

Population and habitat utilization of the Puerto Rican boa (*Chilabothrus inornatus*) in an urban fragmented habitat.



Eneilis S Mulero-Oliveras
University of Puerto Rico at Mayaguez
US Army Fort Buchanan
US Army Engineer Research and Development Center (ERDC)



US Army Corps
of Engineers®
Engineer Research and
Development Center

Introduction



- The Caribbean Islands is a biodiversity hotspot (Reynolds and Gerber, 2012) with 94% endemism in reptiles (Conservation International, 2011).
- The Genus *Chilabothrus* (Reynolds, et al., 2013), previously known as *Epicrates*, are island endemics with limited geographical range and, thus, are more prone to extirpation.

Introduction



- Endemic to Puerto Rico.
- Listed as endangered and protected by USFWS Endangered Species Act in 1973.
- 5-year review suggests that it not be down-listed because it is “sufficiently in danger of extinction and there is missing data relevant to recovery criteria” (USFWS, 2011).

Biology

- Cryptic semi-arboreal, nocturnal species.
- Habitat types found:
 - From sea level to 480 m . Although highest elevation encountered was 1050m.
 - Montane forest, mangrove forest, limestone karst, urban areas, etc.
- Size range: ~2' – ~7'
- Morphotypes: color & patterns vary.
- Reproduction:
 - Reproductive season from ~February-May
 - Parturition: ~August – October
- Diet: Invertebrates, reptiles and amphibians, rats, bats and small to medium size birds.
- Predators: Indian mongoose, cats (feral and domestic), dogs, red tailed hawks & humans.



Objectives

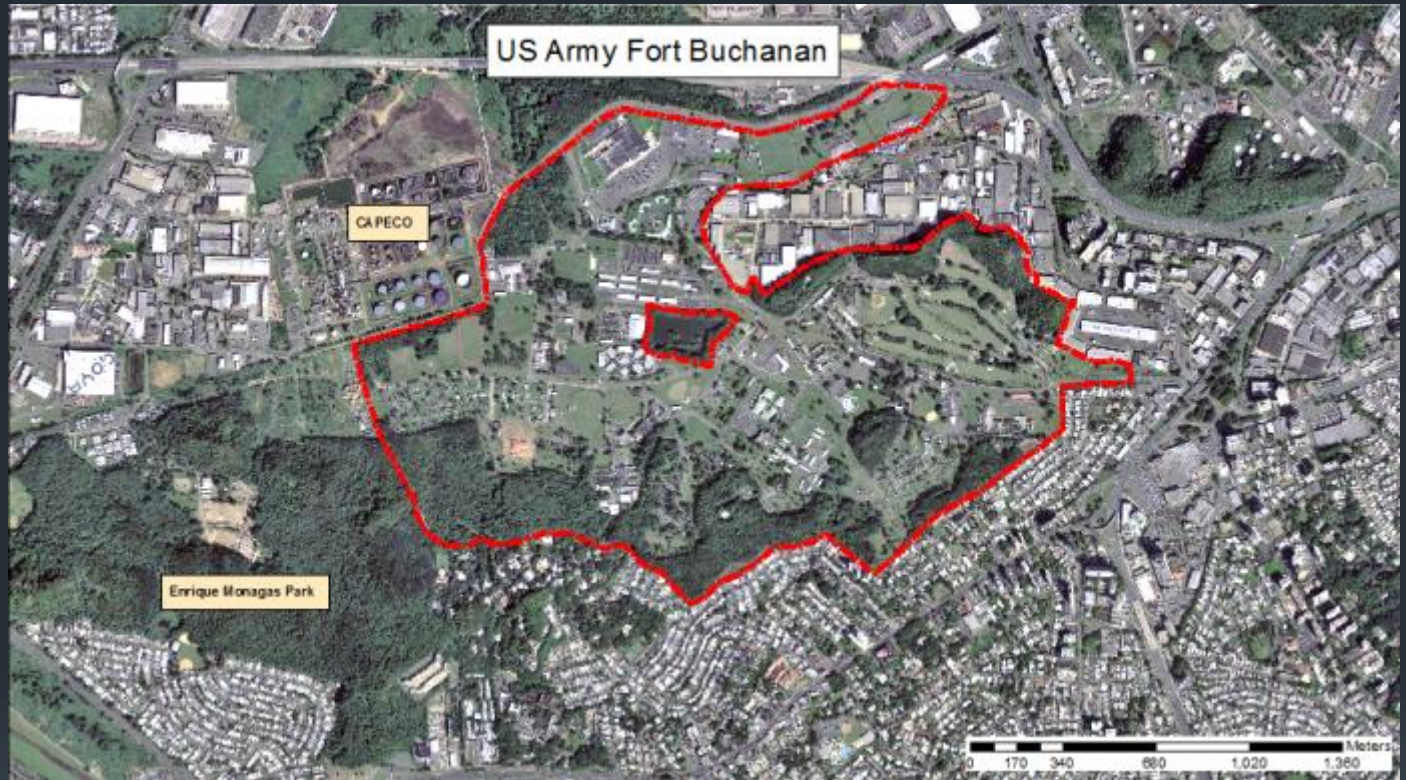
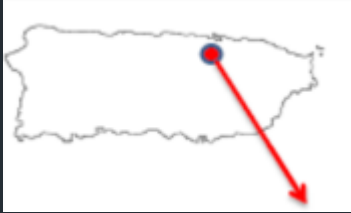
- The study will help identify critical elements to increase the effectiveness of conservation and management practices on Fort Buchanan to ensure the continued viability of boa populations.
- Our study will address questions of spatial ecology in areas with fragmented habitat.

