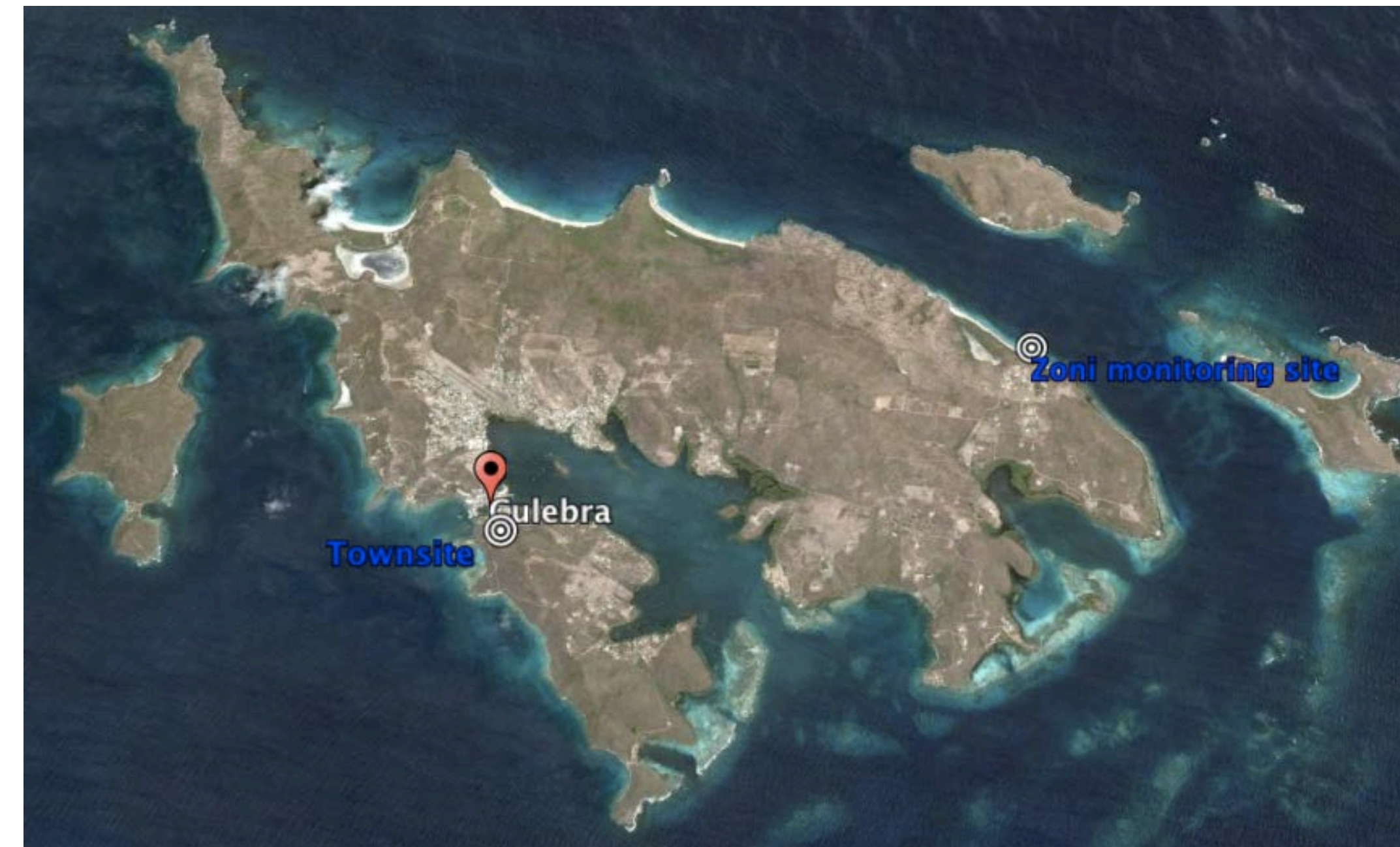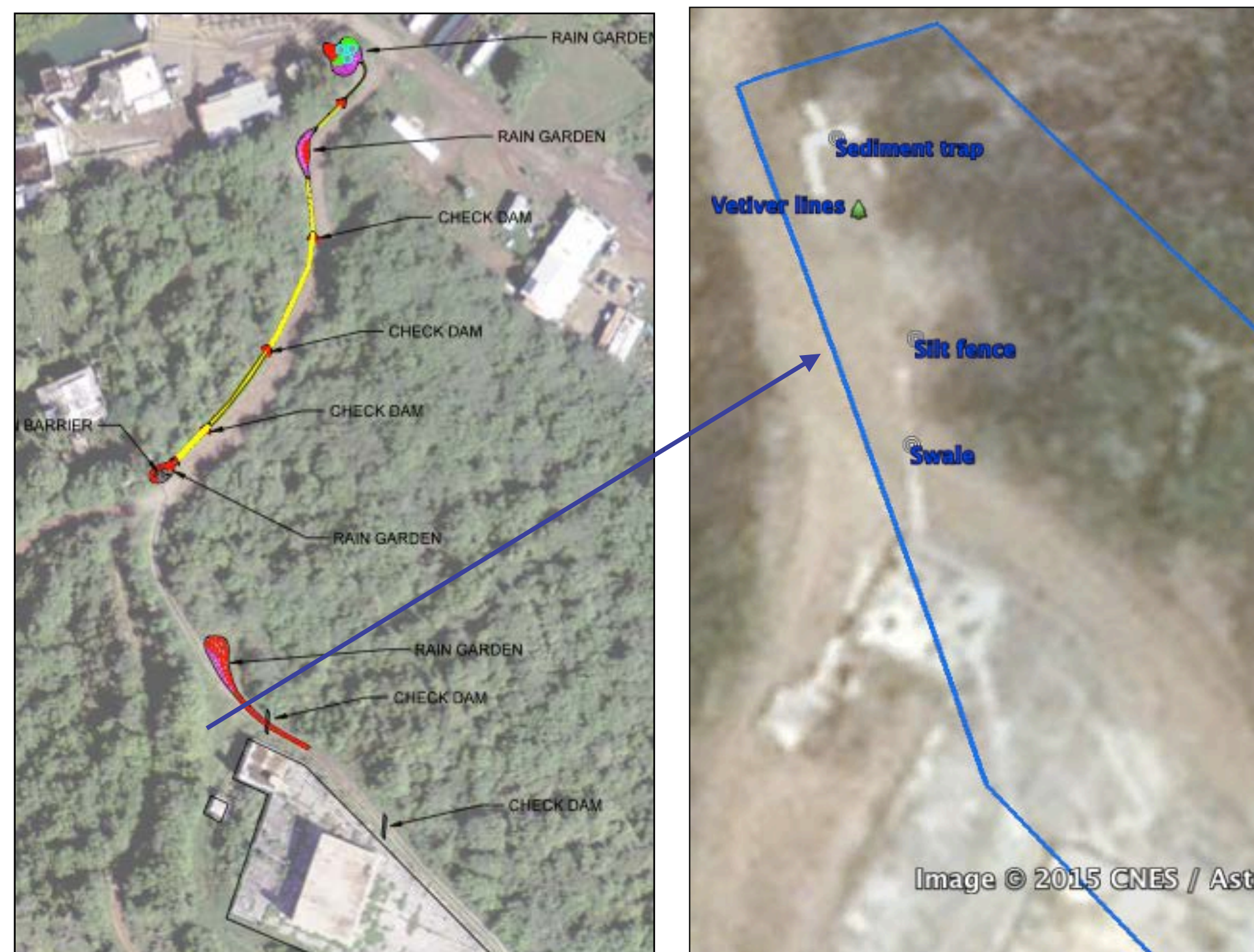 Using a treatment train approach in Culebra, Puerto Rico to capture higher rates of sediment runoff to reduce transport to coral reefs

