

# *Implementation of the Guánica Bay Watershed Management Plan*

## **Integrated Watershed Management Actions**

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**Puerto Rico**  
**Del Monte al Mar**  
December, 2021





# Content

- History
- Watershed description
- Watershed Management Plan
- NGO
- Implementation 2012-2022
- Update Integrated  
Recommended Actions
- Graduation

# Partners



Yauco



Guánica



Guayanilla



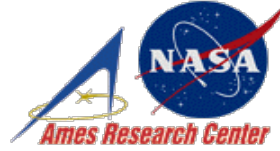
Lajas



GlobalGiving



sartorius stedim  
biotech



The University of Texas at Austin  
Teresa Lozano Long Institute  
of Latin American Studies



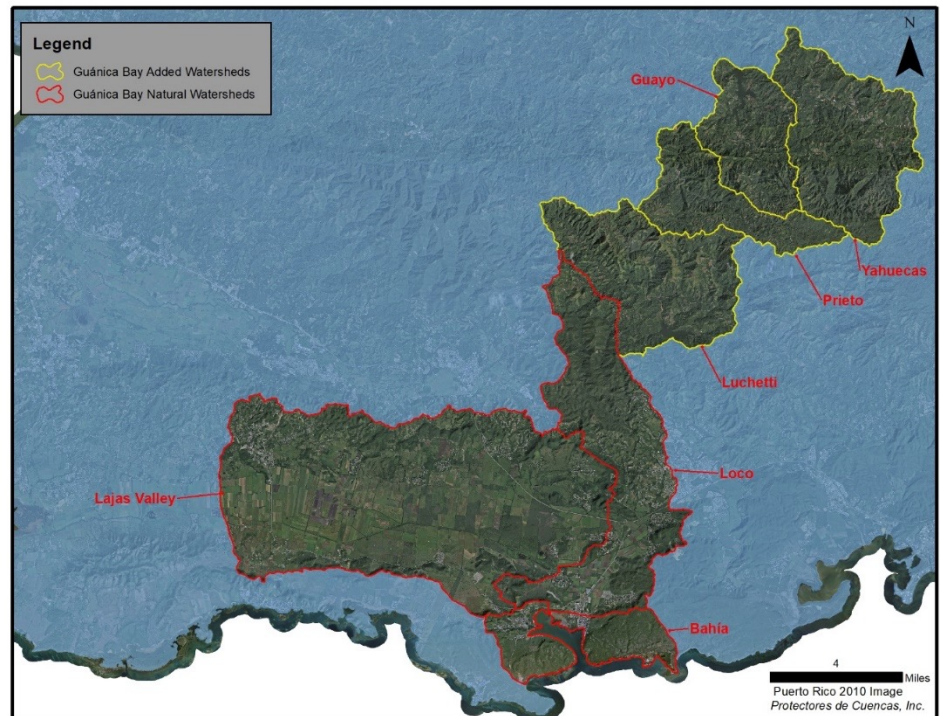
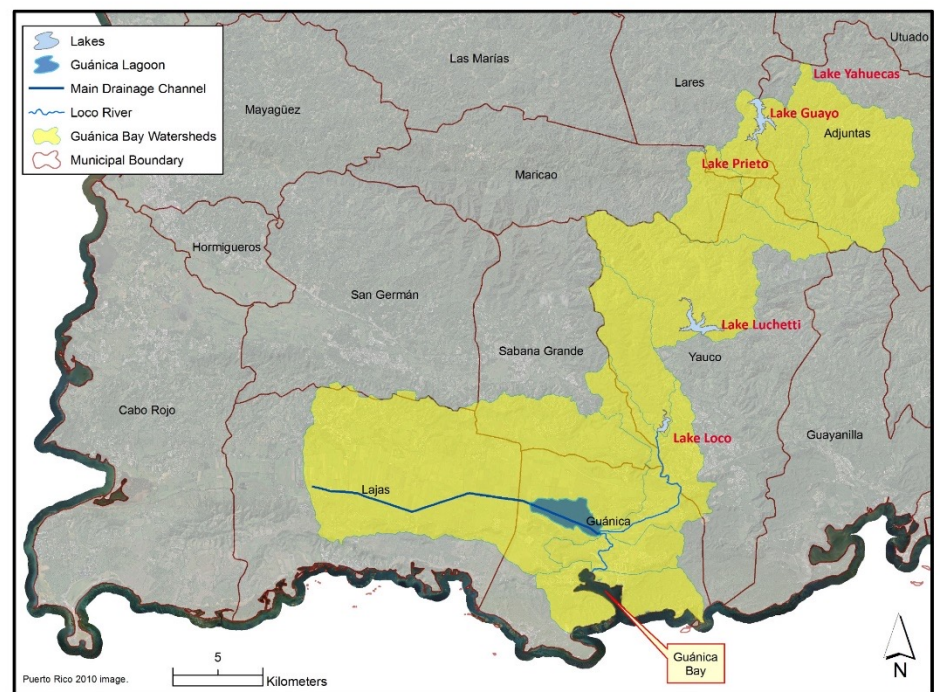
FUNDACIÓN COMUNITARIA  
DE PUERTO RICO