It will help to:

- determine the boa population size;
- preferred habitats;
- seasonal and daily activity patterns;
- prediction of potential interactions between boas and installation personnel.



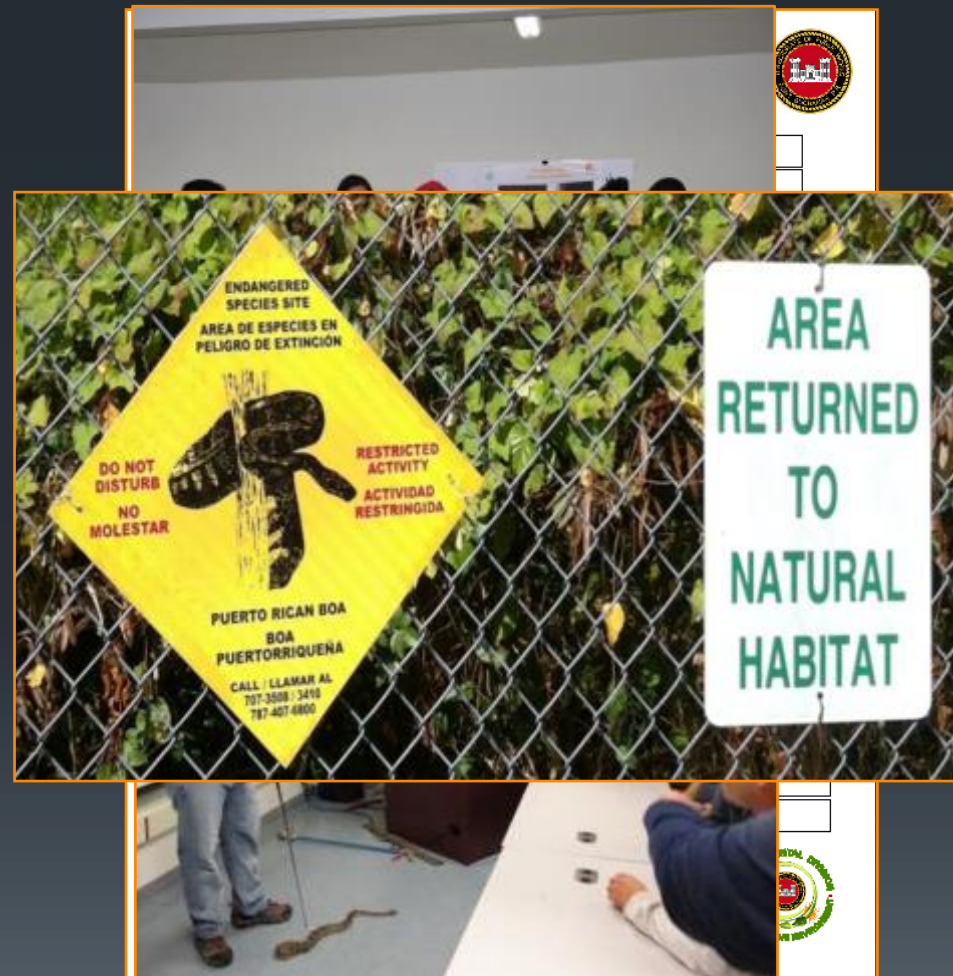
Study Area



- Us Army Fort Buchanan
- 746 acre installation amid the urban sprawl of the San Juan Metropolitan area.
- Retains over 100 acres of secondary forest.
- Boas have been sighted throughout the base.
 - Inside installation structures and in designated boa habitats.

Puerto Rican Boa Management

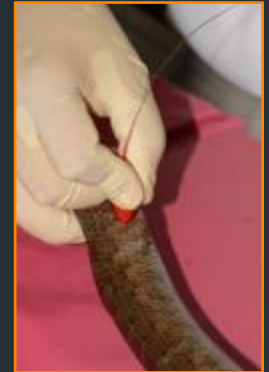
1. Education
2. Boa Standard Operating Procedure:
 1. Reporting and record keeping of boa sighting
 2. Nuisance boa capture and relocation
 3. Habitat Conservation (boa signs)
