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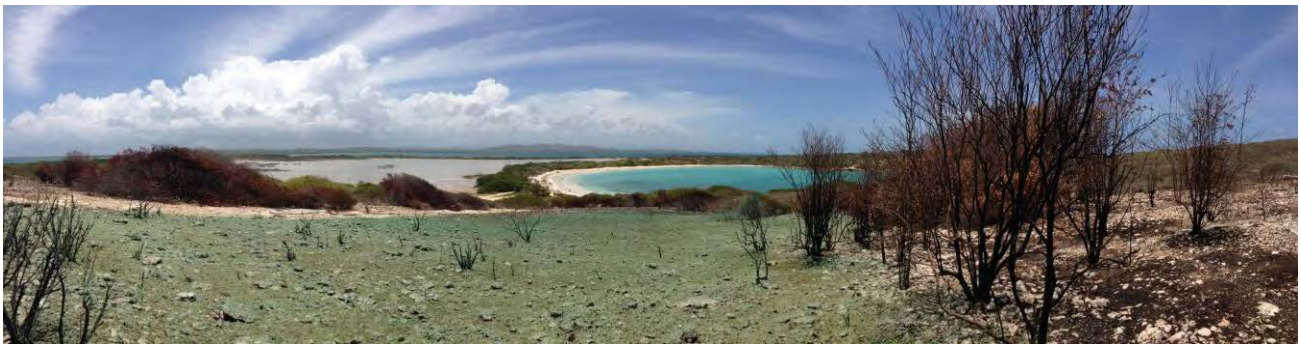
Guánica Hydroseeding 2014



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Background

Ridge to Reefs and Protectores de Cuencas have defined a set of methods to stabilize bare soils on high mountain and dry coastal sites in Puerto Rico. These methods are applicable to other sites across the Caribbean and likely into the tropical areas of the Pacific. Our efforts began with NFWF funded hydroseeding/hydromulching efforts that included a Soil Stabilization Roundtable in Puerto Rico which involved technical partners/experts from Department of Natural and Enviromental Resources of Puerto Rico, US Fish and Wildlife Service, NC State University, NOAA Restoration Center, Natural Resources Conservation Service (NRCS) and a Puerto Rico Department of Agriculture Agricultural Extension Service from the high mountain areas of the Guánica watershed. Through the NFWF funded project we were able to test hydroseeding/mulching methods on slopes between 70 and 90% and refine suggested techniques.

The Fiscal Year 2012 (FY12) funds were used to expand and begin to implement these methods on a larger and broader scale and to diversify the types of sites which included two farm sites and one commercial site. The Fiscal Year 2013 (FY13) funds were used to complete the acreage on the Finca La Paz site, the Hardware Store site as well as to do test plots on two burn sites using primarily native species as well as rye grass to initiate immediate stabilization.

As the FY2013 project was a continuation of the FY2012 project, we have presented some of the same information and photos for the two sites initiated in FY12. We have also provided a summary and a table of achievements using FY2013 funds and highlighted in bold some of the additional lessons and items gleaned using the FY2013 funds.

Summary

The goal of the project was to continue to implement stabilization efforts in the Guánica Watershed and Priority watershed areas on highly erodible soils. The project resulted in the stabilization of 7 acres. Highly Erodible Lands (HEL) were identified as a priority for implementation of the 2008 Guánica Watershed Management Plan and subsequent efforts to identify priority areas in the Cabo Rojo watershed. The work this year was focused on stabilizing sites already initiated in the previous fiscal year 1) Finca La Paz - a farm site composed of 3 acres of hydroseeding steep slopes in the Lajas Valley, 2)

Hardware Store (ACE) Ferreteria Solar El Almacigo – where and additional 2 acres of highly erodible bare soil were stabilized very close to a direct tributary of the Rio Loco in Yauco. Each of the sites resulted in very high levels of stabilization and vegetative cover.

The locations were identified as opportunities within priority subwatershed areas within the lower watershed (Figure 1). The 1st site Finca La Paz site was identified as a recent clearing on steep slopes within the lower watershed in the foothills of the Lajas Valley. The second site was a hardware store that was performing mass grading on a site adjacent to a road and impervious surfaces and a flow path leading directly to the Rio Loco. The Finca La Paz Site and the Hardware store site are large sites and FY13 funds had to be used to complete the remaining acreage. In addition, 1 acre of Bosque del Pueblo in Adjuntas and 1 acre in El Faro in Cabo Rojo were stabilized after fires devastated these areas destroying vegetation and exposing bare soils.

Figure 1. Project Location Map with Bosque del Pueblo, Cabo Rojo site, Finca La Paz and the Hardware store

Percent vegetative cover was restored to the sites at the respective rates 90% and >95%, the Finca La Paz farm site stabilization was diminished slightly due to the age of the site as it has been over 60 days since the site was cleared by the farmer –this resulted in lost soil, more sporadic growth at first and compacted soil making stabilization more challenging including lengthening the amount of time we needed to water than a freshly cleared site (Note: re-clearing the farm site would have increased cost and the risk of even more soil loss if a storm were to happen). Match in FY2013 included: water for hydroseeding and for watering to ensure germination and successful stabilization; labor from volunteers and agencies including Puerto Rico Department of Natural Resources

(DNER); additional labor from Protectores de Cuencas/Ridge to Reefs; and materials from National Fish and Wildlife Foundation. For example, water for the stabilization of bare soils at the hardware store site was provided by the hardware store and accounted for more than 30 truckloads. Labor for the Adjuntas and Cabo Rojo was supplemented greatly by Protectores de Cuencas, DNER, Casa Pueblo and Amigos de Bosque Seco. National Fish and Wildlife Foundation supplied materials equivalent to more than $2000 per acre.

Table 1. Project Implementation Summary

Component	Project 1	Project 2	Project 3	Project 4	Total
Name	Completion of Finca La Paz	Completion of Hardware Store (ACE) Ferreteria Solar El Almacigo	Forest Fire Adjuntas, PR Bosque de Pueblo	Cabo Rojo, PR (El Faro Burn site)	NA
Landowner	Private Farmer	Private Hardware Store	DNER	DNER	NA
Maintenance Agreement	Private Farmer	With Hardware Store	With Casa Pueblo and DNER	With DNER	NA
Permitting	Not needed	Not needed	Not needed	Not needed	NA
Accomplishments /Metrics	3 acres of bare soil stabilized Restored to >90% vegetative cover	2 acre of bare soil stabilized Restored to >95% vegetative cover	1 acre of bare soil stabilized Restored to >90% vegetative cover	1 acre (Restoration assessment and watering still in process)	7 acres
Match*	$9,500.00*	$6,100.00*	$11,000*	$11,700*	$38,300.00
NOAA Funds	$21,000.00	$14,037.56	$981.22	$981.22	$37,000.00
Total	$30,500.00	$20,137.56	$11,981.22	$12,681.22	$75,300.00

* Match Funds include supplies and materials from NFWF funding

In summary, the achievements included:

- the stabilization of over 7 acres of bare soils – 2 acres at over 95% vegetative cover and 4 acres of over 90% vegetative cover and one acre still being assessed

- over $38,300 in match from partners including labor and watering support and materials
- successful work in the agricultural community, urban community and business community
- maintenance and watering of the sites for over 1 month to ensure project success including 1 grass cutting at the farm and hardware site
- Testing of hydroseeding methods at two burn sites and the regeneration of native species using native seeds within the hydroseeding mixture (testing and evaluation still in process)

Lessons Learned

- stabilization occurs best immediately after disturbance the longer the time between clearing and stabilization -- results in a less favorable substrate as often good soil for germination and growing can be washed away prior to hydroseeding efforts -- even considering that issue we were able to achieve >90% vegetative cover for Finca La Paz
- it is important for Protectores de Cuencas to establish a agreement with PRASA for water so that it can legally have access to water that it can take very rapidly such as thru a fire hydrant or other method
- signage is an important factor in urban and very visible locations to further educate the community
- two pumps allow us to cut our watering time in half and allow for extra watering
- increased the seed to 7 lbs rye and 6 lbs bermuda instead of 7 lbs rye and 3 lbs bermuda - results in better stabilization
- site prep and soil prep is critical
- **it is possible to incorporate native tree and shrub species into hydroseeding mixtures with seeds collected by local biologists and members of the community**