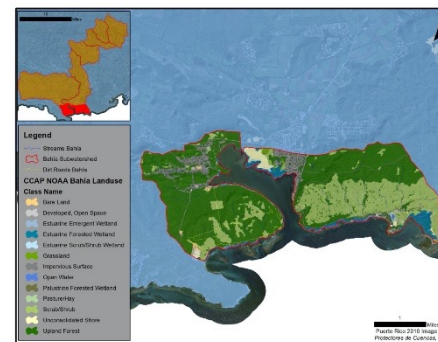
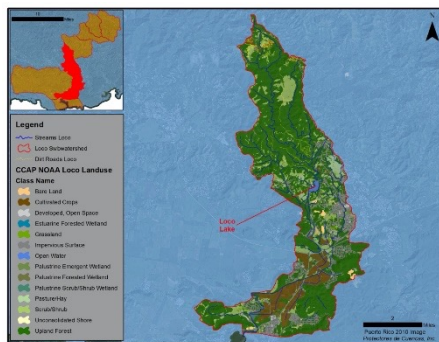
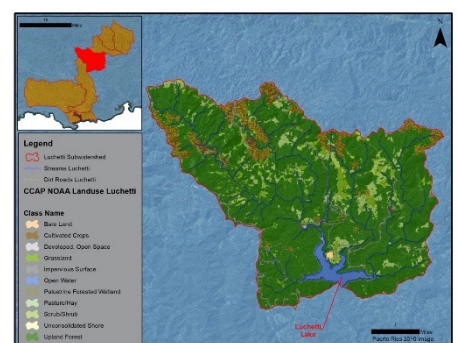
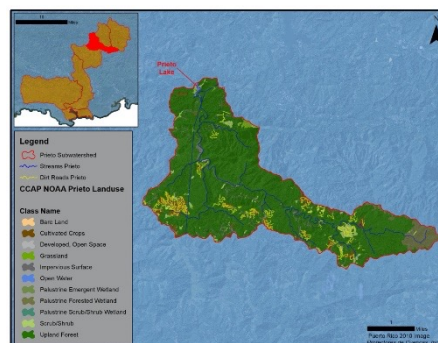
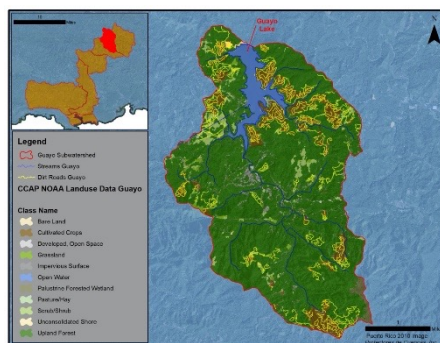
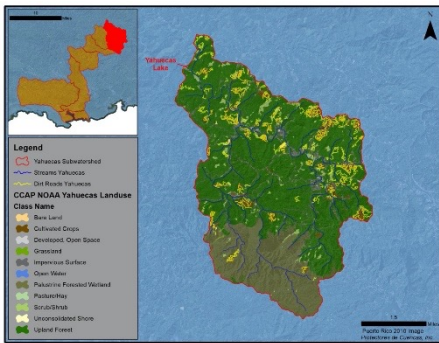
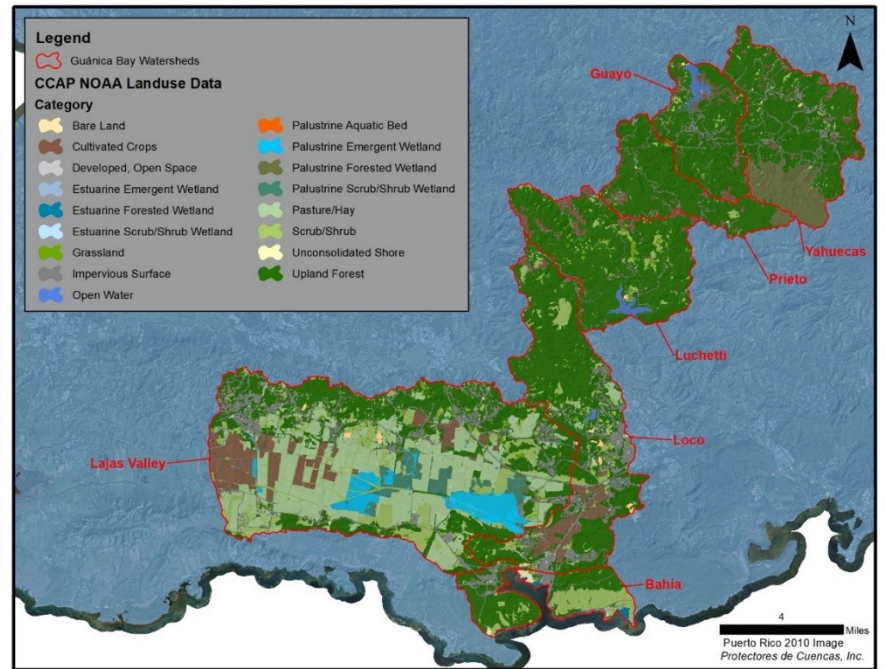
# Guánica Bay Watersheds and Subwatersheds

- Located in southwestern Puerto Rico
- Spans eight municipalities
- Seven subwatersheds - four added artificially
- 89 miles<sup>2</sup> originally to approximately 143 miles<sup>2</sup> (91,417 acres).
- Five reservoirs
- One main river, two main tributaries



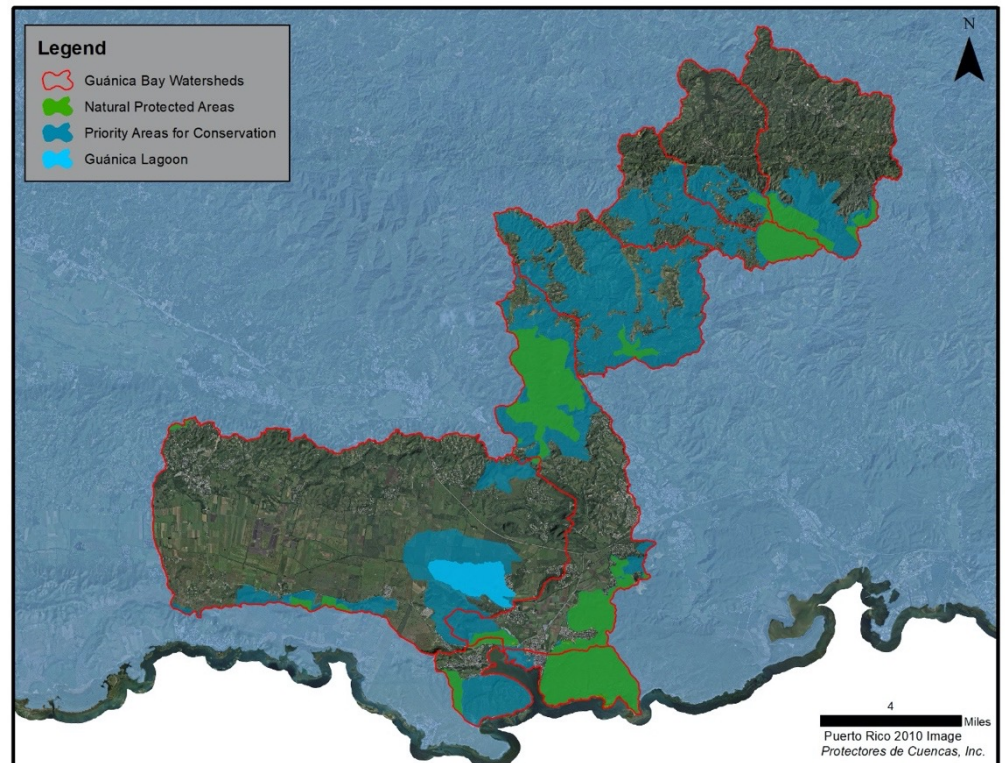
# Land use

CATEGORY	ACRES	% LAND COVER
Forest	53,374.19	58.39%
Agriculture	17,744.82	19.41%
Scrub/Shrub	11,984.52	13.11%
Urban	2,757.49	3.02%
Paved Roads	2,296.58	2.51%
Grassland	1,637.04	1.79%
Water	815.19	0.89%
Bare Soils	412.07	0.45%
Dirt Roads	394.76	0.43%
<b>TOTAL</b>	<b>91,416.67</b>	<b>100.00%</b>