 4. Control of on-base predator population (mongoose, feral cats and dogs)



Methodology

1. Snake and radio-tracking procedures:

- Boas are caught opportunistically by hand during diurnal and nocturnal surveys.
- Subcutaneous implantation of a PIT tag to allow individual ID.
- A radio transmitter is surgically implanted if it weighs less than 2.5% of the total weight.
- Snakes are released at point of capture but are relocated if the individual is found in a construction site or urban area.
- Radio tracking of boa is done every 48 hours.



2. Habitat Utilization

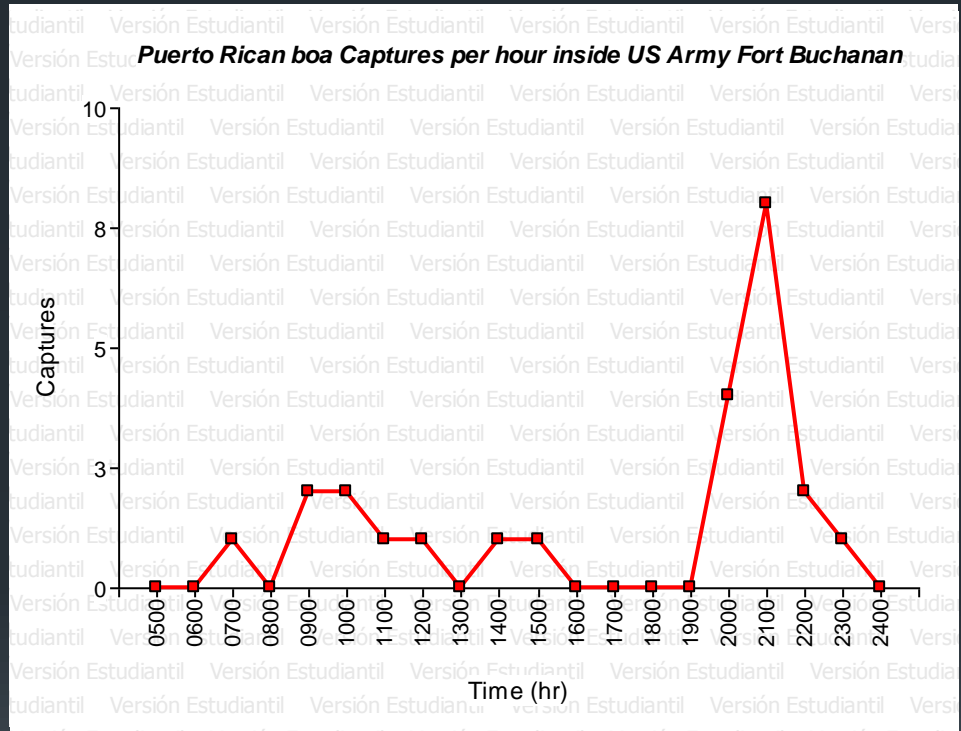
- Locations taken for each animal were classified as to the habitat type (forest, open habitat and urban) in which they occurred and determine percentage of time each individual spends in a particular habitat type.