Hardware store

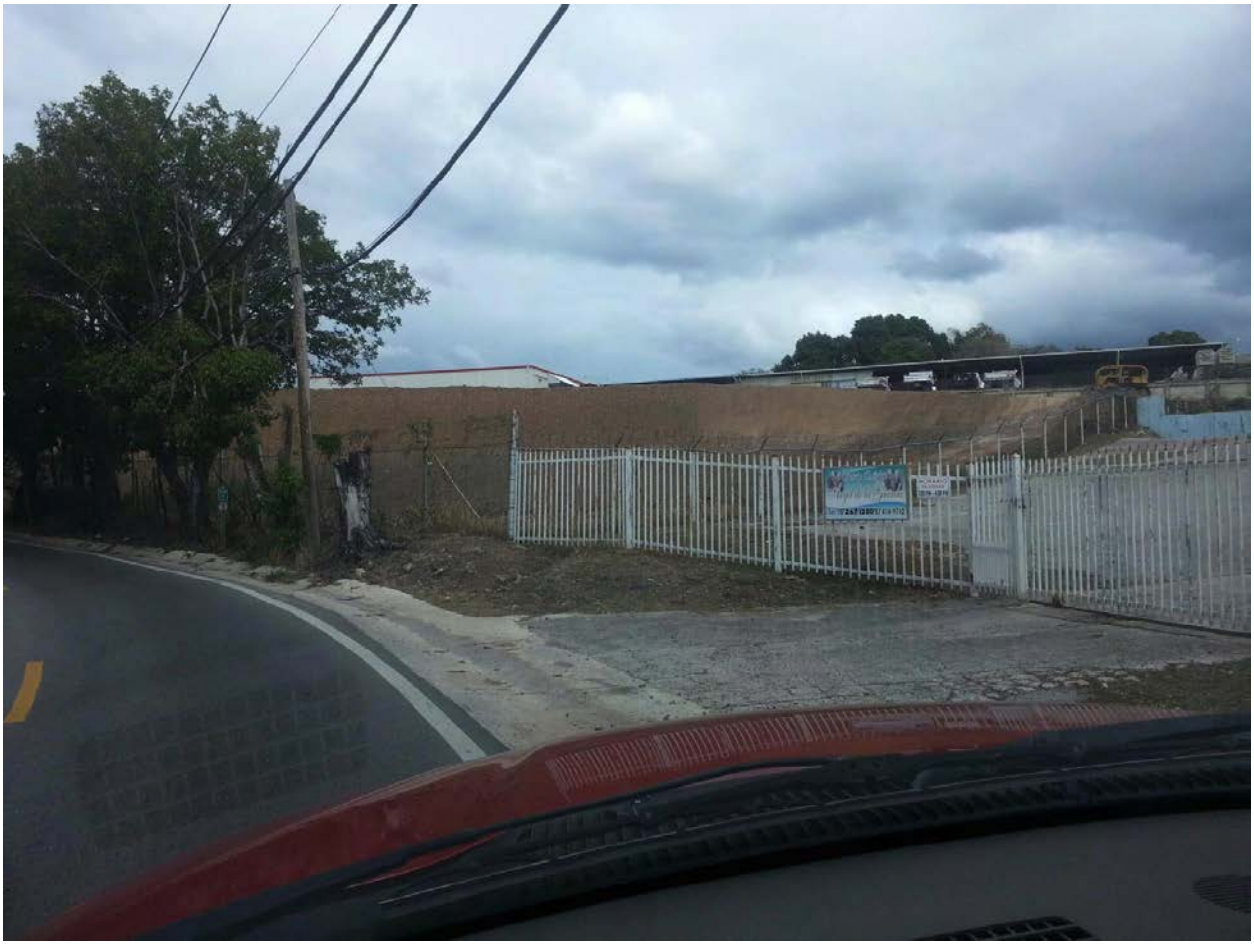

Figure 5. Bare soil from the hardware site

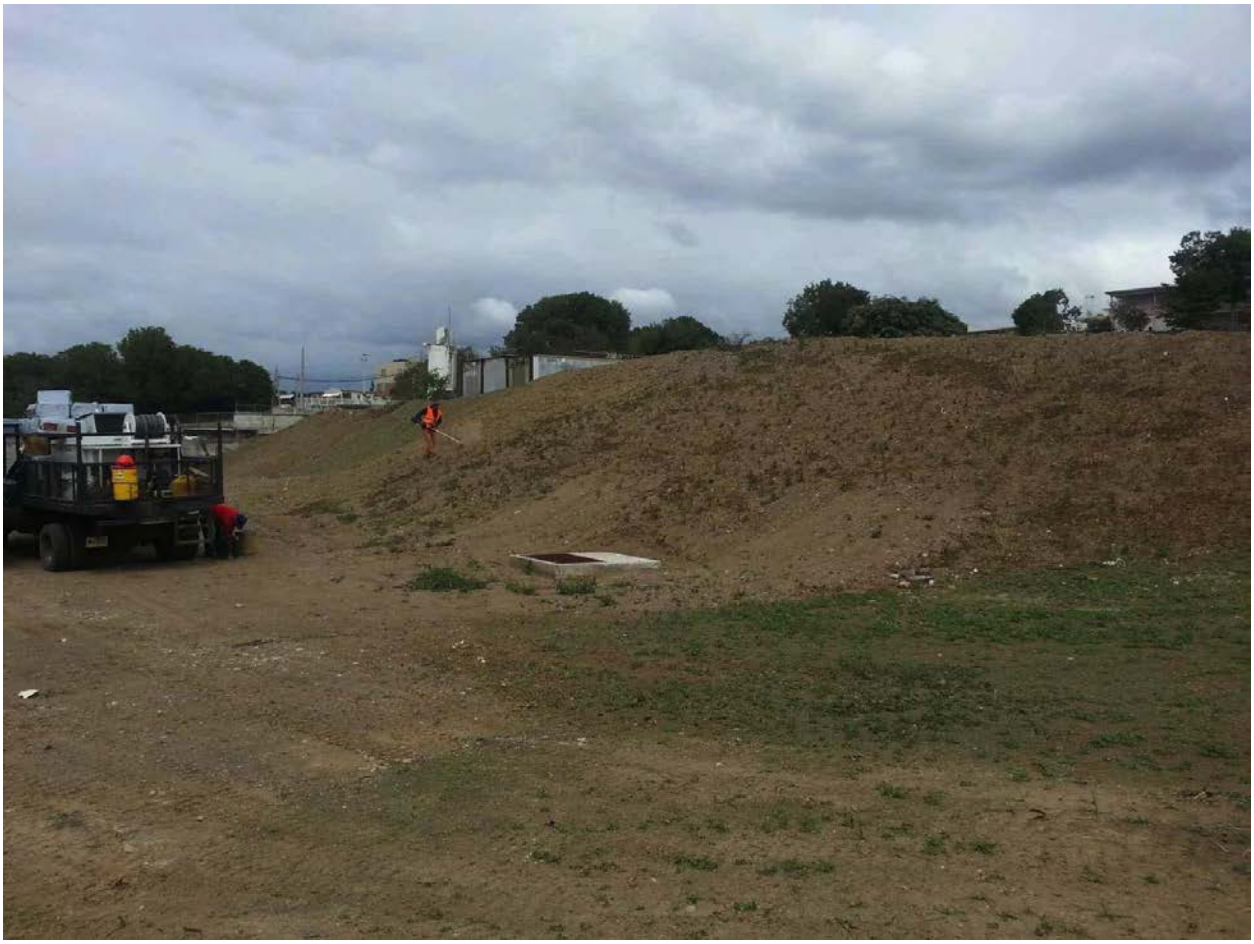

Figure 6. Preparing the site for hydroseeding

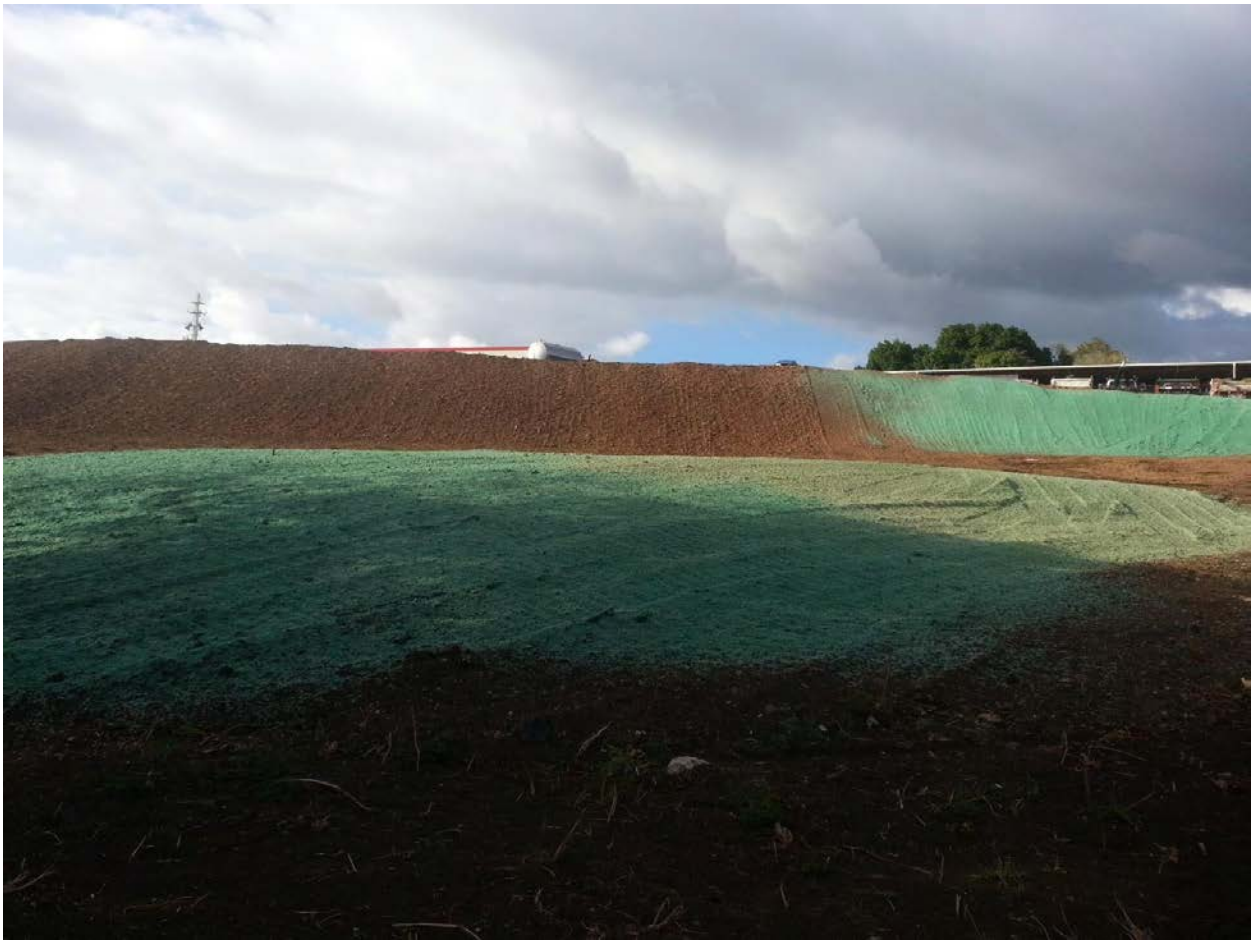

Figure 7. Hydroseeding in process at the hardware store site