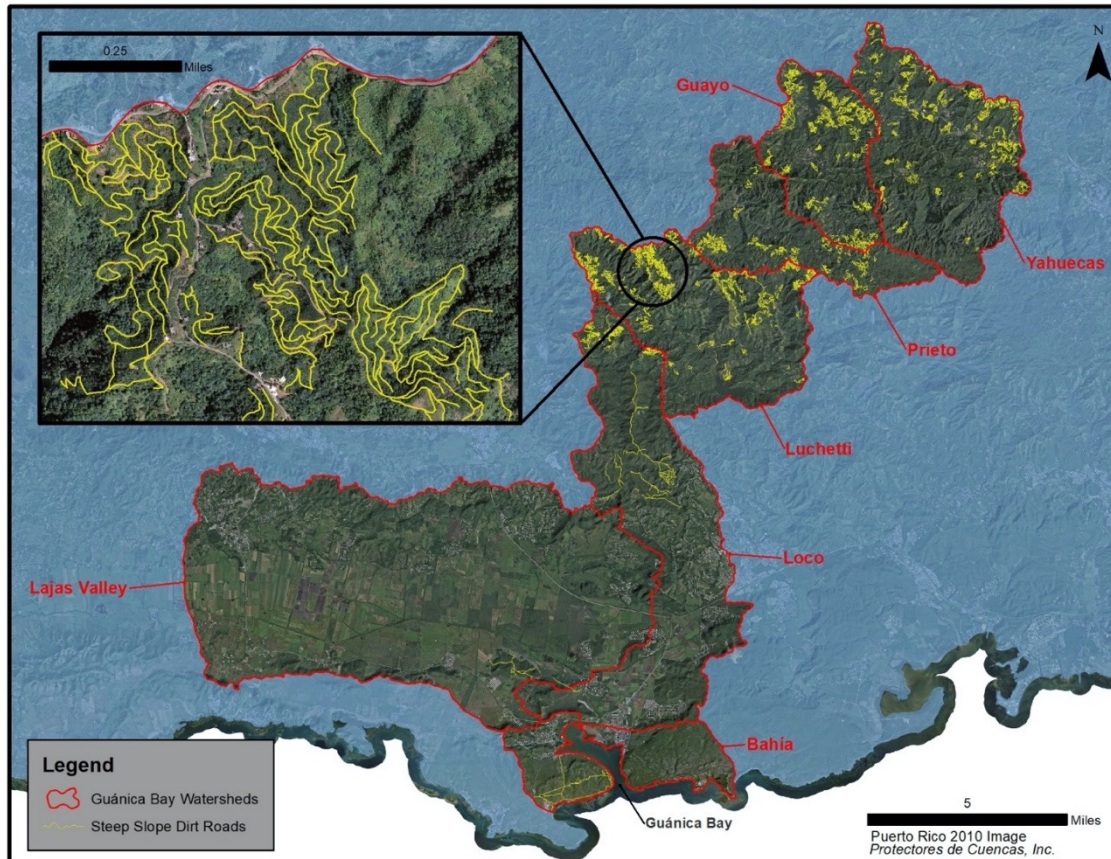
# Natural Protected Areas

NATURAL PROTECTED AREA	ACRES	% LAND COVER
Bosque Estatal de Guánica	3,372.71	3.7%
Bosque Estatal de Susua	2,864.77	3.1%
Bosque Estatal de Monte Guilarte	1,842.44	2.0%
Zona de Conservacion del Carso	735.26	0.8%
Refugio de Vida Silvestre Lago Luchetti	231.86	0.3%
Reserva Natural La Parguera	360.61	0.4%
<b>TOTAL</b>	<b>9,407.64</b>	<b>10.3%</b>



# Dirt Roads

SUBWATERSHED	MILES	ACRES	% LAND COVER
Luchetti	98.85	117.90	1.06%
Yahuecas	77.95	92.91	0.83%
Guayo	73.44	87.55	1.42%
Loco	32.82	39.13	0.25%
Prieto	31.39	37.43	0.61%
Bahía	8.17	9.74	0.19%
Lajas Valley	3.60	4.29	0.01%
<b>TOTALS</b>	<b>326.21</b>	<b>388.94</b>	<b>0.43%</b>





# Principal Recommendations of the Guánica Management Plan

## Guánica Bay Watershed Management Plan

A Pilot Project for Watershed Planning in Puerto Rico



10/12/08

### Prepared for

NOAA Coral Reef Program  
Office of Ocean and Coastal Resource Management  
Silver Spring, Maryland

Departamento de Recursos Naturales y Ambientales (DRNA)  
Estado Libre Asociado de Puerto Rico



### Prepared by

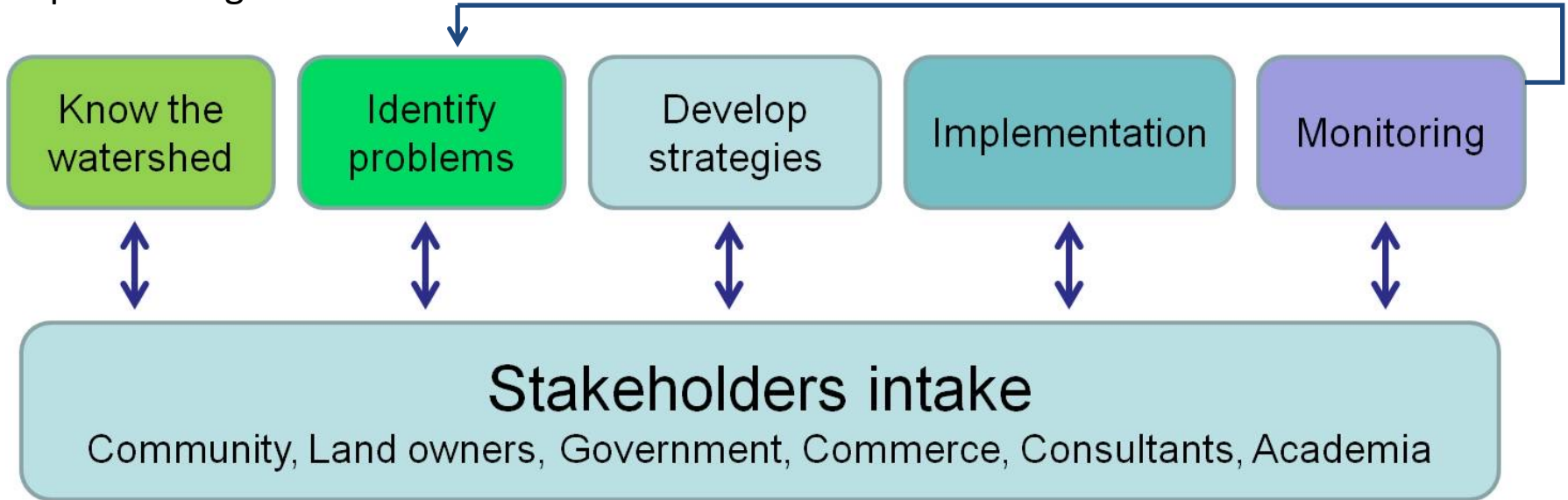
Center for Watershed Protection  
8390 Main St, 2<sup>nd</sup> Floor  
Ellicott City, MD 21043 USA  
[www.cwp.org](http://www.cwp.org)