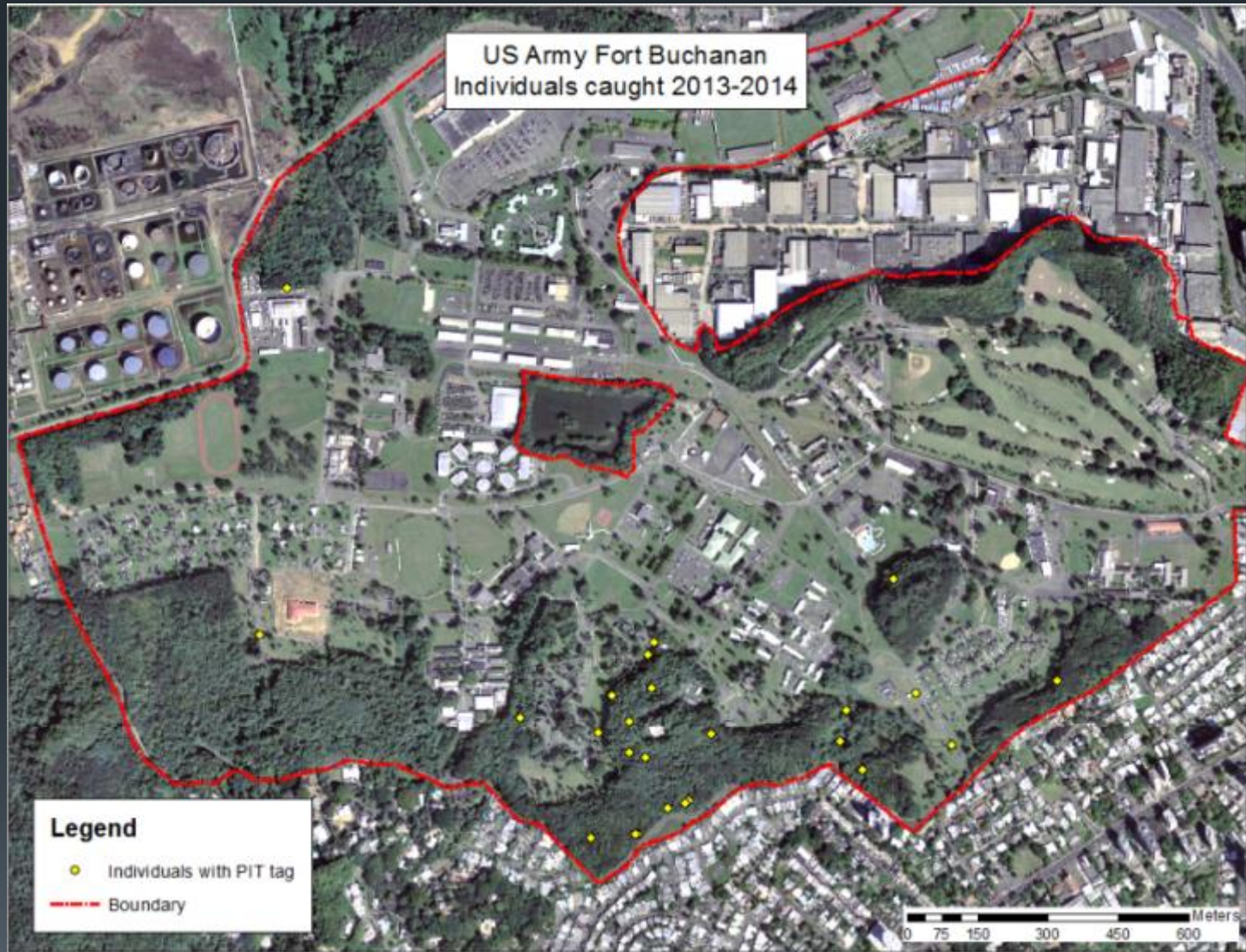
Preliminary Results

Captured boas 2013-2014

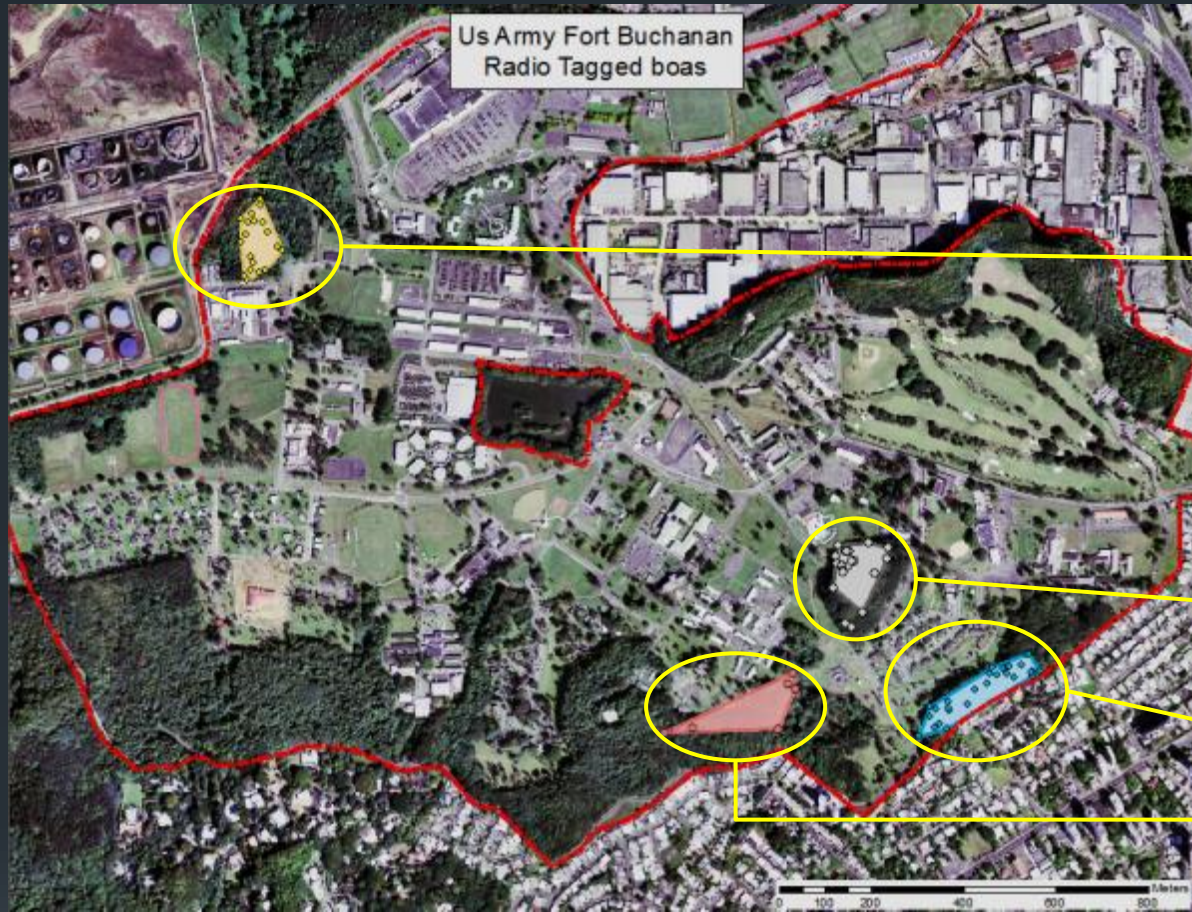
- Total of boas captured = 24
 - 17 females, 7 males
- 1 recaptured individual that increased 17.6cm (SVL) and 105g in ~1 yr range (March 2013- June 2014)
- Four boas were used for radio telemetry.
- Snake captures:
 - Summer season (May-August) > Rest of year
 - Night surveys > Day surveys