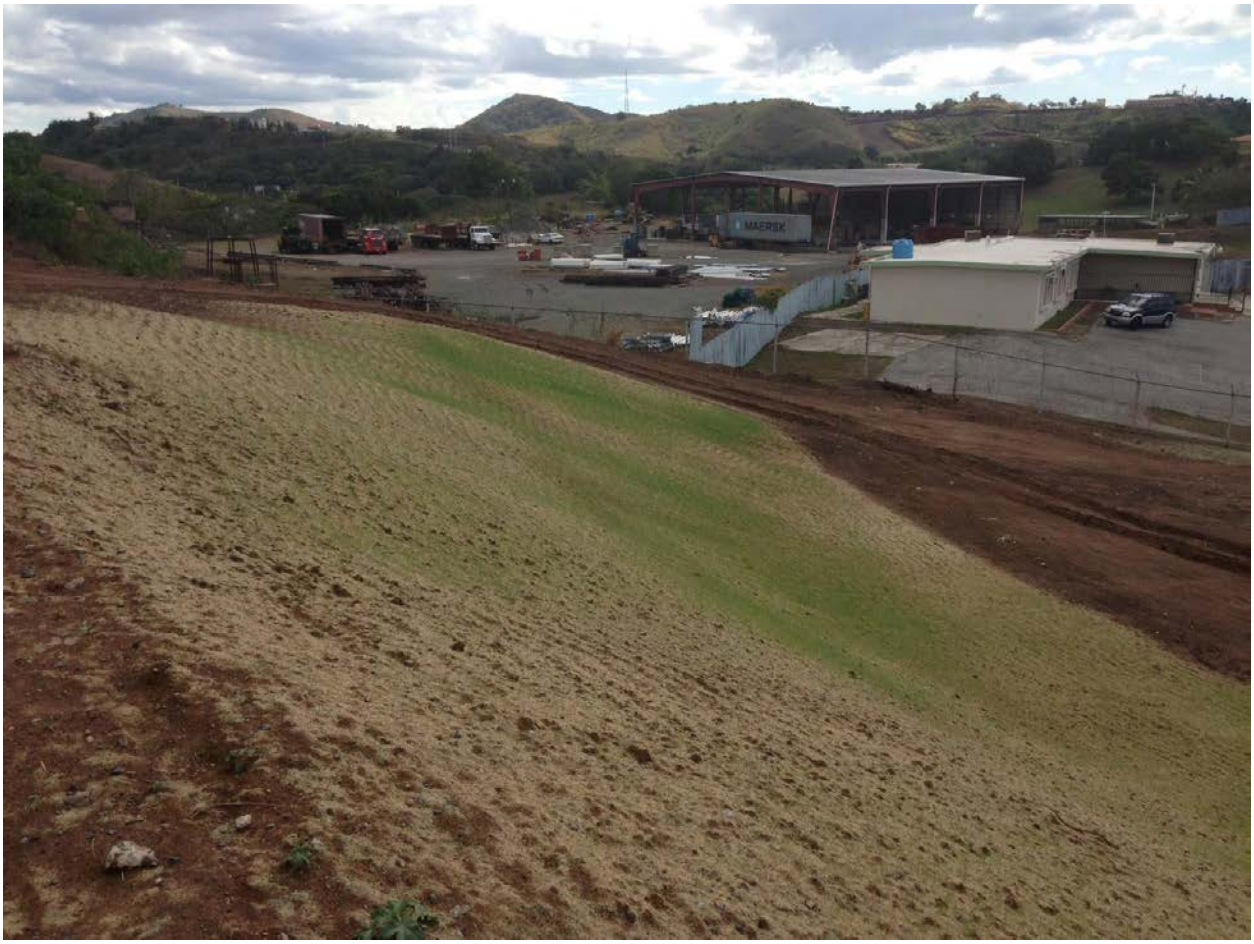

Figure 8. Stabilization and initiation of germination of hardware site

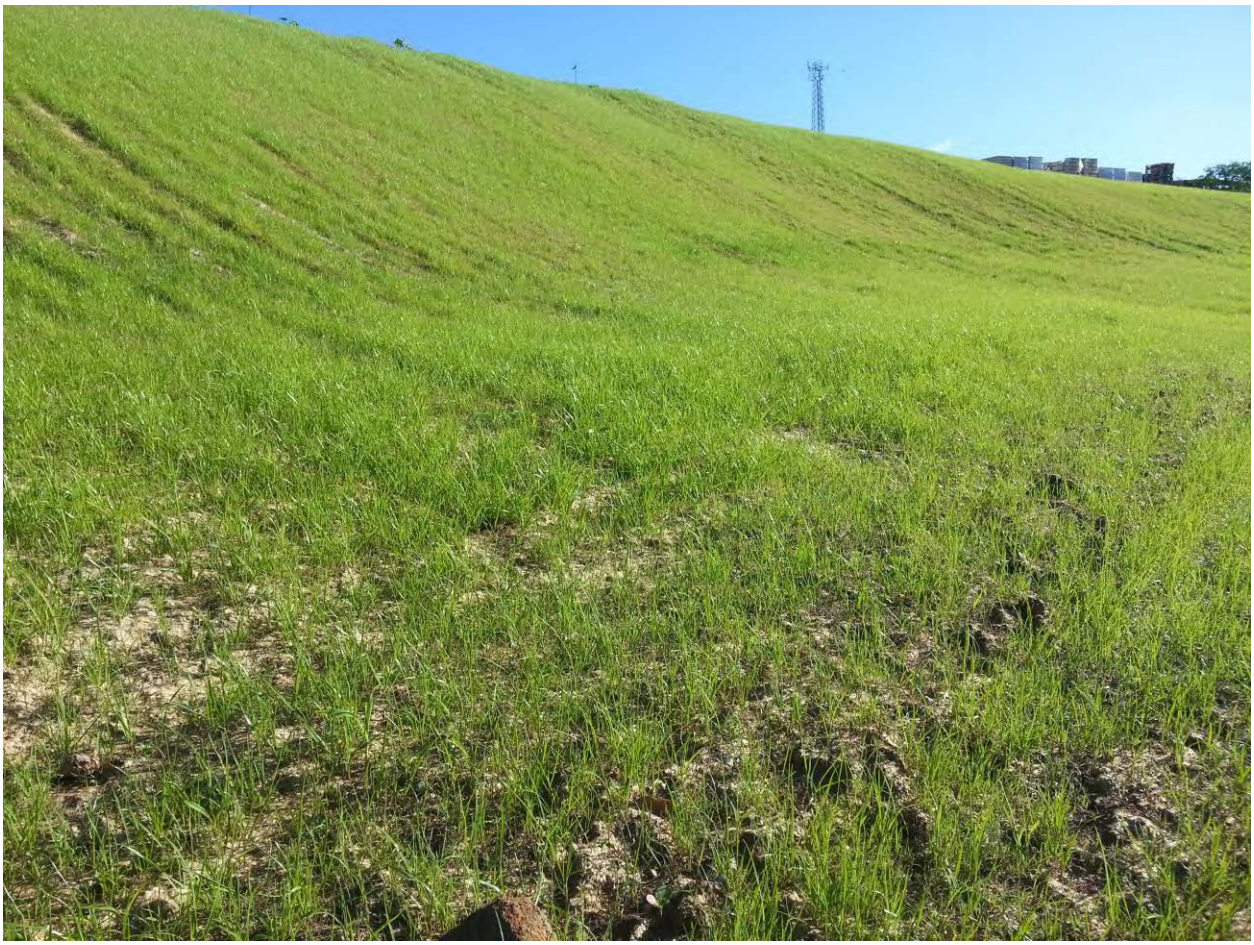

Figure 9. Re-establishment of grass at the site

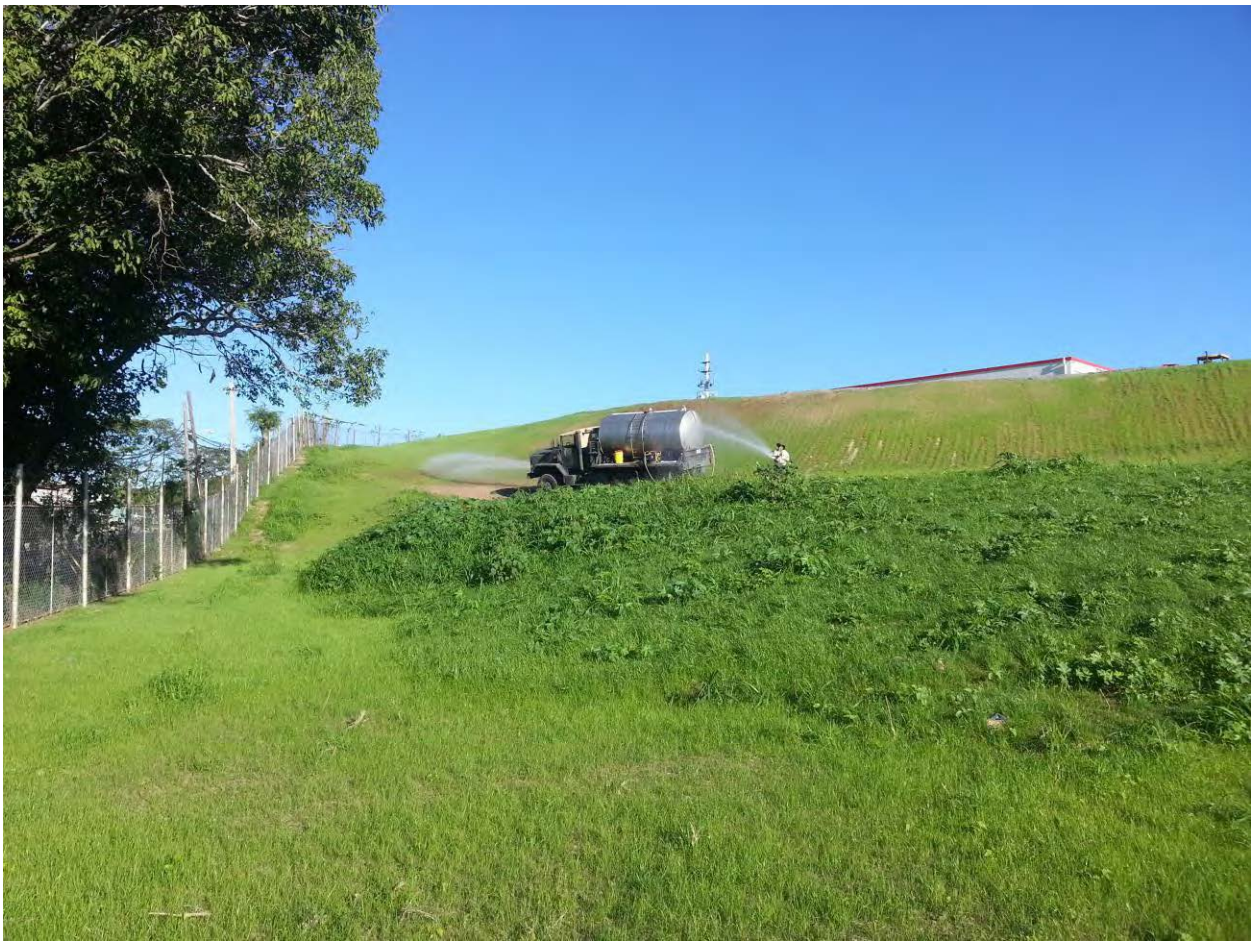