CENTER FOR  
WATERSHED  
PROTECTION

- Restoration of Guanica Lagoon
- Rio Loco River Restoration efforts
- Stabilization of High Mountain Soils
  - Control of sediment transport from Coffee Farms Erosion control and conversion to shade coffee
  - Control of sediment transport from bare soils - road sides, urban areas (construction) etc.
- Sewage treatment wetlands at the Guanica sewage treatment plan
- Investigate and address other sources of pollution

# Watershed plan implementation Process

Implementing since 2010



# INSTITUTIONAL CAPACITY BUILDING

## *Native Plants Nursery*

- More than 60,000 plants produced yearly
- Restoration Projects across the Island

## *Monitoring Equipment*

- HACH 2100Q Portable Turbidimeter
- HACH SL1000 Portable Nutrient Multiparameter
- YSI Multiparameter
- HANA Ammonia Medium Range Portable Photometer - HI96715
- IDEXX Quanti-Tray System for bacteria

## *Restoration Equipment*

- 12 4x4 Pick up trucks
- 6 4x4 6m Dump Trucks
- 1 4x4 Service Truck
- 2 20m Dump Trucks
- 2 Backhoes
- 2 Crawler Dozers
- 2 Compacting Rollers
- 2 Skid Steer
- 6 water trucks
- 6 trailers
- Hydromulcher
- 2 Mini excavators
- 1 Mid Excavator
- 2 Boats

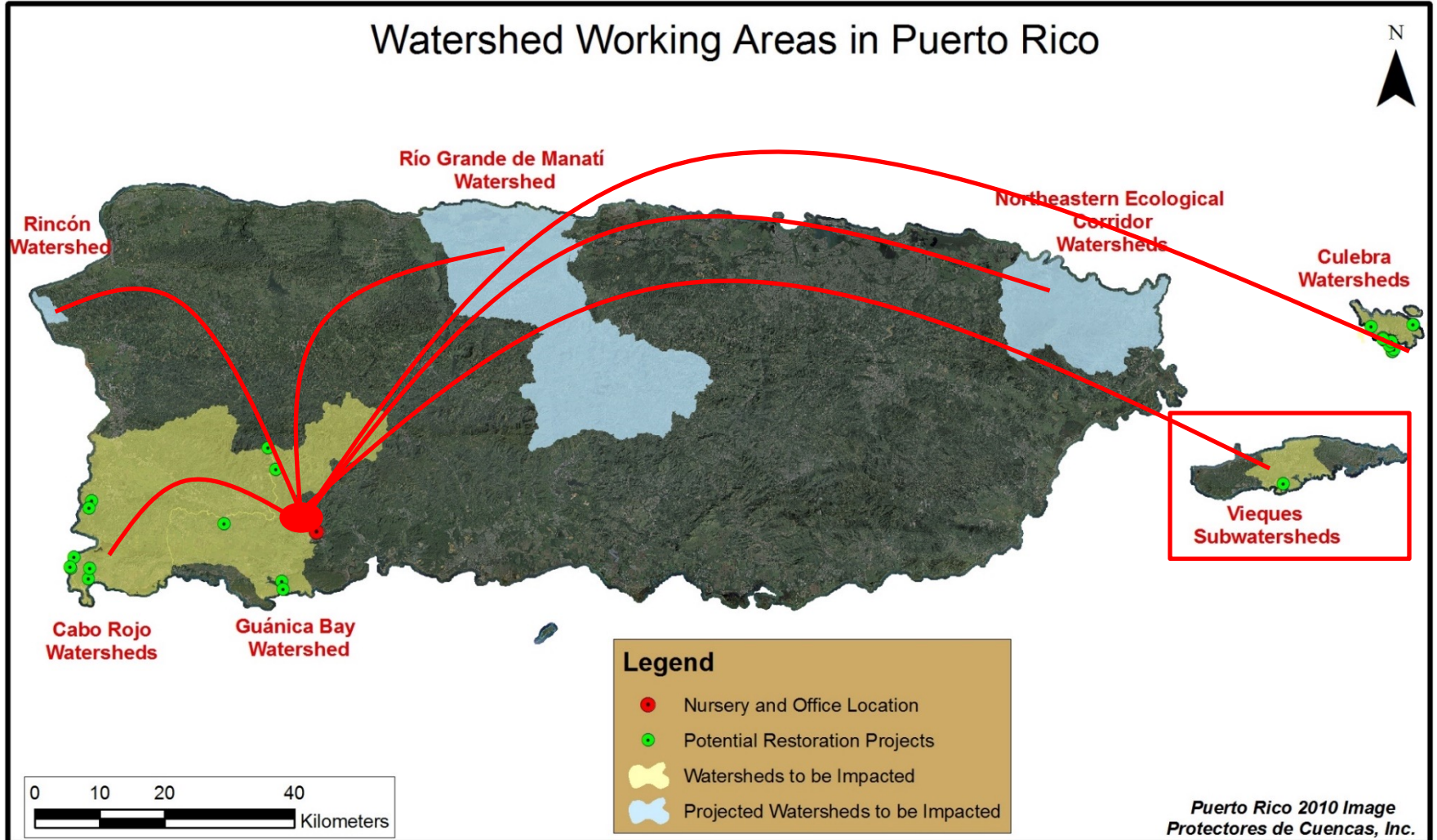
## *Staff:*

- 8 Technical Personnel
- 30 General Labor experts in BMP and Green Infrastructure





