

Usos y Aplicaciones de SIG en los Refugios de Vida Silvestre



William J. Hernández
Servicio Federal de Pesca y Vida Silvestre
Refugio de Cabo Rojo



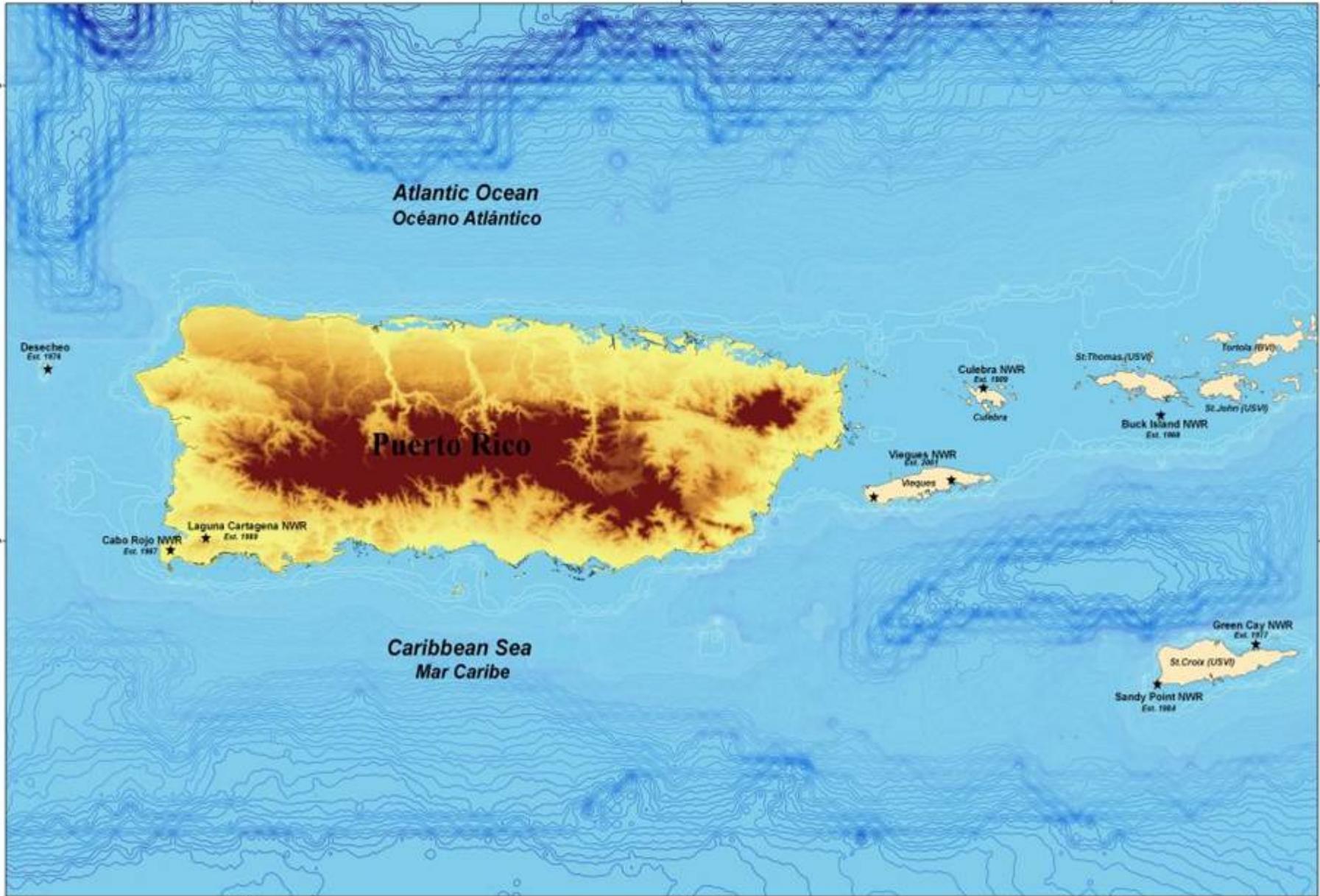
Refugios Nacionales de Vida Silvestre de las Islas del Caribe