Figure 10. Vegetative stabilization and watering at the hardware store site

Finca La Paz

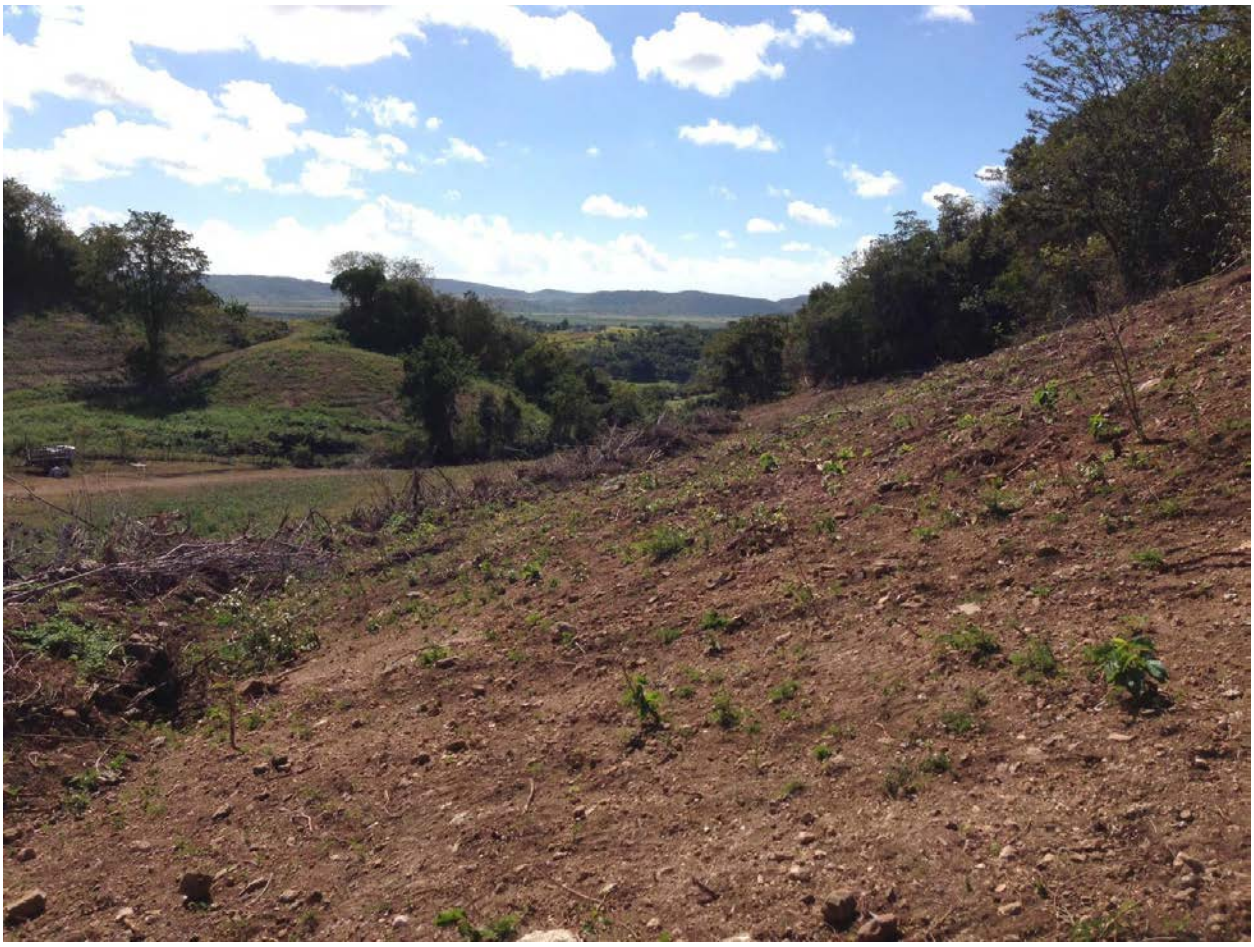

Figure 11. Bare soil cleared on Finca La Paz -- note piling of woody debris to break the slope and reduce concentrated runoff from the hillslope