# Expanding our model



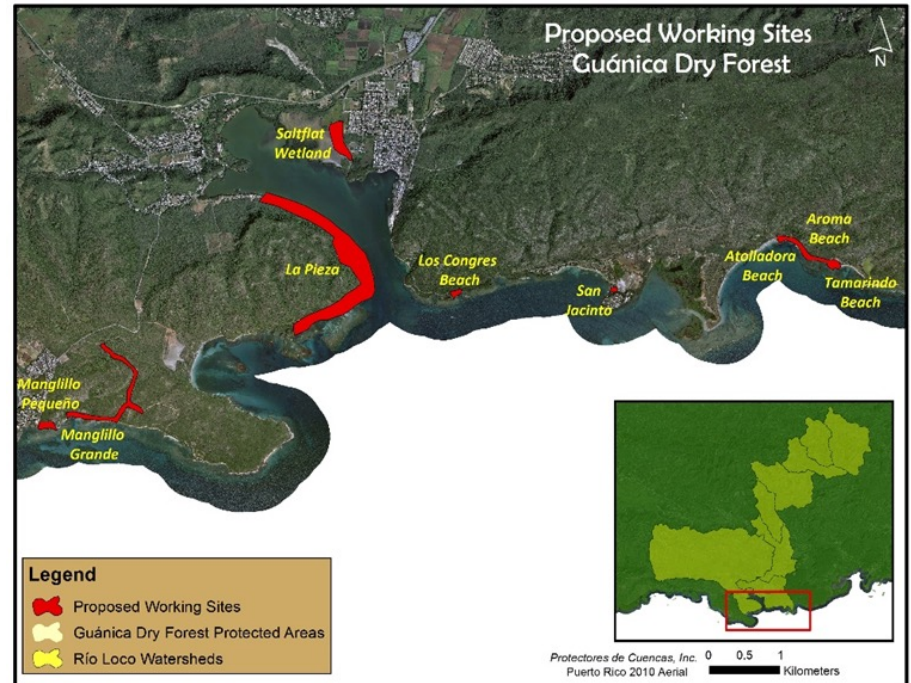
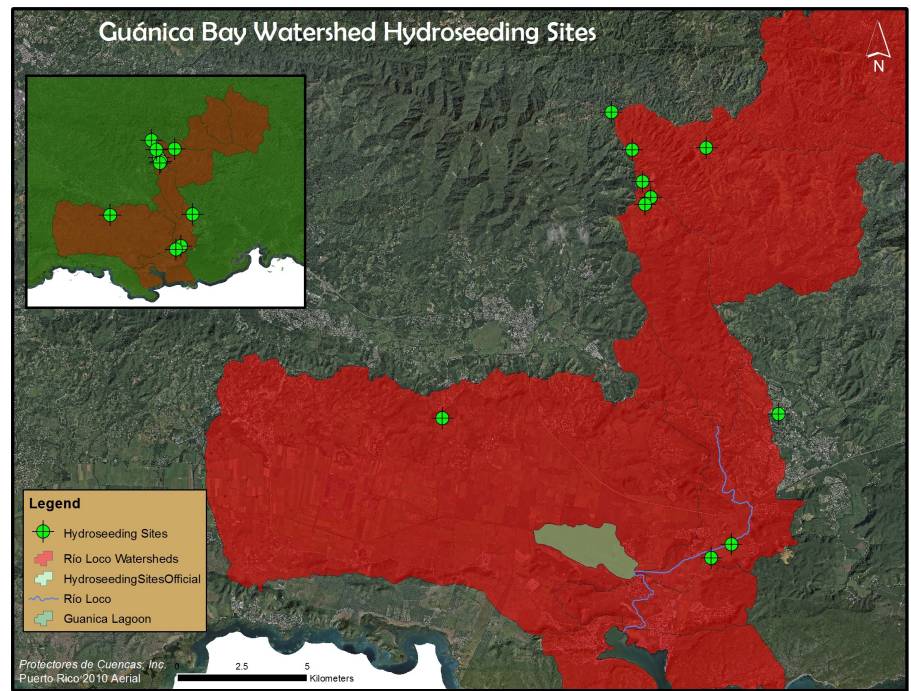
# SOURCE AREA POLLUTION

## Hydroseeding

- 24.5 acres of bare soils that have been stabilized by hydroseeding across the Guánica/Río Loco
- Over \$100K in match contributions
- Expand to other priority watersheds

## Coastal Stabilization and Habitat restoration

- Shoreline Stabilization
- Sand dune restoration
- Reforestation
- Habitat protection, creation and enhancement
- Fire prevention
- Soil stabilization





# La Jungla Bosque Seco de Guánica













# COASTAL RESTORATION AT TAMARINDO BEACH GUÁNICA DRY FOREST, PUERTO RICO



**Legend**

- Elevated Boardwalks
- x-x Delimitation of Sensitive Areas
- Sand Dune Restoration Sites
- Coastal Forest Restoration Sites

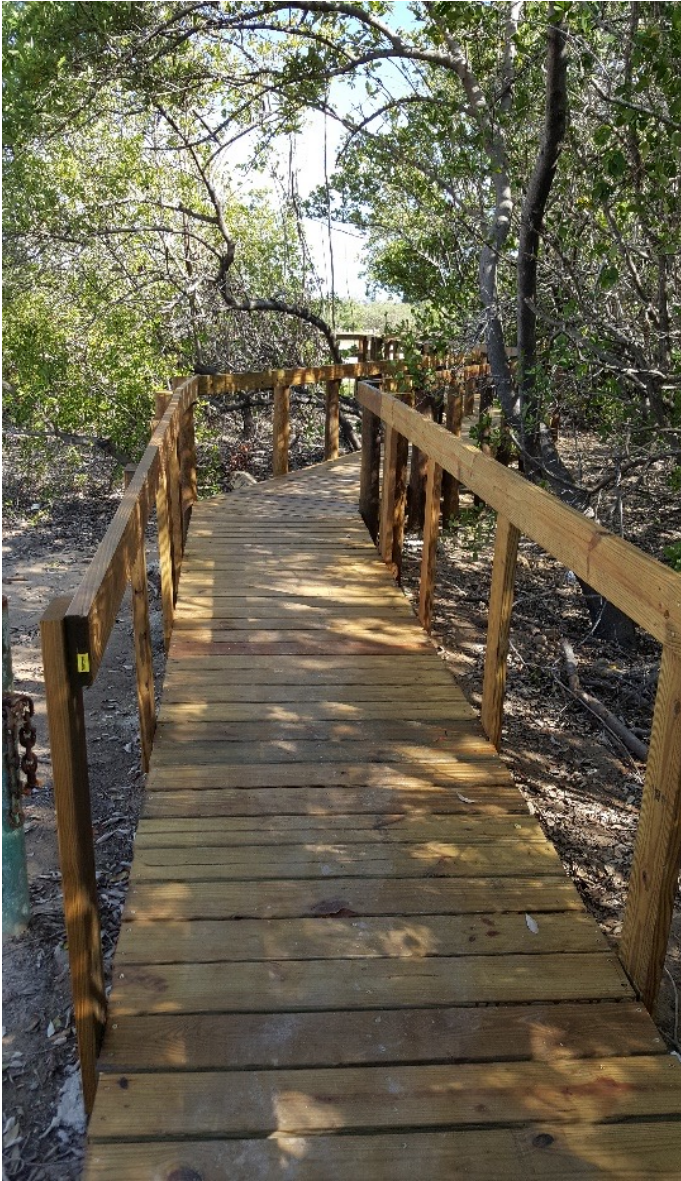
0 60 120  
Meters

Puerto Rico 2010 Aerial  
Protectores de Cuencas, Inc.