Tagged boas



Radio tagged boas



Boa ID	Area (m ²)	Days Tracked	No Fixes	Visible (%)	NV (%)	Habitat Type (%)		
						Forest	OH	Urban
Penelope	12,097.45	286	40	22.5	77.5	92.5	7.5	0
Rosario	15887.02	223	32	15.78	84.21	82.35	2.95	14.7
Juanita	15958.62	171	22	16.67	83.33	18	4	1
Palestina	9802.04	125	29	6.89	93.11	28	0	1

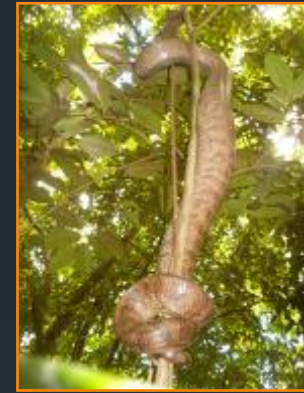
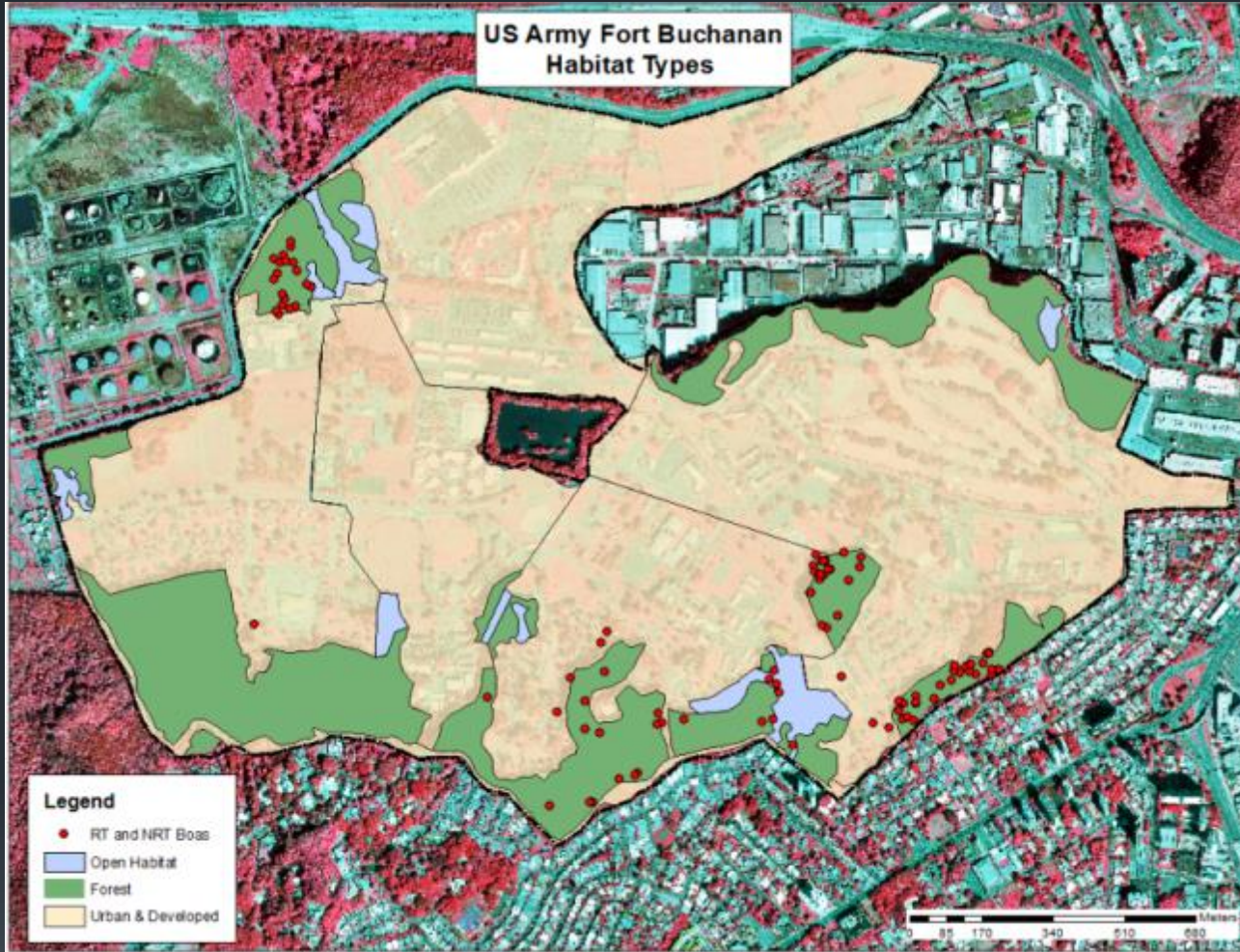
Table 1. Boas used for the telemetry study