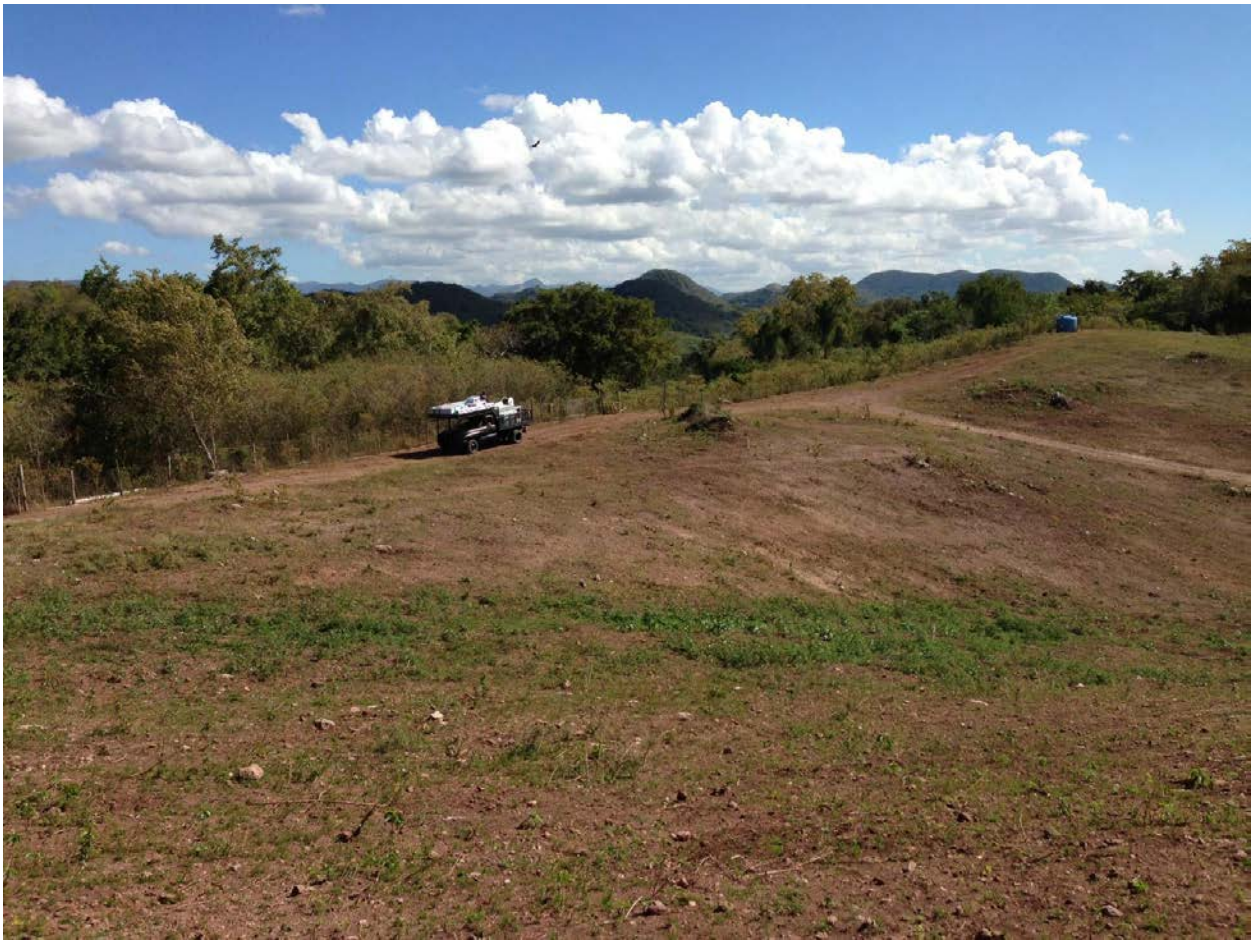

Figure 12. Part of the La Paz site prior to stabilization

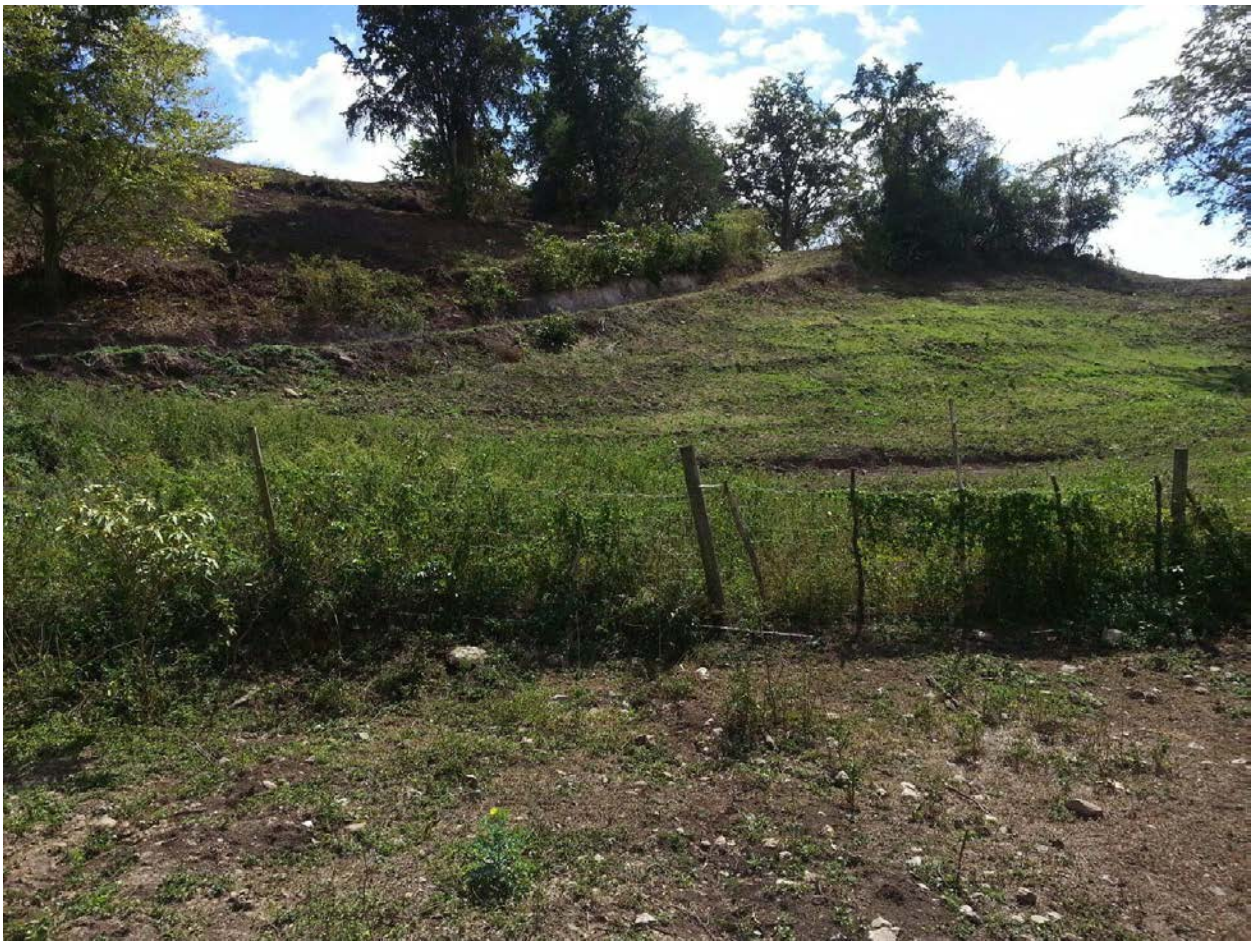

Figure 13. Germination of the La Paz site

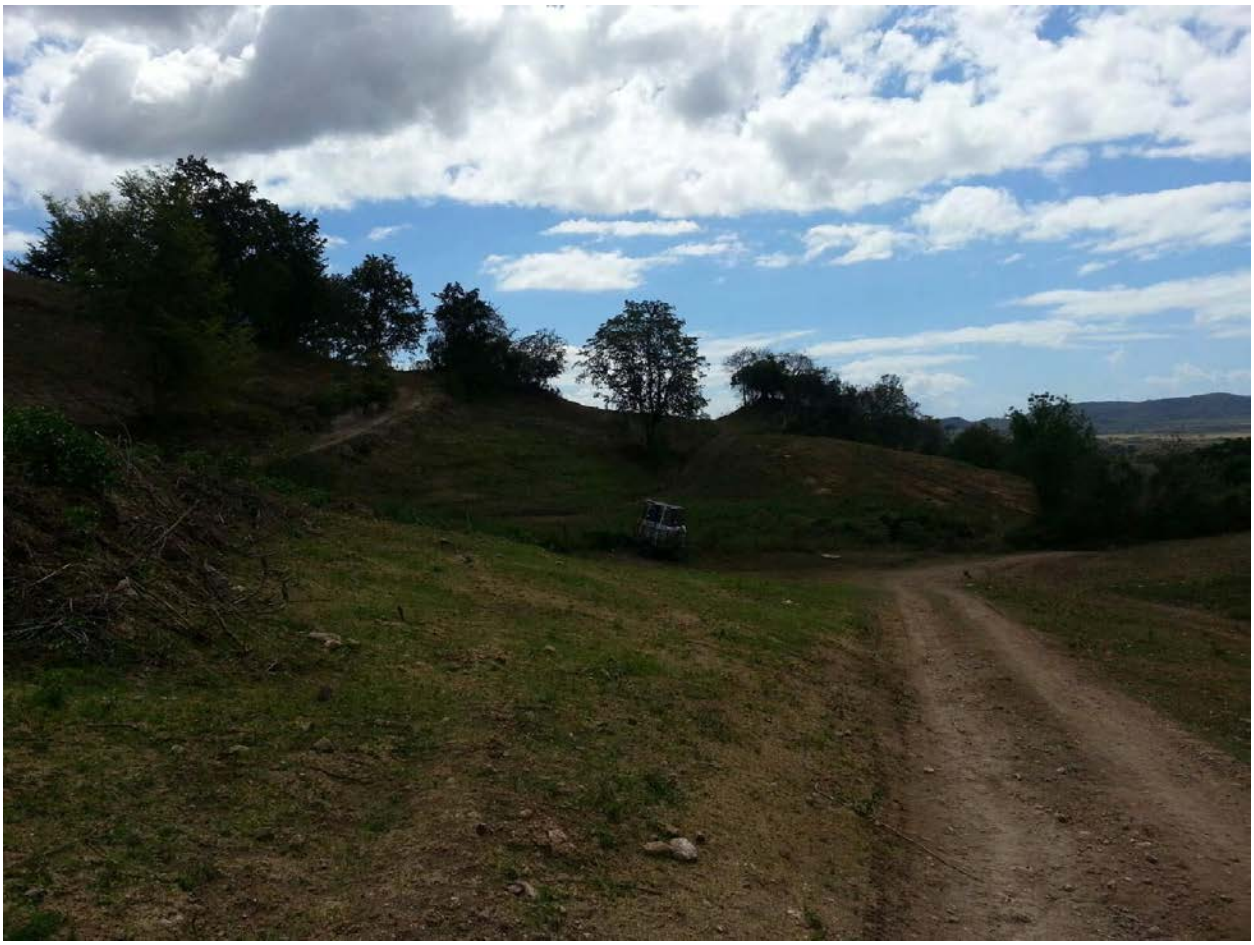

Figure 14. Germination and greening of the La Paz site

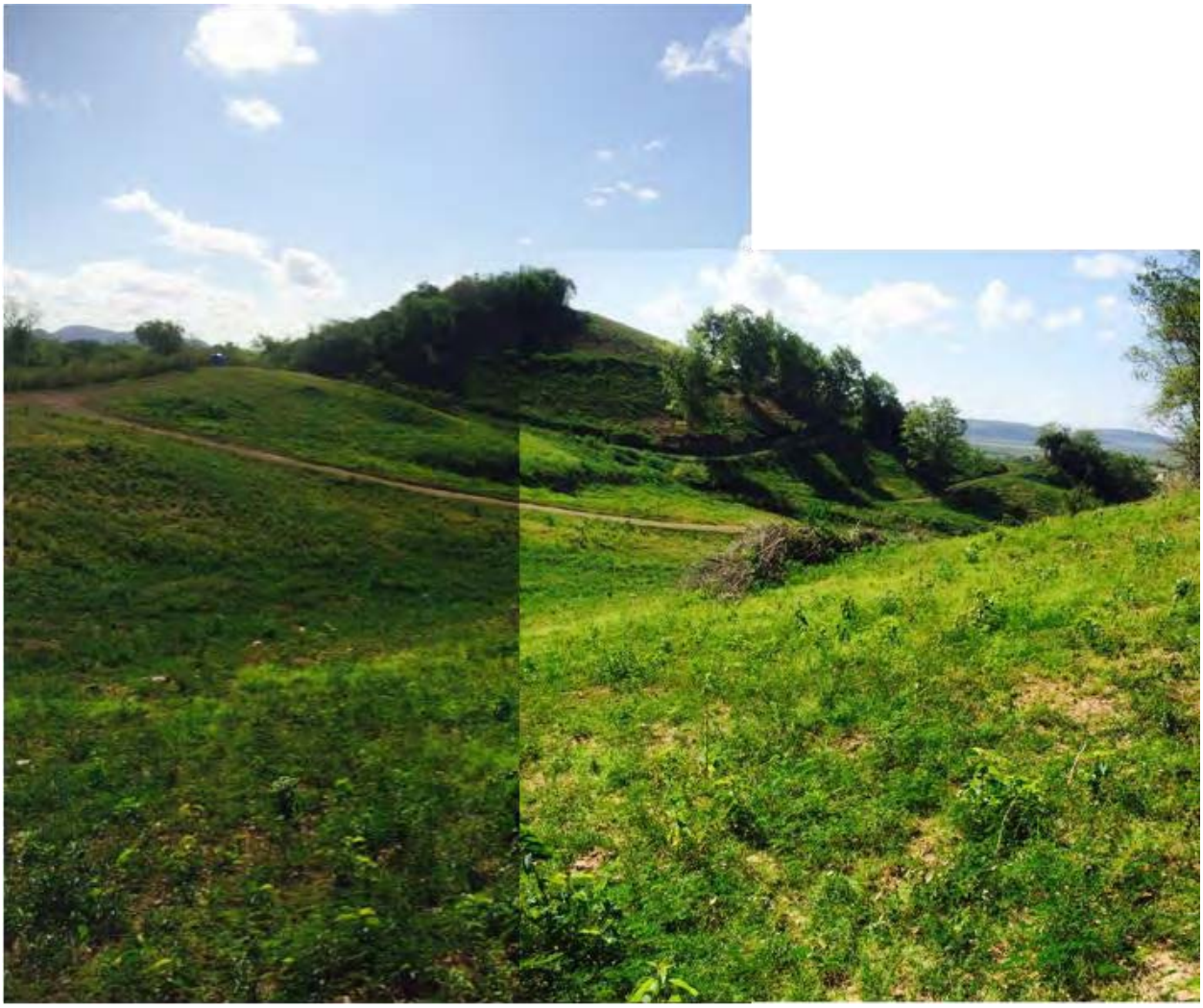

Figure 15. Stabilization at the Finca La Paz site

Restoration and Stabilization of Recently Burned Sites in Puerto Rico

Restoration of recently burned sites is important to support ecological diversity and to stabilize bare and unprotected soils at recently burned sites – particularly in southwest and southern Puerto Rico as these areas commonly burn. Puerto Rico unlike mainland United States does not naturally have sky to ground lightning strikes – so vegetation has not evolved to handle frequent fires as they have in Florida and the southeastern US. Therefore, stabilization and revegetation is particularly important due to the often

steep slopes and erodible soil in Puerto Rico. With this years funding we have been able to utilize a small amount of support from NOAA as well as our own resources, labor and matching effort and materials from NFWF, DNER, and the community including Casa Pueblo, Amigos de Bosque Seco and other organizations dedicated to the protection of natural resources in Puerto Rico. The following information is a summary of those efforts where we have been able to restore two acres of burned sites. The sites had the restoration efforts supplemented by the community and agencies who collected seeds and plants and helped to re-establish the sites. Seeds collected included those listed in Table 2. Representative photos of the restoration sites are provided below.

Table 2. Native species used in the restoration sites

Adjuntas Site – Bosque del Pueblo		**Cabo Rojo Site – Playa Sucia**	
Common Name	**Species name**	**Common Name**	**Species name**
Roble nativo	Tabebula heterophylla	Roble nativo	Tabebula heterophylla
Capa prieto	Cordia alliodora	Mangle de botón	Conocarpus erectus
Yagrumo macho	Schefflera morototoni	Almacigo	Busera simaruba
Guara	Cupania Americana	Ucar	Bucida bucerus
Cedro hembra	Cedrela odorata	Roble guayo	Bourreira succulenta
		Guayacan	Guaiacum officinale
		Matorral de Costa	Uniola virgata

Adjuntas Site (Bosque del Pueblo)

Figure 16. Conditions after the burn (note stabilization efforts on left)