N













# PUERTORRICAN CRESTED TOD

## CLIMATE CHANGE ADAPTATION PLAN

- 2 ponds of Constructed Wetlands built uphill
- Funds from USFWS, DNER, ASA
- Matching contribution from Municipalities



# OUTREACH AND EDUCATION



- Over 5,000 students impacted from 5 different schools across the watershed

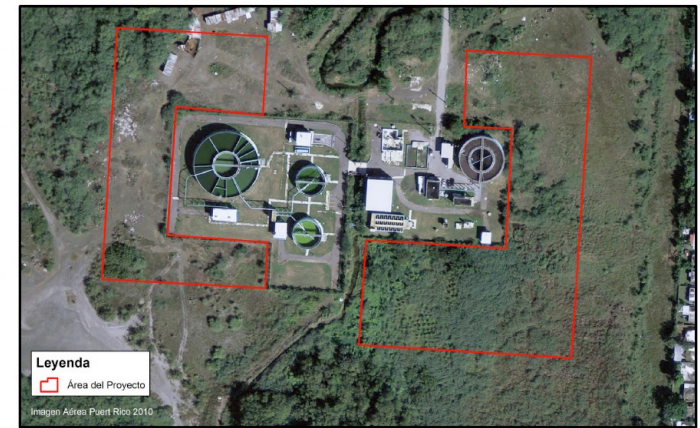


# GUÁNICA TREATMENT WETLANDS

- 100% engineering designed
- 100% of permit process completed
- Environmental compliance
- 78% construction completed

## Next Steps:

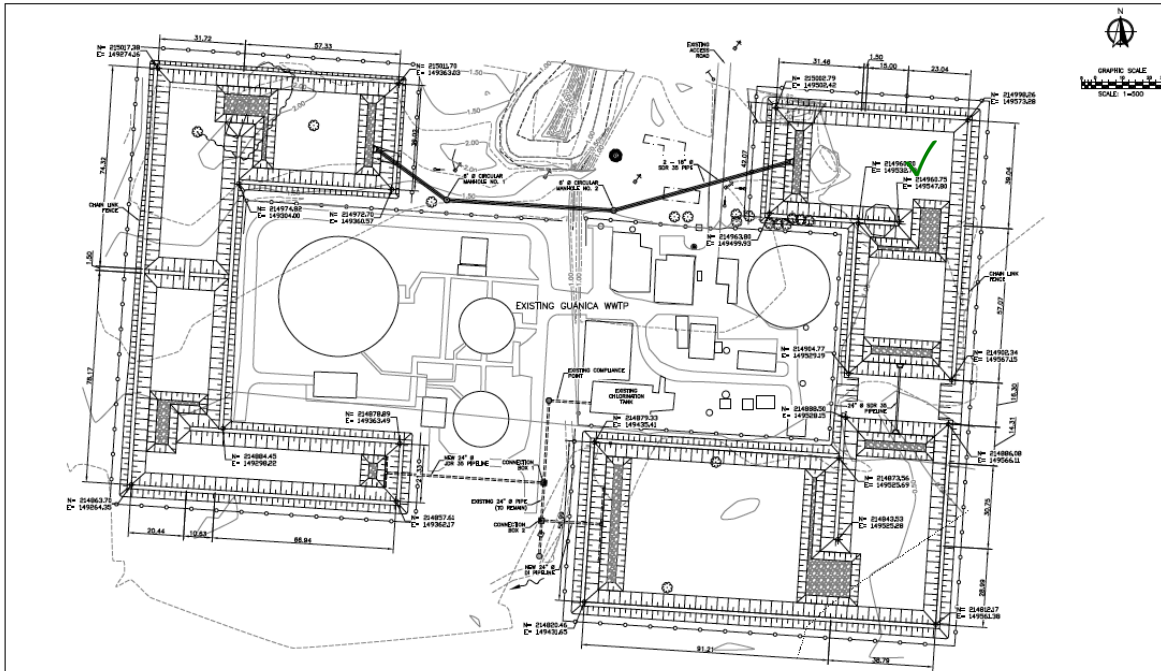
- MOU Signature with PRASA for Phase 2
- Finalize construction September 2023



**Leyenda**  
 Área del Proyecto  
 Imagen Aérea Puerto Rico 2010



**Figura 4**  
**Imagen Aérea Ampliada**  
 CONSTRUCCIÓN DE HUMEDALES DE TRATAMIENTO EN  
 PLANTA DE AGUAS USADAS DE GUÁNICA  
 Guánica, Puerto Rico