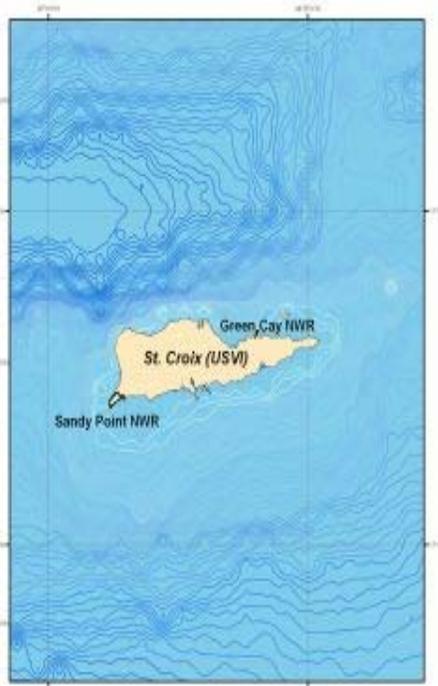
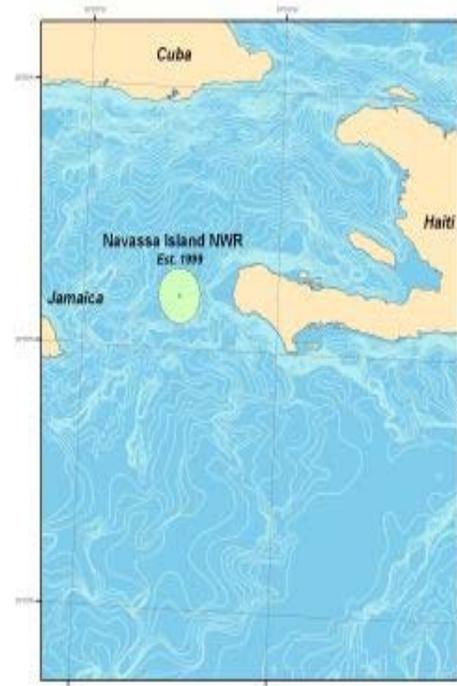
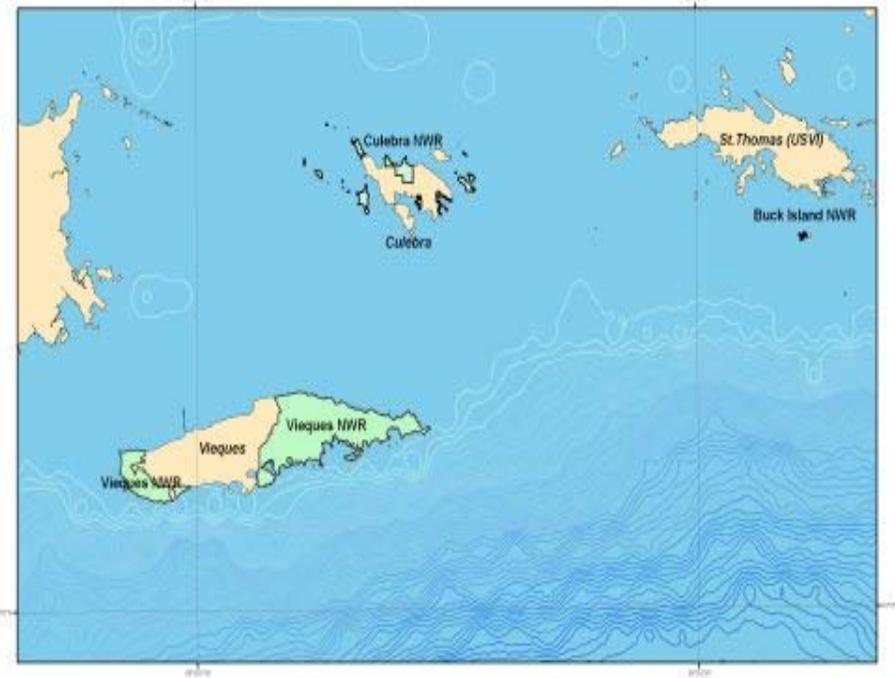
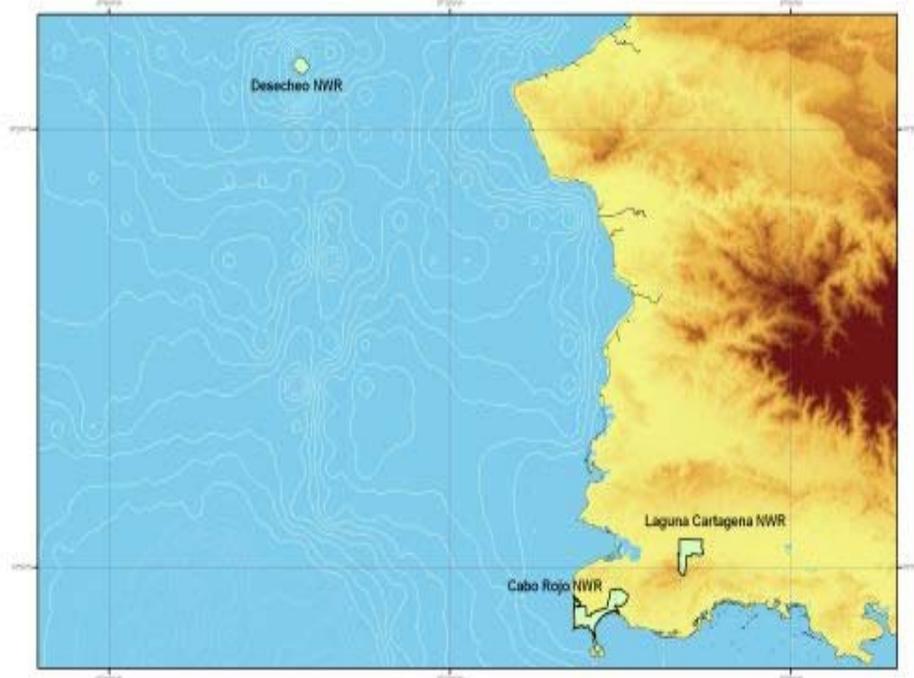
- 🌍 Complejo de 9 refugios localizados en Puerto Rico, Islas Vírgenes y el pasaje de Jamaica
- 🌍 Cabo Rojo, Culebra, Desecheo, Buck Island, Green Cay, Sandy Point, Laguna Cartagena, Navassa y Vieques.
- 🌍 Manejados por Servicio de Pesca y Vida Silvestre cuya misión es conservar, proteger y mejorar la flora, fauna y sus hábitat, para beneficio de los ciudadanos.
- 🌍 Cada unidad consta de una composición única de especies de plantas y animales



Caribbean Islands National Wildlife Refuge Complex

Refugios Nacionales de Vida Silvestre del Caribe





Photos credited by authors

Caribbean Islands NWR Complex
 PO Box 510
 Boqueron, PR 00622

 Road 301 KM 5.1
 Corozo Ward
 Boqueron, PR
 787 851 7258 Tel
 787 255 0725 Fax
<http://caribbean.fws.gov>

Source data: USFWS Division of Realty,
 Caribbean Islands NWR, Puerto Rico Planning Board,
 US Corps of Engineers, National Atlas
 Map info: State Plane Puerto Rico US Virgin Islands
 NAD 1983 Software: ESRI ArcGIS 9.0
 Date: June, 2006
 Map Design: William J. Hernández



Usos y Aplicaciones de SIG

- 🌐 Informativo
 - Veredas
 - Mapas
 - Interpretativo
- 🌐 Manejo de Fuegos
 - Mapas
- 🌐 Restauración
 - Siembra
 - Manejo de Refugio
- 🌐 Límites del Refugio
 - Organización
 - Base de Datos Geográficos
- 🌐 Plan Comprensivo de Conservación (CCP Vieques)
- 🌐 Productos Cartográficos



Informativo

Veredas (~12 millas)

- Caminatas
- Interpretativas
- Bicicletas*

Evaluación

- Selección de área
- Rotulación
- Conectividad carreteras
- Estacionamiento
- Impacto a los recursos

Aplicaciones

- ArcGIS 9.0, Xtools 3.0
- Fotografía Aérea
- Colección de datos geográficos (GPS)