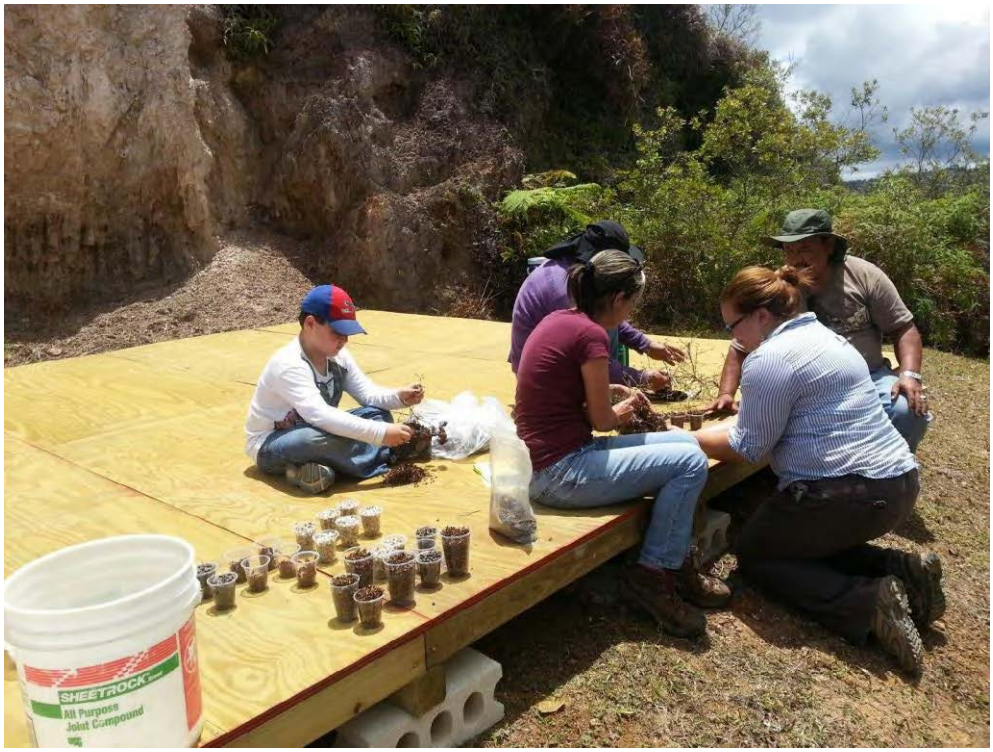

Figure 17. Volunteers and DNER staff processing collected seeds

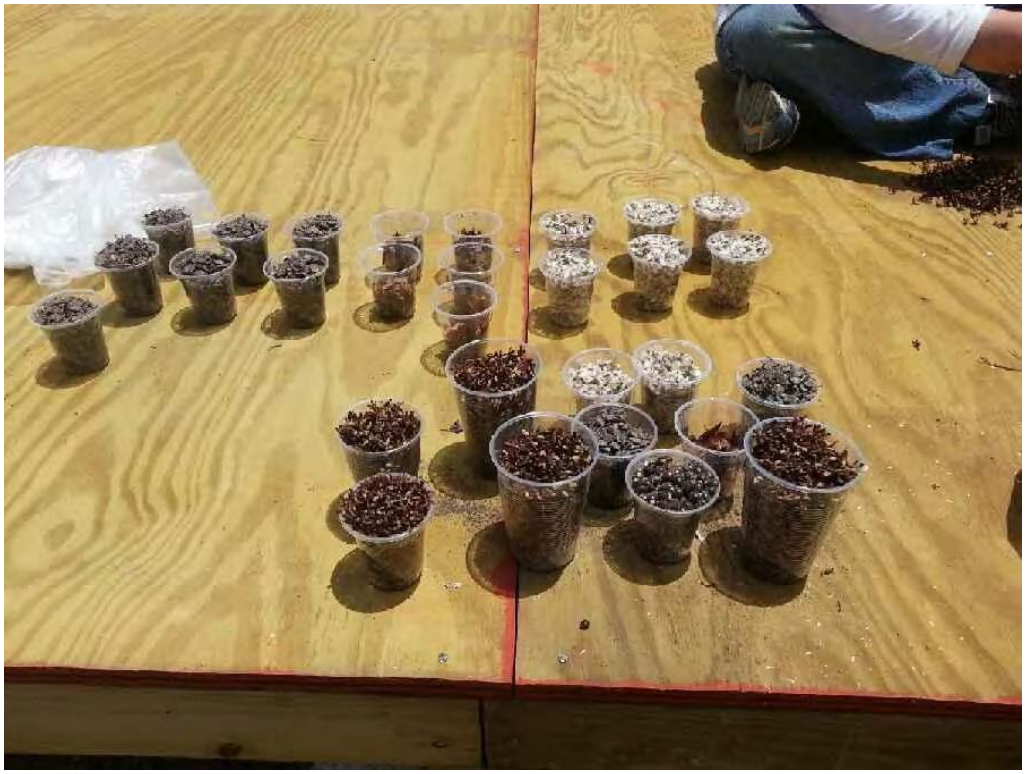

Figure 18. Native seeds used in the hydromulching mix

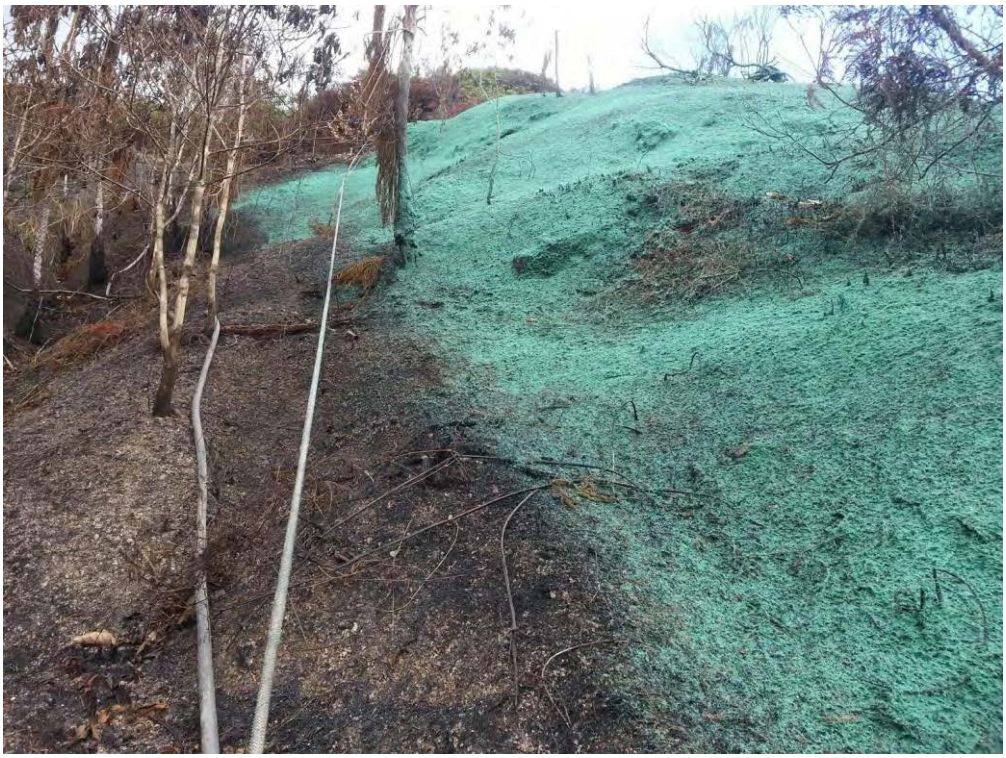

Figure 19. Post stabilization of one of the sites in Bosque del Pueblo

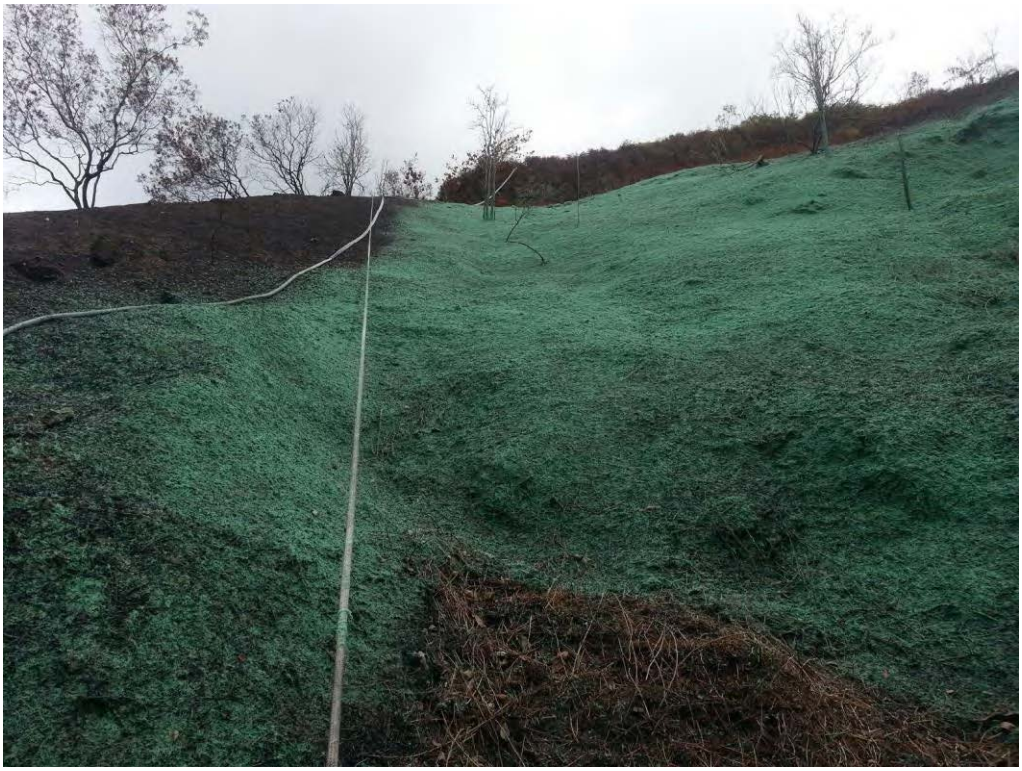

Figure 20. Test plot in Bosque del Pueblo

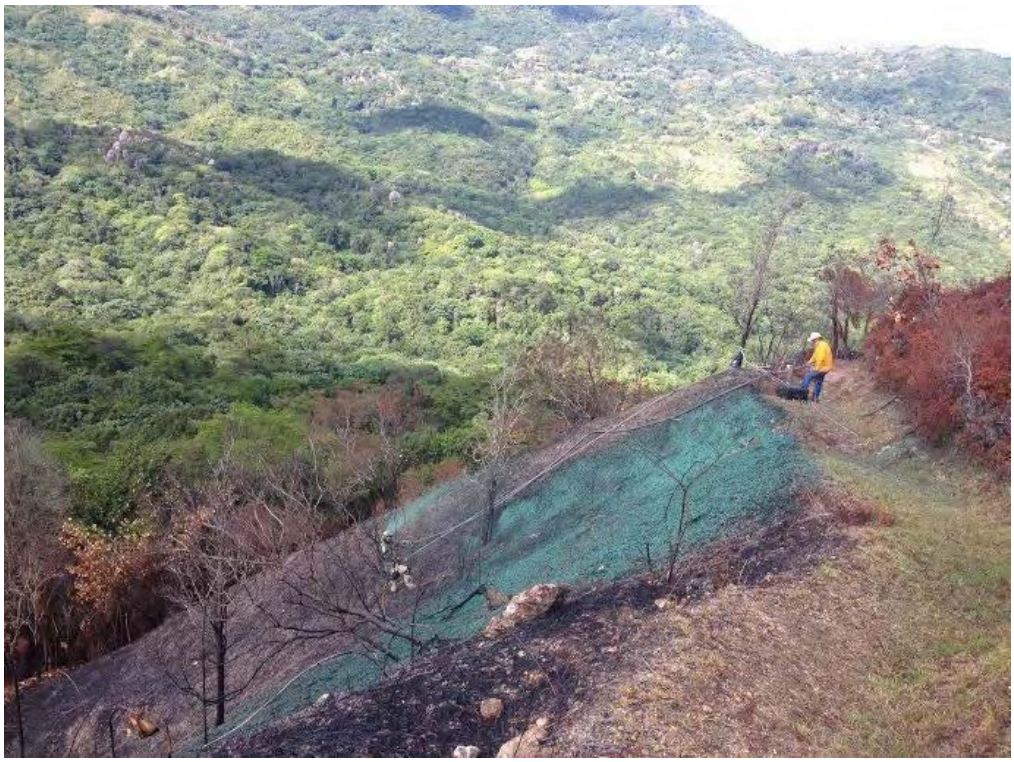

Figure 21. Laying out the test plot and applying hydroseeding

Figure 22. Adjuntas plot –post stabilization and watering – rapid stabilization and good germination

Cabo Rojo – El Faro

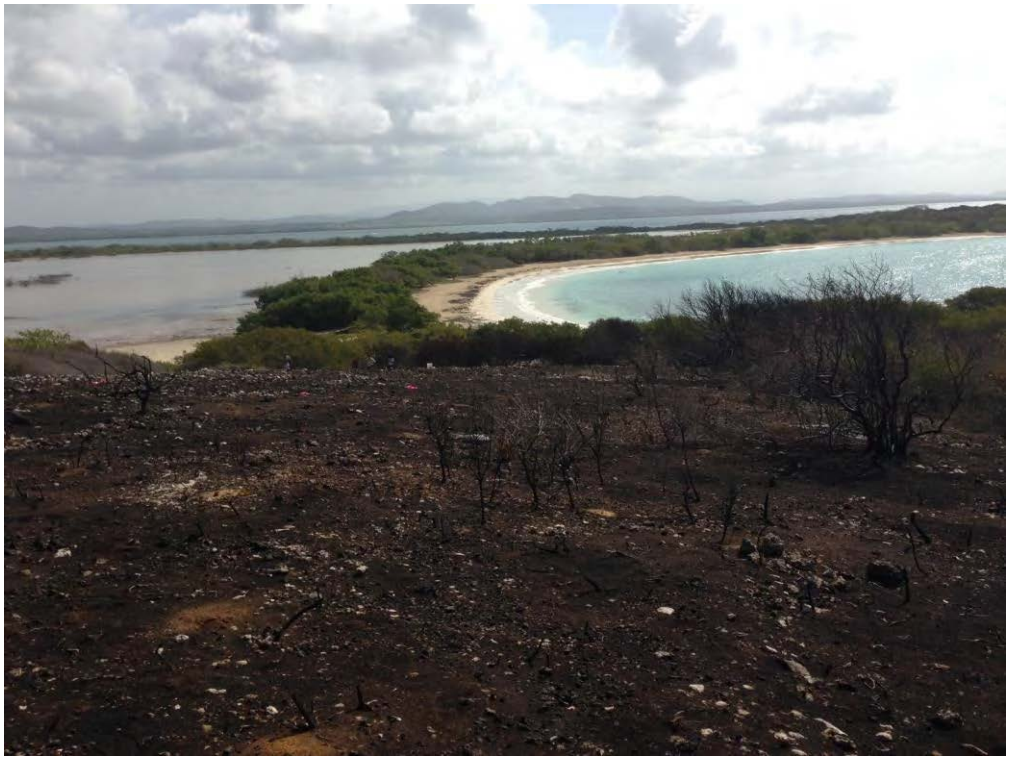

Figure 23. Burn site prior to restoration efforts

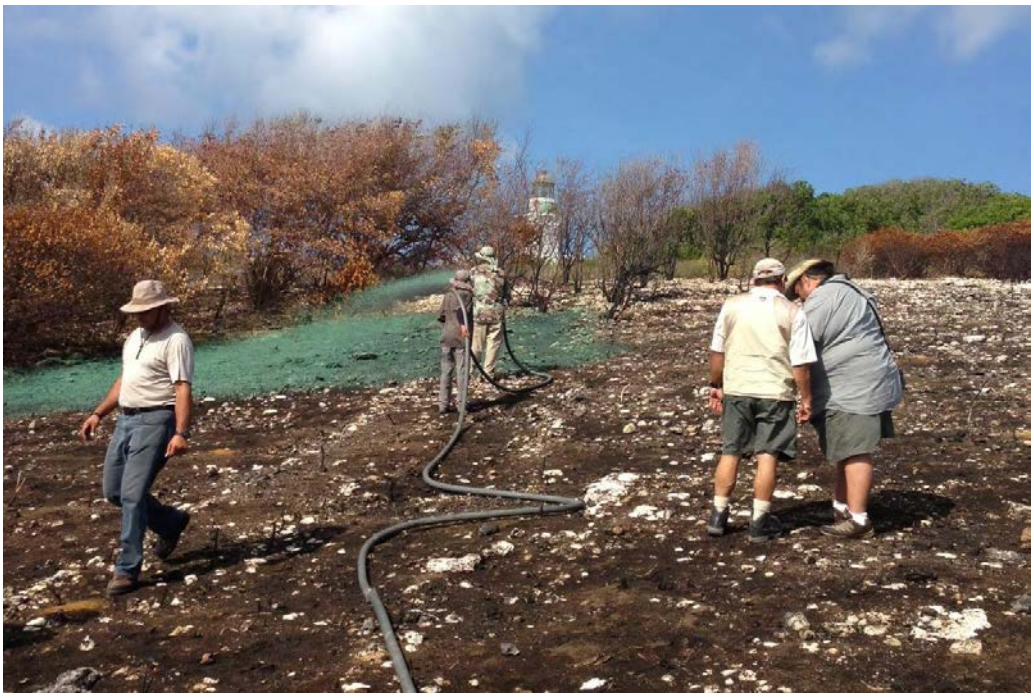

Figure 24. Hydroseeding and restoration effort

Figure 25. Native seeds used in hydromulching mixture

Training and Capacity Building

- NOAA staff, local businesses, farmers and Puerto Rico Department of Natural and Environmental Resources (DNER), Casa Pueblo and Amigos de Bosque Seco all participated in the projects and played direct roles in the project
- Protectores de Cuencas was able to train a 3 person labor crew that is knowledgeable and can work as a team with supervision and guidance to perform hydromulching activities
- Several construction projects have requested quotes and we have performed hydroseeding for the Municipality of Yauco and for one development project
- Farms have continued requesting and inquiring about our services
- **Puerto Rico Department of Natural and Environmental Resources have requested our assistance in addressing burn sites and have helped provide labor and watering resources**

Obstacles