Translocated Distance



Rosario: 623.23m
Juanita: 1012.43m

Available Habitat Types



Habitat Types	Acres
Forest	137.64
Open Habitat	17.86
Urban and Development	561.78

Available Habitat Types

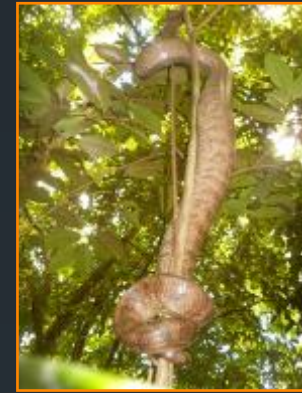
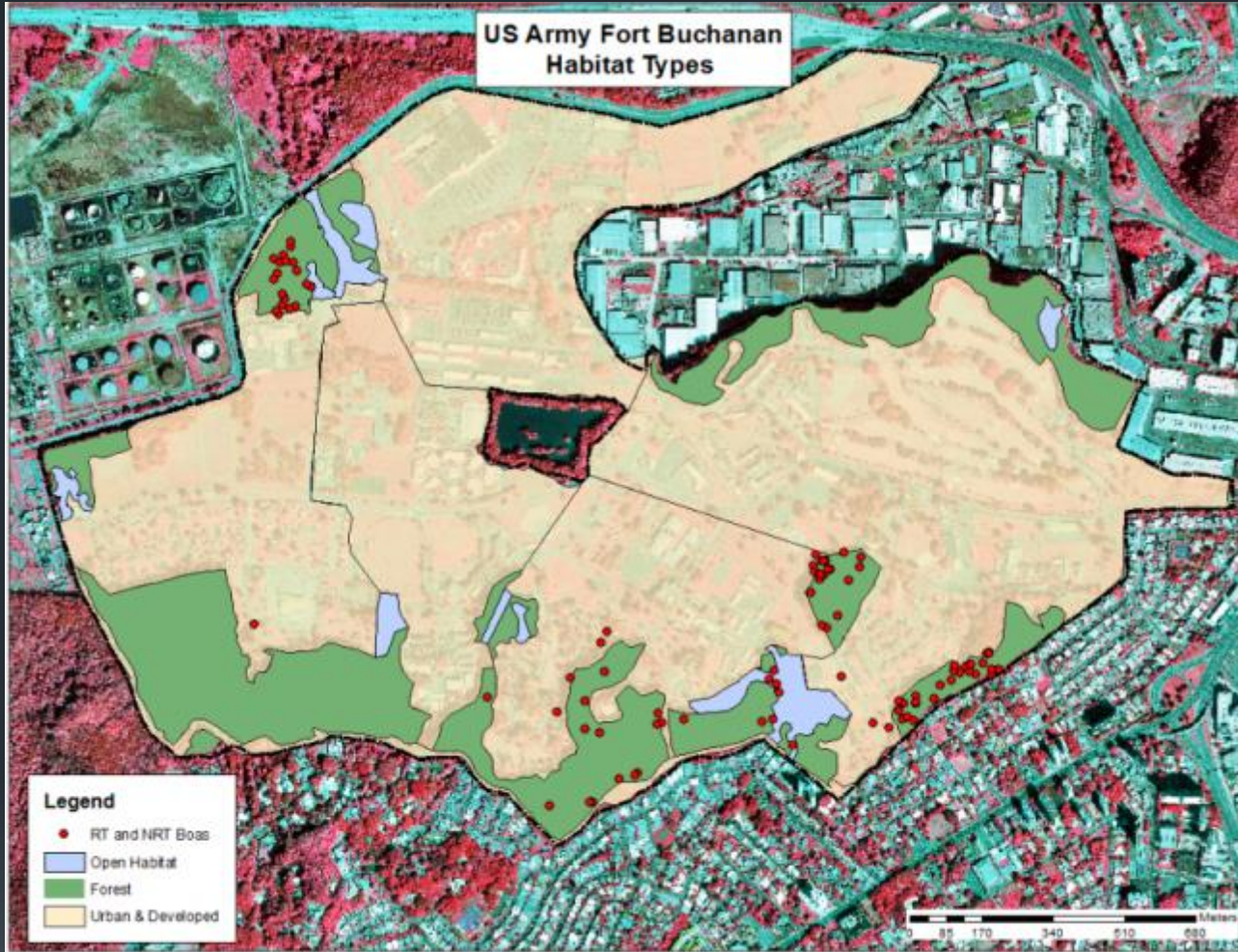