Mapas

- Diseño cartográfico
- Reglas de Uso

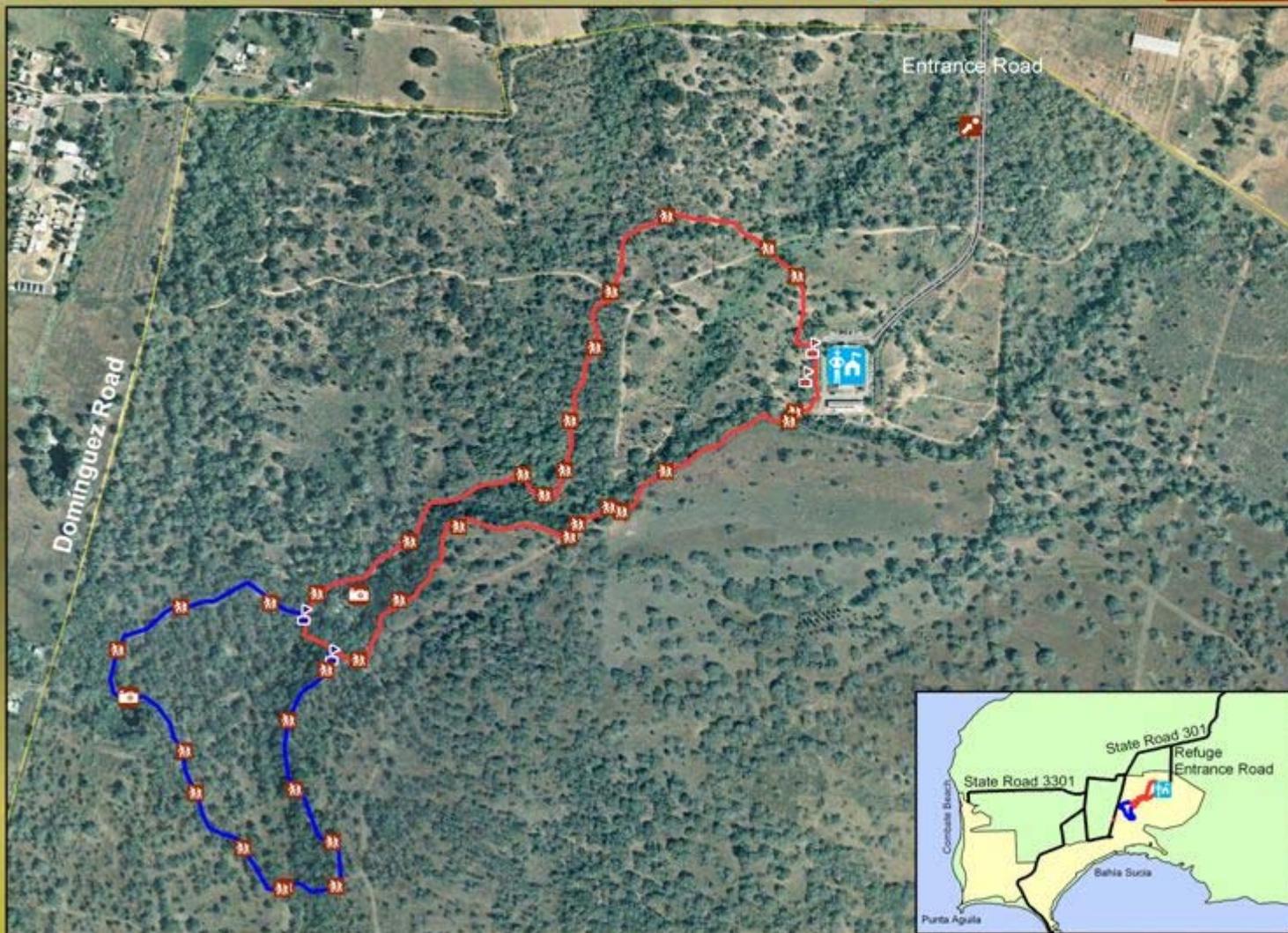




US Fish and Wildlife Service Cabo Rojo Refuge Hiking Trails



Photos by: T. Clark and W. Hernández



- Long Trail 3.4 km / 2.1 mi
- Short Trail 2.2 km / 1.4 mi
- Entrance Road
- Ponds
- Refuge Boundary
- Reference Point
- Long Trail Start
- Short Trail Start
- Trail Signs
- Photo Stations
- Cabo Rojo Visitor's Center

Cabo Rojo NWR
 PO Box 510
 Boqueron, PR 00622
 Road 301 KM 5.1
 Corozo Ward
 Boqueron, PR
 787 851 7258