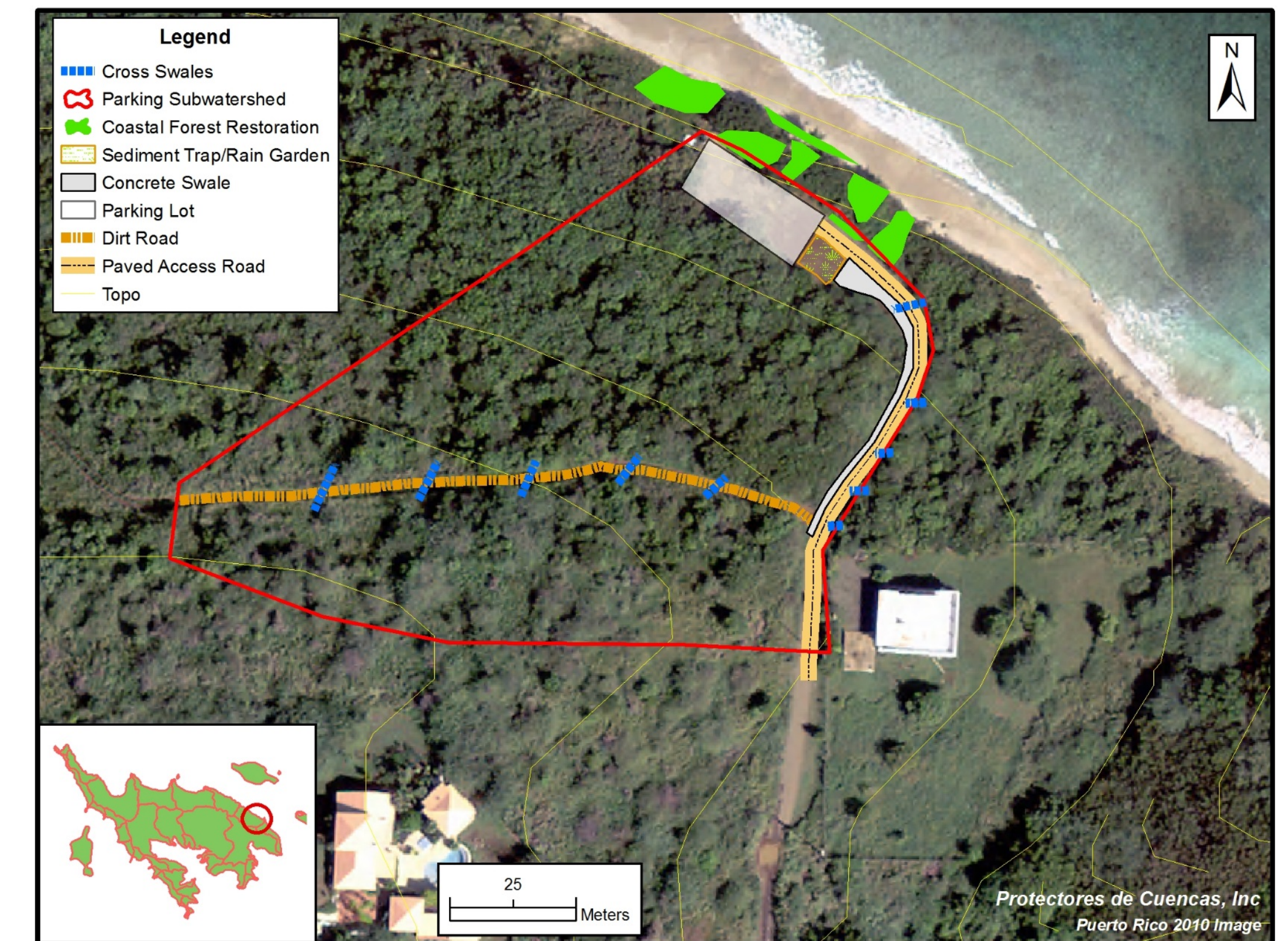Paul Sturm[1] and Nicolas Gomez[2],

Ridge to Reefs[1], University of Puerto Rico, Rio-Piedras[2]

Town Site:

Methodology

At the Townsite, silt fence was placed near the cross swale in order to trap bulk sediment transported from the adjacent dirt road near the PRASA water storage tank; sediment samples were taken from: 1) the soil trapped by the silt fence; 2) the soil trapped by vetiver grasses placed perpendicular to water flow and 3) the soil deposited in the sediment trap. A volume and the percentage of sand, silt and clay was estimated for each of the 3 sediment trapping practices at 6 months and will be done again at 12 months.