ADVANCED DESIGN  
 (90% DESIGN)  
 NOT FOR CONSTRUCTION

NO.	REVISIONS	DATE	BY	APPROVAL

NATIONAL OCEANIC AND  
 ATMOSPHERIC ADMINISTRATION  
 UNITED STATES DEPARTMENT OF COMMERCE

GUÁNICA WASTEWATER  
 TREATMENT WETLAND  
 GUÁNICA, PUERTO RICO

DATE	1-200
SHEET	C-101
DATE	02/1/2014
SCALE	10
DATE	02/1/2014
SCALE	10



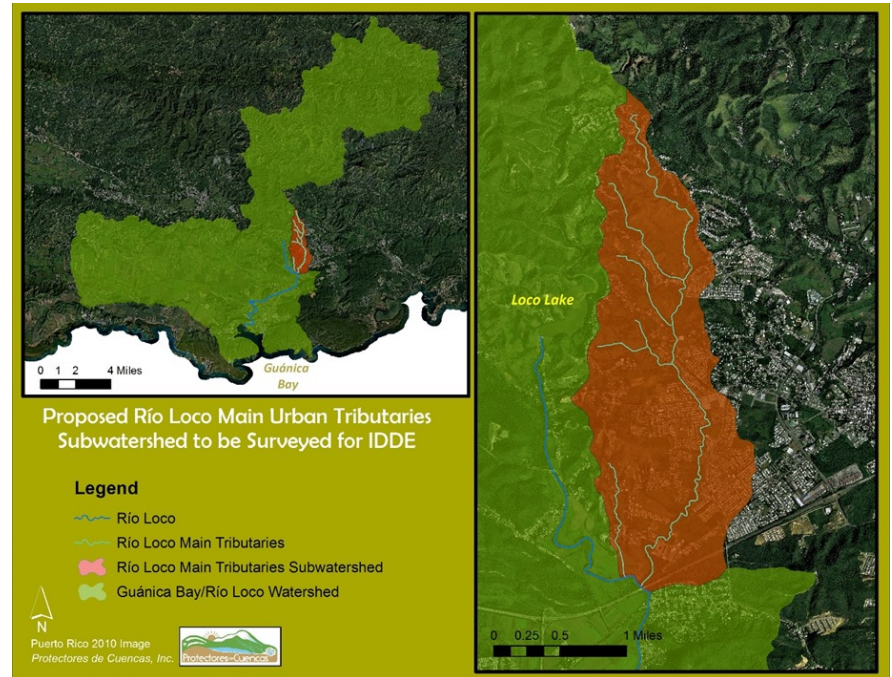


# POLLUTION TRACKING

- IDDE method

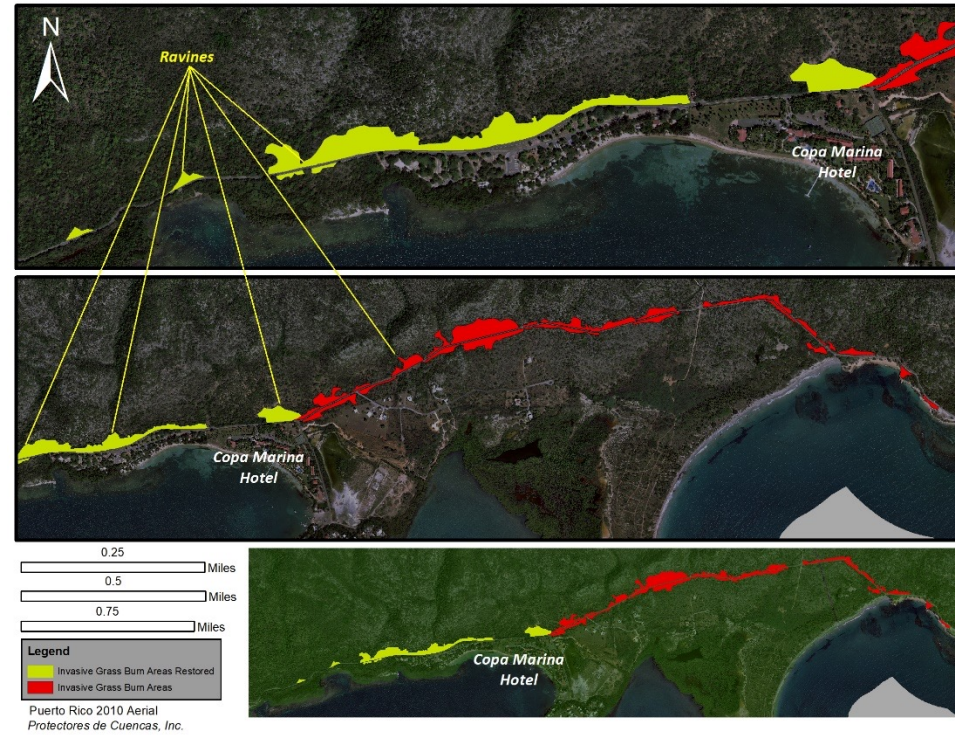
## *Next Steps:*

- Continue on areas of Guánica Town



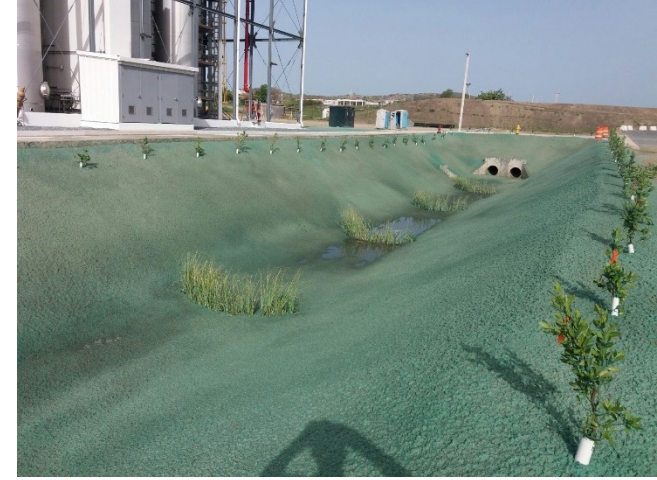
# Eradication of Invasive Grass Species and Forest Fire Prevention in the Guánica Dry Forest, Puerto Rico

- Soil Stabilization
- Native Vegetation
- Invasive Species control
- Forest Fire Prevention
- Forest Rehabilitation
  - 75 acres affected identified
  - 2 acres of forest lost/year
  - Stabilization of 12 acres
  - Funding for additional 30 acres
  - 14,000 native trees planted
  - New partners joined effort