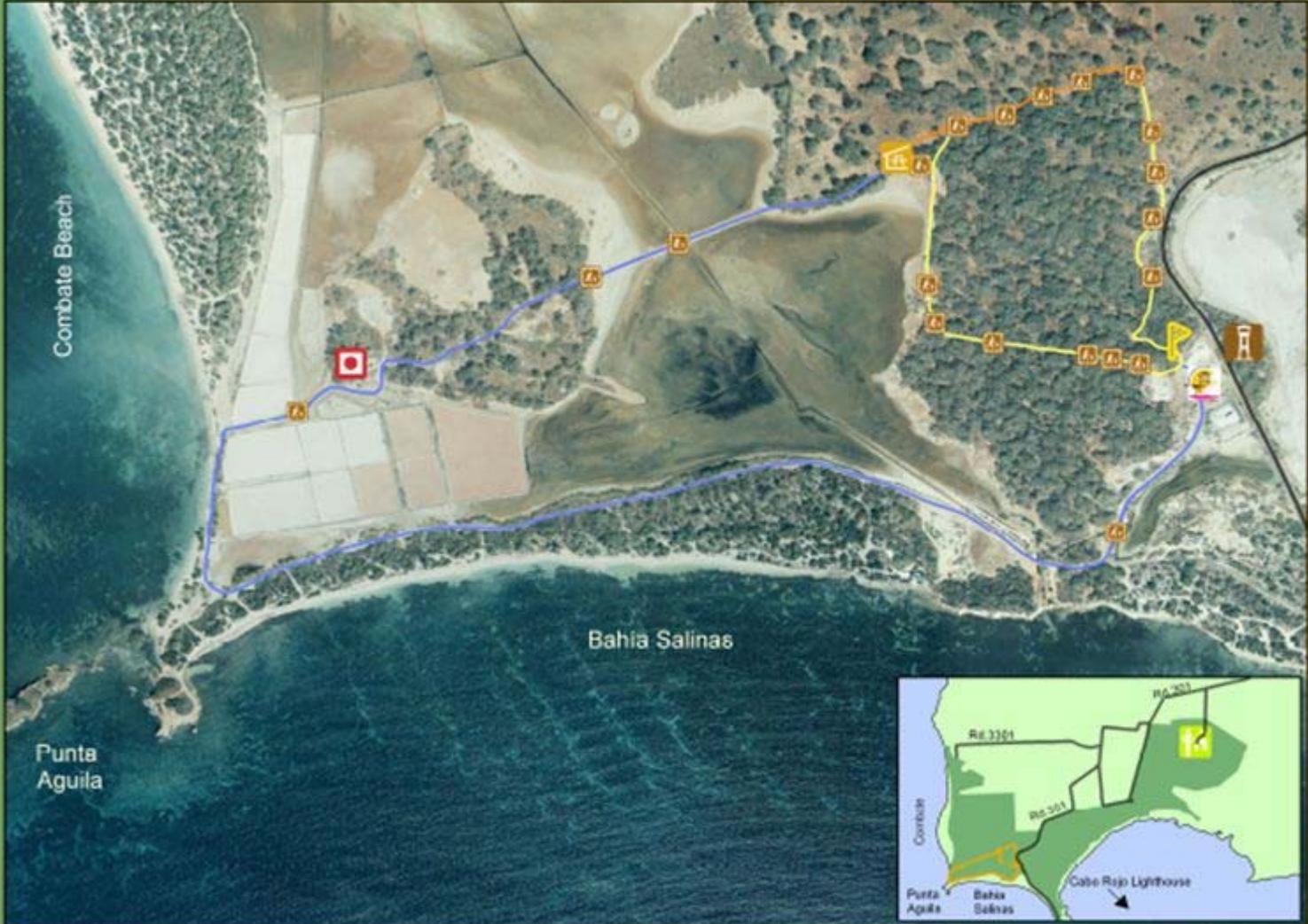
Source data: USFWS Division of Realty,
 Caribbean Islands NWR, Puerto Rico
 Planning Board, US Corps of Engineers
 Map Info: State Plane Puerto Rico
 US Virgin Islands
 NAD 1983
 Software: ESRI ArcGIS 9.0
 Date: January, 2006
 Map Design: William J. Hernandez **1:8,000**



US Fish and Wildlife Service Cabo Rojo Refuge Interpretative Trails



Photos by: G. Hernández



- | | | | | | |
|--|-------------------------------|--|------------------------------------|--|-------------------------------|
| | Saltflats Interpretive Center | | Observation Tower | | Butterfly Trail (.10km/.06mi) |
| | Entrance | | Cabo Rojo NWR Visitor Center | | Long Trail (3.36km/2.09) |
| | Gazebo | | Saltflats Interpretive Trail Signs | | Short Trail (1.39km/.86mi) |
| | Ruins | | | | |

Cabo Rojo NWR
PO Box 510
PR 00622

Rt. 308 Km. 5.1
St. German
Bogartín, PR
787-851-7258



1:5,000

Source Data: Caribbean Islands NWR,
USFWS Realty Division, Puerto Rico
Planning Board, US Corps of Engineers
Map Info: State Plane Puerto Rico US Veg
Islands, NAD 1983
Software: ESRI ArcGIS 9.0
Date: February, 2006
Map Design: Jennifer Ramirez



US Fish and Wildlife Service Cabo Rojo Refuge Bike Trail



Photos by: G. Hernández



- Major Roads
- 🏠 Cabo Rojo NWR Visitor Center
- 🏠 Interpretive Center
- 🏠 Observation Tower
- 🚶 Entrance
- 🚶 Bike Trail 8.5 km / 5.2mi
- 🚶 Candelaria Lagoon Trail 1-30 (4.8 km / 2.9mi)
- 🚶 Fraternidad Lagoon Trail 31-53 (3.7 km / 2.3mi)
- 🏠 Ruins
- 🚶 Wood Bridge (Bikes only)
- 🚶 Other Hiking Trails
- 🅑 Parking



Manejo de Fuegos

Mapas

- Extensión refugios
- Accesos (carreteras, caminos, etc.)
- Area de respuesta
- “Fire Breaks”
- Centro de Comando
- Reducción de combustibles
- Evaluación Area Quemada





US Fish and Wildlife Service Cabo Rojo NWR Fire Management 2006



Legend

-  Cabo Rojo Fire Breaks
-  Cabo Rojo NWR boundary
-  Major Roads
-  Long Trail
-  Short Trail
-  Refuge Service Roads
-  Cabo Rojo NWR Main Office



US Fish & Wildlife Service

Moca Fire (20060206) 1:30-5:00pm

Road 101

9.17

-  Cartagena Fire Response Limit (1 mile)
-  Laguna Cartagena Boundary
-  Fire Total Area Burned ~9.17 acres
-  Major Roads
-  Dirt Road Access

0 0.25 0.5 1 Miles



Restauración

Siembra

- Especies de Bosque Seco
 - ~1,000 árboles
- Identificación Especies

Manejo de Refugio

- Control de heno (combustibles)
 - Mecánica
 - Pastoreo
- Rotulación
- Veredas





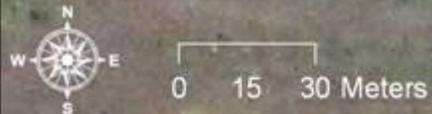
Trees to Protect in Cabo Rojo NWR

Refuge Main Entrance Road



Legend

- *Bucida_buceras*
- ◆ *Bursera_simaruba*
- *Ceiba_pentadra*
- ☆ *Chrysobalanus_icaco*
- *Euphorbia_lactea*
- *Ficus_benjamina*
- ◆ *Guaiacum_officinale*
- ▲ *Polygala_cowelli*
- ▲ *Rauvofia_viridis*
- *Coccoloba_uvifera*
- *Stahliia_monosperma*
- *Swietenia_mahogany*
- ★ *Tabebuia_heterophylla*
- *Zamia_portoricensis*
- *Zanthoxylum_flavum*
- ▲ *Melicococcus_bijugatus*
- *Eugenia_woodburiana*



Refuge Main Entrance Road



Prescribed Burn Guánica Forest



US Fish & Wildlife Service Cabo Rojo NWR Hay Plots (in acres)