- there is little to no local, Federal or Commonwealth enforcement of erosion and sediment control (ESC) regulations in Puerto Rico -- so as a result there is little to compel developers or land clearing operations to spend the resources necessary for rapid stabilization and proper ESC
- regulations require rapid stabilization often within 15 days of final clearing but this is never enforced in Puerto Rico
- Hydroseeding and successful stabilization through follow up watering is quite expensive compared to the alternative -- allowing silt fence to blow in the wind or to do nothing at all
- On the positive side hydroseeding is quite cost competitive with sod as a stabilization method

- Hydroseeding in mountainous and high evaporation areas of Puerto Rico is more expensive than similar applications stateside -- so NRCS cost-share rates are not adequate to make hydroseeding viable in Puerto Rico as a fully funded or well funded cost-share practice despite its effectiveness at controlling erosion
- Puerto Rico Environmental Quality Board (EQB) and USEPA need to be further brought into these projects to be made aware of the advancements in hydroseeding being made in Puerto Rico and to begin to advise developers and agencies in the use of this methodology
- The benefits to developers in terms of decreased costs of re-grading after storm events, extensions in project time and overall project costs need to be described for Puerto Rico and the Caribbean in order for developers to see project benefits and not just compliance benefits to hydroseeding
- **Capital funding for environmental restoration in Puerto Rico still proves to be very challenging and cash funding was not available for the restoration of the two burn sites – emergency restoration funding for the protection and restoration of terrestrial based sources of pollution such as a recently burned site needs to be made available to handle such emergencies.**