A sediment trap was placed at the Zoni site to measure net transport from the restoration site transported into the nearshore marine environment. The trap was constructed based on specifications in Ramos-Scharron et. al (2014) and is shown in Figure 2. The trap was monitored and maintained on a monthly basis. Best management practices (BMPs) installed upstream at the site included cross swales, vetiver lines, a series of three biofilters, a rain garden and a permeable parking area.

Abstract

The reduction of sediment transport in human altered tropical catchments is a challenging prospect and a number of researchers have estimated that best management practices (BMPs) are likely to only reduce sediment by 70-80% annually. By introducing a treatment train approach (placing BMPs in series) we have been able to achieve high levels of sediment reduction (>90%) and more importantly capture and stabilize small grained particles that are problematic to coral reefs. In addition, a treatment train approach helps to maintain necessary storage and treatment volumes within best management practices. For example a silt fence can be used to capture larger particle bulk sediments outside of a structural BMP – thereby leaving volume needed to capture and attenuate the small particles. Two examples of the treatment train approach from Culebra, Puerto Rico are presented as well as initial data collected over a period of 12 months.

Results

The influence and benefit of the treatment train approach to sediment reduction is demonstrated at these two sites. At Zoni (right), minimal amounts of sediment are being transported through the series of treatment practices and deposition measurements in the sediment trap reflect primarily the movement of sand by a burrowing crab. At the Townsite (left), the benefit of the treatment train approach is reflected by the gradient of deposition of sediment particles at the three sediment control practices in series. At practice TWN-1 (a silt fence) the larger particles are captured; at practice TWN-2 (vetiver eyebrows) – large and medium particles are captured and at TWN-3 (sediment trap) captures a high percentage of the smallest particles including silts and clays. Additional analysis will be performed to estimate the volumes captured as well as to evaluate the rainfall events in relation to deposition at the sites.

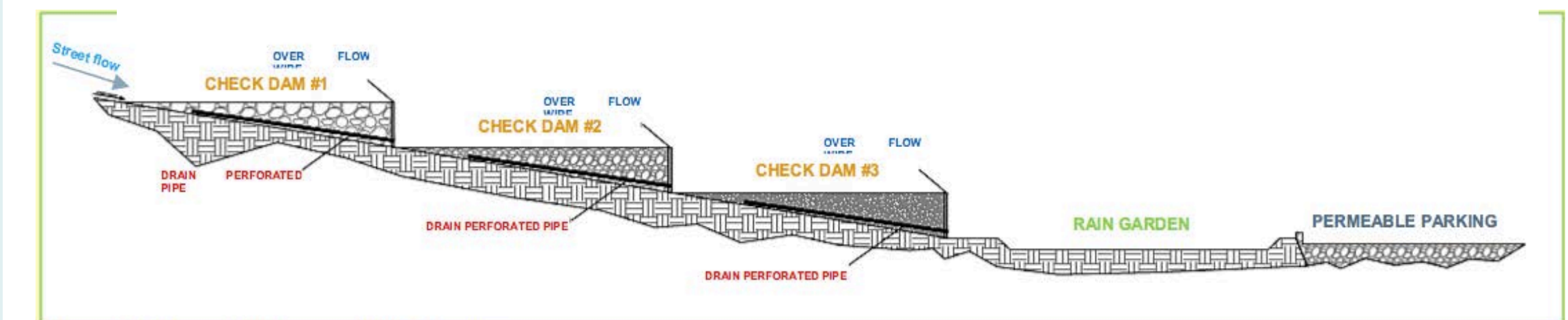| Sample Identification	Percent Sand	Percent Silt	Percent Clay	Textural Classification
TWN-1	74.0	16.0	10.0	Sandy Loam
TWN-2	66.0	20.0	14.0	Sandy Loam
TWN-3	22.0	52.0	26.0	Silt Loam

Zoni Beach Site

Figure 1. Sediment trap at Zoni located after the permeable parking lot

Figure 2. Sediment trap at Zoni initially and after 11 months