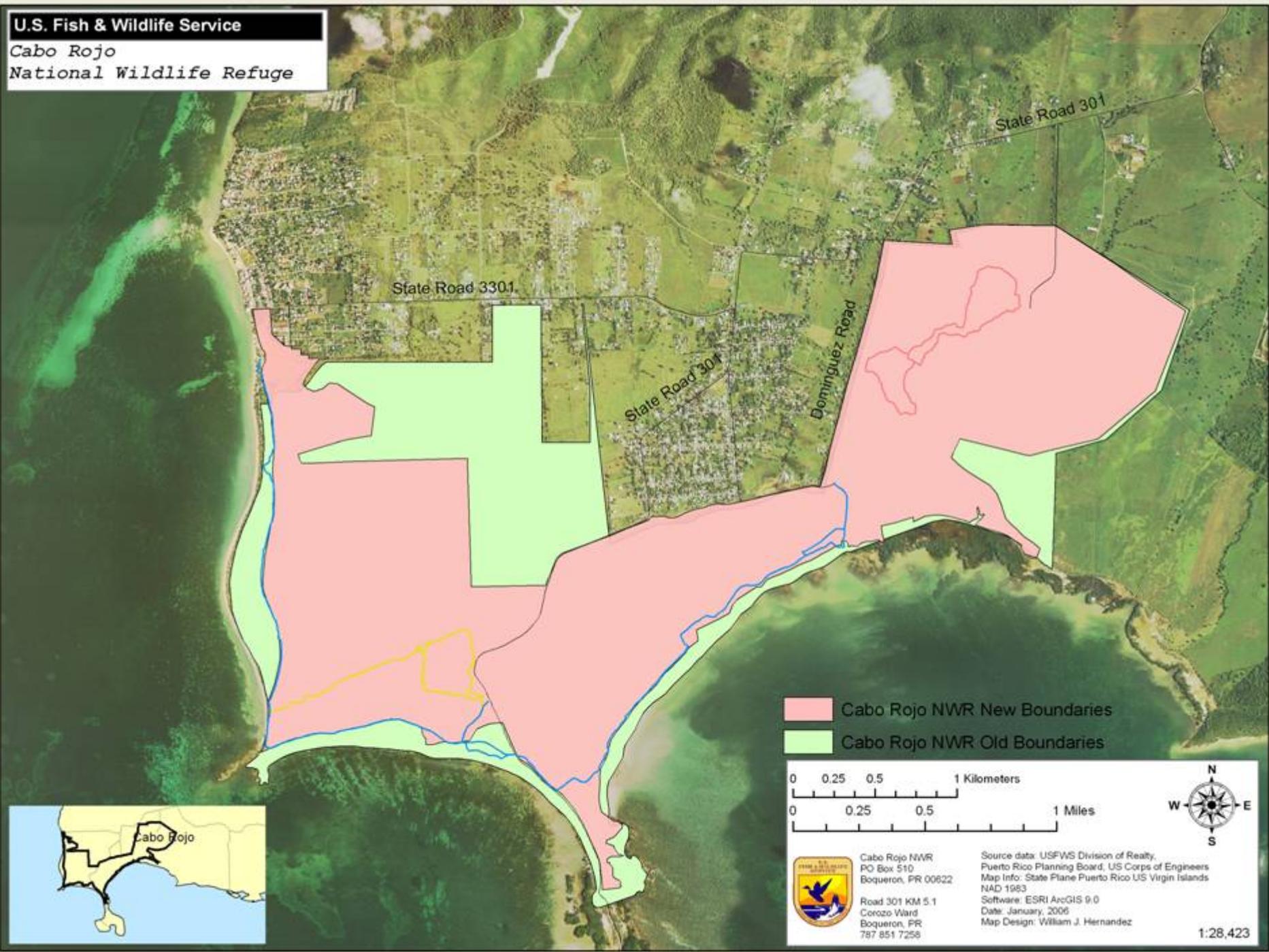


Límites de los Refugios

- Mejorar precisión del archivo geográfico refugios del Caribe
 - Trimble GeoXT Hurricane Antenna
 - Planos de Mensura USFWS R4
 - Catastro del CRIM
 - Precisión 10-15 m a 2-5 m
- Actualizar Bases de Datos Geográficas (GDB) de los refugios



U.S. Fish & Wildlife Service
Cabo Rojo
National Wildlife Refuge



 Cabo Rojo NWR New Boundaries
 Cabo Rojo NWR Old Boundaries

0 0.25 0.5 1 Kilometers

0 0.25 0.5 1 Miles




Cabo Rojo NWR
PO Box 510
Boqueron, PR 00622

Road 301 KM 5.1
Corozo Ward
Boqueron, PR
787 851 7258

Source data: USFWS Division of Realty,
Puerto Rico Planning Board, US Corps of Engineers
Map Info: State Plane Puerto Rico US Virgin Islands
NAD 1983
Software: ESRI ArcGIS 9.0
Date: January, 2006
Map Design: William J. Hernandez

U.S. Fish & Wildlife Service
Culebra
National Wildlife Refuge



 Culebra NWR Boundaries



Culebra NWR
PO Box 190
Culebra, PR 00775
Road 250 KM 4.2
Lower Camp
Culebra, PR

Source data: USFWS Division of Realty,
Puerto Rico Planning Board, US Corps of Engineers
Map Info: State Plane Puerto Rico US Virgin Islands
NAD 1983
Software: ESRI ArcGIS 9.0
Date: September, 2008