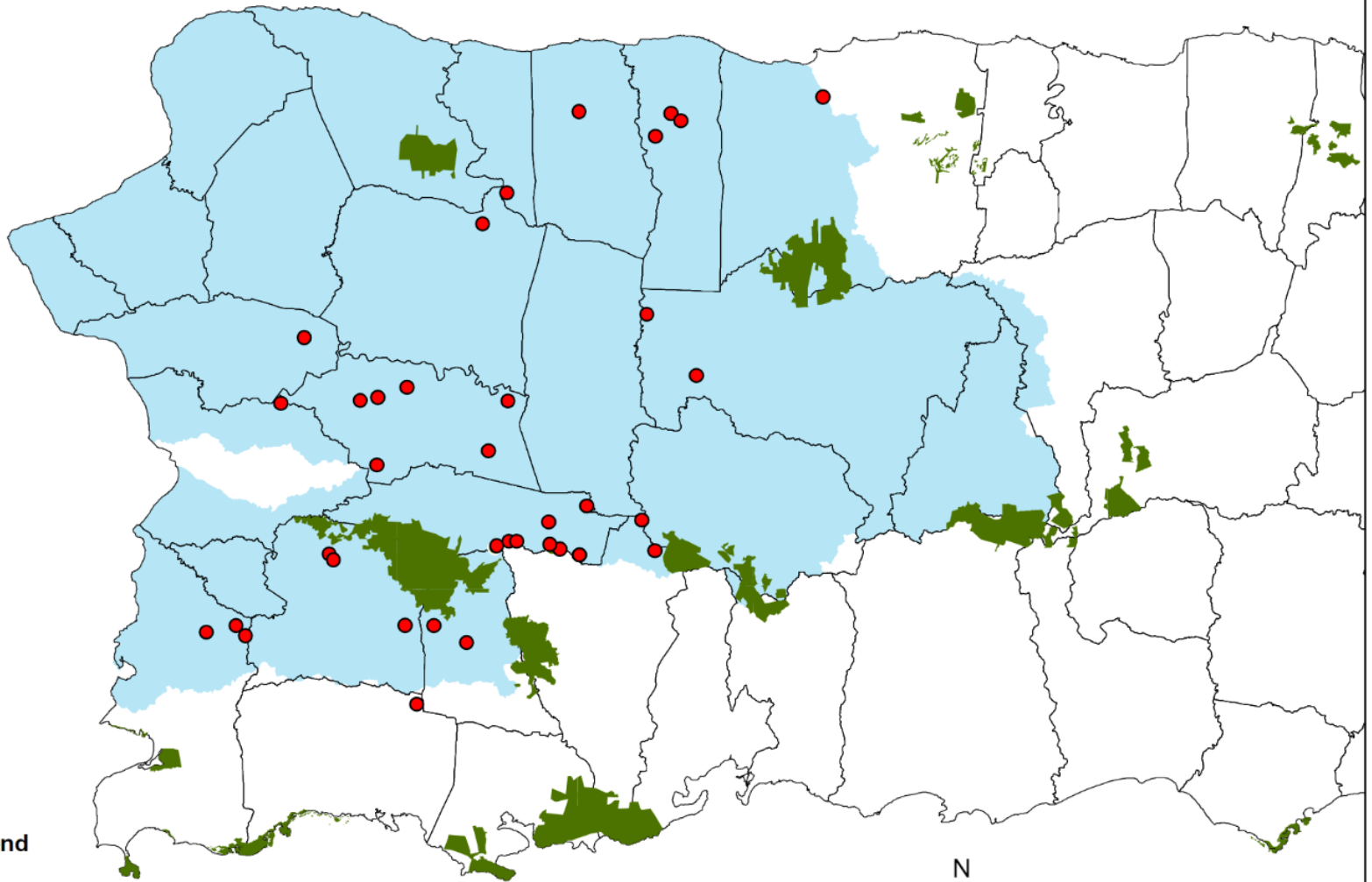
# Sartorius Biotech company

- Expanding work to private sector
- Sediment and erosion control practices
- Landscaping
- Design stormwater management practices
- 16 acres of Hydroseeding
- Long term maintenance contract




sartorius stedim  
biotech


# Private lands participating in the Caribbean Area Joint Chiefs Landscape Restoration Partnership (2018-2020)

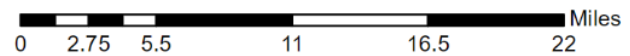


## Legend

 Joint Chiefs LRP focus area

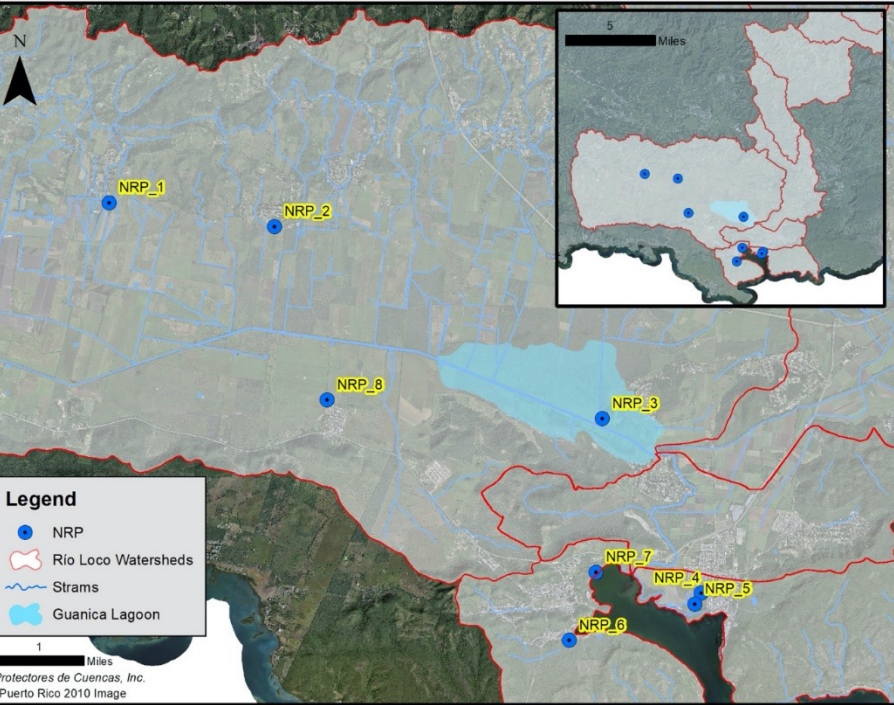
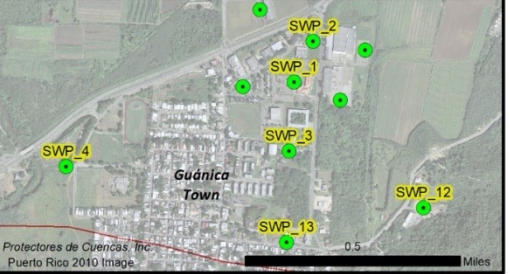
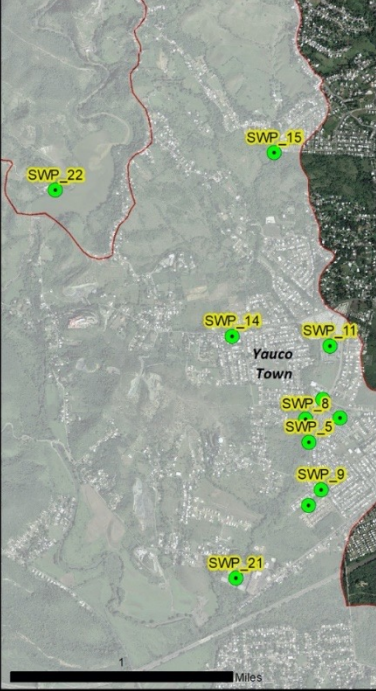
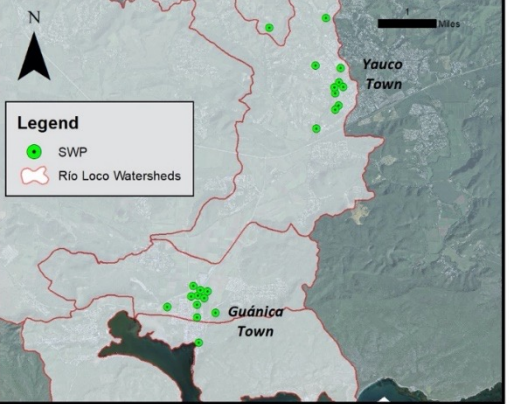
 State Forests

 Joint Chiefs LRP participants





# Integrated Watershed Management Actions Update



# Guánica Bay Graduation

- 1 to 2 year process
- Multiple Lines of Evidence Approach
  - No existing continuous monitoring program
  - PDC is working with partners to consolidate and synthesize all existing monitoring data



Natural Resources Conservation Service





# THANK YOU!

Web: [protectoresdecuencas.org](http://protectoresdecuencas.org)  
[rviqueira@protectoresdecuencasinc.org](mailto:rviqueira@protectoresdecuencasinc.org)