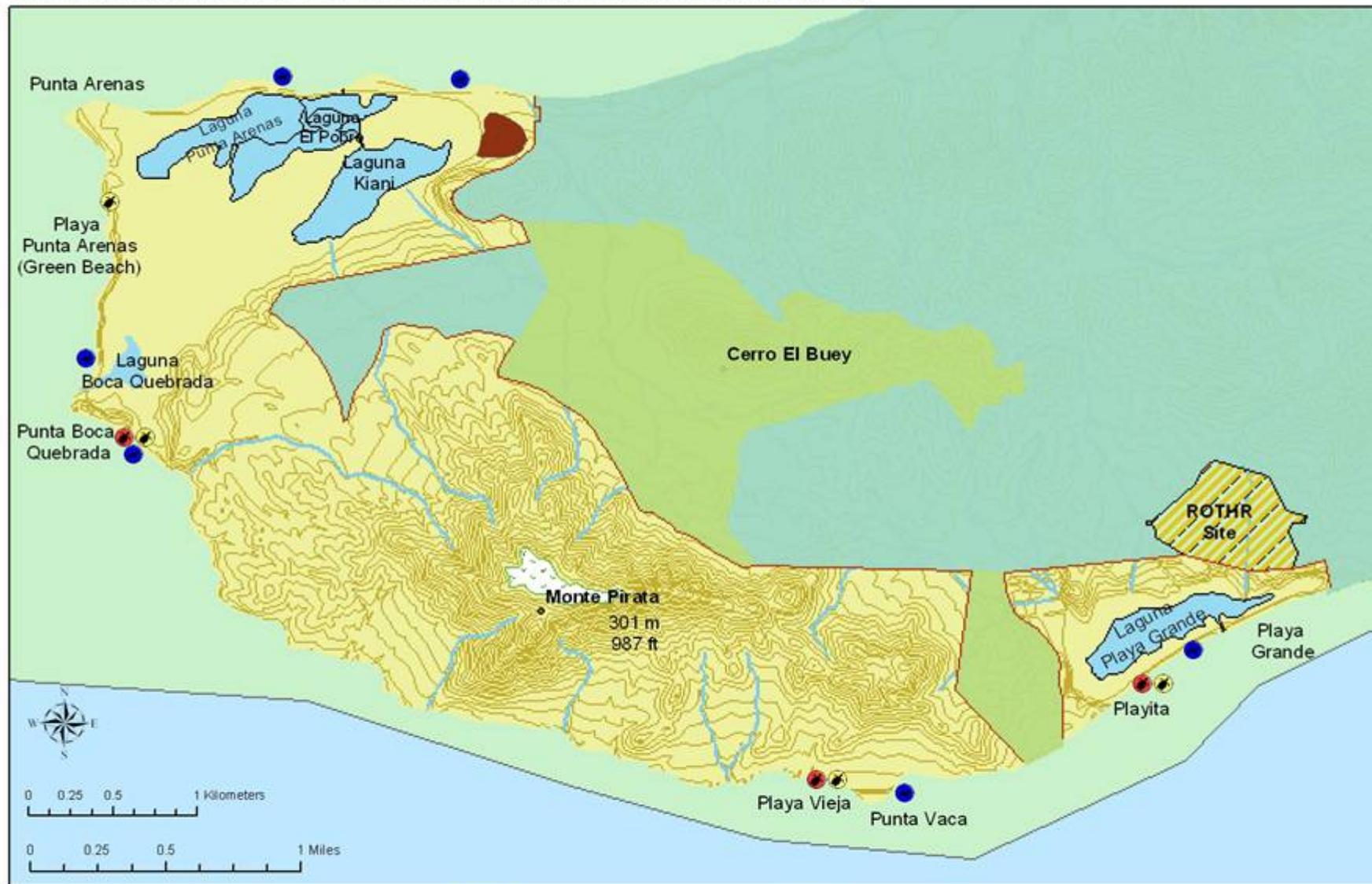
Plan Comprensivo de Conservación (CCP)

- El CCP es una herramienta del personal del refugio para proveer una dirección en el manejo y actividades de restauración del refugio.
- Es una guía a largo plazo para las decisiones de manejo por los próximos 15 años e identifica estrategias para cumplir con la misión y objetivos del refugio.
- Refugio de Vieques

Yellow Beach, Vieques



Threatened and Endangered Species of Vieques National Wildlife Refuge (West)



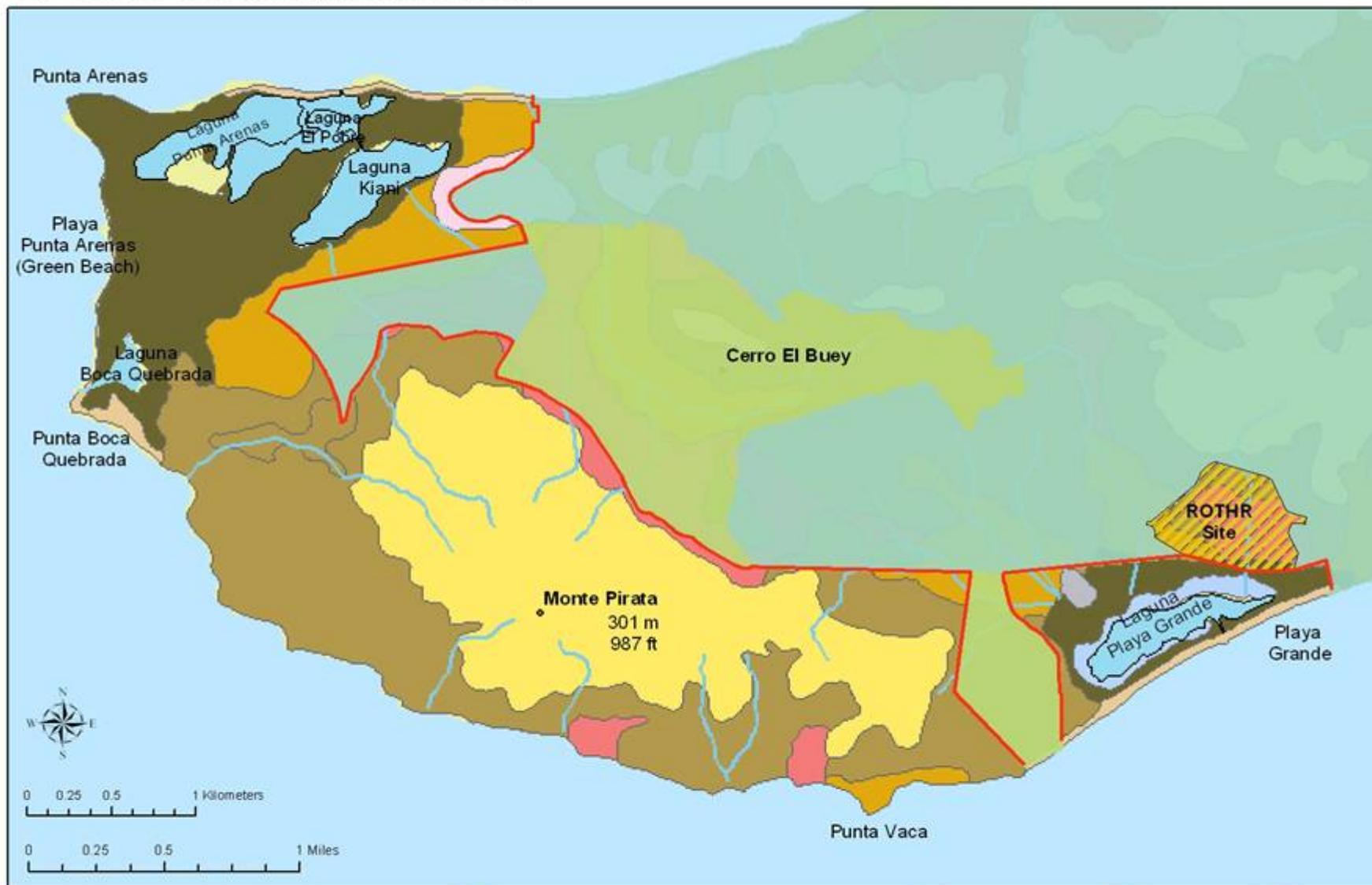
- | | | |
|----------------------------------|---|----------------------------------|
| Vieques National Wildlife Refuge | Vieques National Wildlife Refuge Boundary | <i>Stahlia monosperma</i> |
| Municipality of Vieques | Intermitent Streams | <i>Calypttranthes thomasiana</i> |
| PR Conservation Trust | Sea Turtles | Brown Pelican |
| ROTHR | Leatherback | Manatees |
| Lagoons | Hawksbill | |
| | Green | |

Topography of Vieques National Wildlife Refuge (East)



- Vieques National Wildlife Refuge
- Municipality of Vieques
- PR Conservation Trust
- Lagoons
- Vieques National Wildlife Refuge Boundary
- Intermitent Stream
- 10 meter contour

Soils of Vieques National Wildlife Refuge (West)

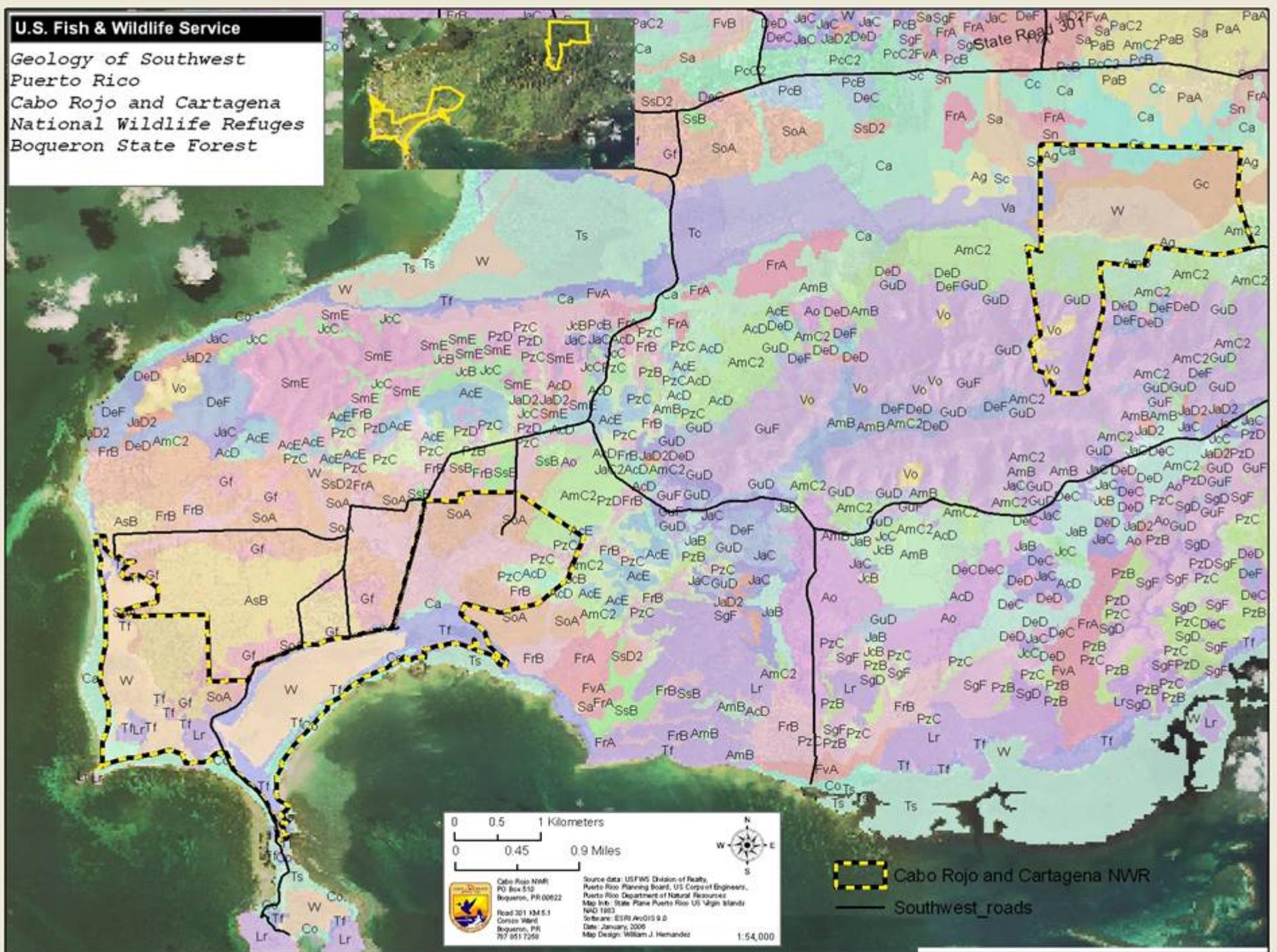


Vieques National Wildlife Refuge	Soil Series	Descalabrado clay loam	Pozo Blanco clay loam	Not Surveyed
Municipality of Vieques	Amelia gravelly clay loam	Descalabrado-Rock land complex	Rock land	
PR Conservation Trust	Cartagena clay	Fraternidad clay	Salt water marsh	
Lagoons	Catalina clay	Jacana clay	Soil not surveyed	
ROTHR	Catano loamy sand	Made land	Tidal flats	
Vieques National Wildlife Refuge Boundary	Coamo clay loam	Pandura-Very stony land complex	Tidal swamp	
Intermittent Stream	Coastal beach	Paso seco clay	Vieques loam	
	Descalabrado and Guayama soil	Poncena clay		

Productos Cartográficos



U.S. Fish & Wildlife Service
Geology of Southwest
Puerto Rico
Cabo Rojo and Cartagena
National Wildlife Refuges
Boqueron State Forest



0 0.5 1 Kilometers
 0 0.45 0.9 Miles

Cabo Rojo NWR
 PO Box 510
 Boqueron, PR 00622
 Road 301 104.5.1
 Concho Ward
 Boqueron, PR
 767 951 2266

Source data: USFWS Division of Realty,
 Puerto Rico Planning Board, US Corps of Engineers,
 Puerto Rico Department of Natural Resources
 Map Inv.: State Plane Puerto Rico US Virgin Islands
 NAD 1983
 Software: ESRI ArcGIS 9.0
 Date: January 2006
 Map Design: William J. Hernandez

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Cabo Rojo and Cartagena NWR
 Southwest roads

U.S. Fish & Wildlife Service
Topography Laguna Cartagena
National Wildlife Refuge

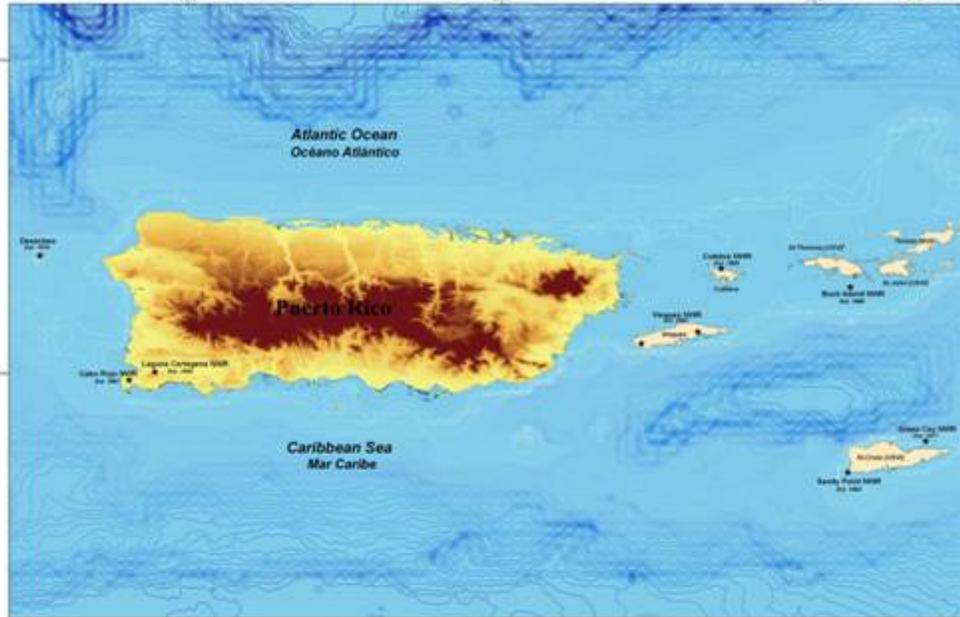


U.S. Fish & Wildlife Service
Cabo Rojo
National Wildlife Refuge





Caribbean Islands National Wildlife Refuge Complex
Refugios Nacionales de Vida Silvestre del Caribe

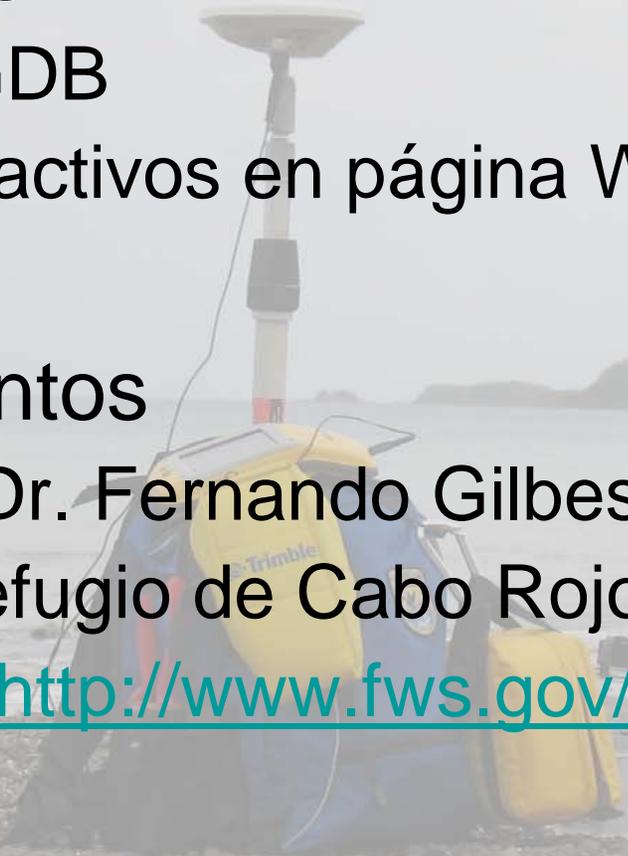


Caribbean Islands National Wildlife Refuge Complex
 P.O. Box 110
 Washington, DC 20502
 Phone: 202-486-5111
 Fax: 202-486-5111
 Website: www.fws.gov
 Email: caribbean@fws.gov

St. Croix NWR
 St. Eustace NWR
 Nevis NWR
 St. John NWR
 St. Kitts NWR
 Sandy Point NWR
 Culebra NWR
 Vieques NWR



Caribbean Islands, Refuges for Wildlife
Las Islas del Caribe, Refugios para la Vida Silvestre

- 
- A Trimble GNSS receiver is mounted on a tripod on a rocky beach. The receiver is yellow and blue, with the brand name 'Trimble' visible. The background shows a calm sea and a hazy sky.
- Proyecciones
 - Actualizar GDB
 - Mapas interactivos en página Web
 - Agradecimientos
 - UPR-RUM Dr. Fernando Gilbes
 - Personal Refugio de Cabo Rojo y Vieques
 - Voluntarios <http://www.fws.gov/volunteers/>

<http://caribbean.fws.gov>

¿Preguntas?