Table 2. Percentage of time snakes were encountered in different habitat types.

Habitat Type	2013-14 encounters (%)
Forest	82.64
Open habitat	7.44
Urban	9.92

Table 3. Percentage of time snakes were encountered in two types of locations.

Location	%
Tree	25.62
Ground	74.38

Summary

- Population Status: Only one recapture which may indicate a high population size or that the boa is relatively rare due to their cryptic habits which were demonstrated by the fact that in more than 78% of fixes we did not visually detect telemetrically radio tracked boas.
- Average area used by radio tracked female boas inside US Army Fort Buchanan is 13,436.3m²
 - Roads may be a possible barrier for snake movement. Roads have been barriers for different snakes such as Prairie kingsnakes and some species of rattlesnakes living in fragmented landscapes.
 - In contrast with average home range in El Yunque: females = 103,000m² and males = 133,000m² (Wunderle, 2004) and average home range in Arecibo: females = 7,890m² and males = 5,000m² (Puente and Bird, 2004)
- Snakes spent more time inside forest habitat than any other habitat type inside the base.
 - Probably because we have been surveying the forested areas more than before the project started (Records from 2007-2013 indicate that boas were more common in urban environments).
- Radio tracked and marked snakes were more commonly found on ground and underground than on trees.
 - According to Wunderle (2004) females spend more time on ground than males which spend more time on trees.
- Education and awareness to installation personnel is yielding positive results . Seven of the 24 boas captured were reported immediately by maintenance personnel.

Acknowledgements

- Dr. Fernando Bird-Picó, University of Puerto Rico at Mayaguez
- Dr. Alberto Puente-Rolón, Interamerican University
- Dr. Jinelle Sperry, US Army ERDC Lab
- Dr. Ismael Pagán, University of Puerto Rico at Mayaguez
- Dr. José Figueroa from Juan A Rivero Zoo
- Victor Rodriguez, DPW Environmental Office at US Army Fort Buchanan
- Personell at US Army Fort Buchanan and volunteers Geysel Gómez, Onyx Negrón and Maraliz Vega for all their support and patience during field surveys.
- Carib-PARC for the

References

- Blouin-Demers, G., Bjorgan, L. and Weatherhead, P. 2007. Changes in Habitat Use and Movement Patterns With Body Size in Black Ratsnakes (*Elaphe Obsoleta*). *Herpetologica* 63(4): 421-429
- Blouin-Demers, G. and Weatherhead, P. 2001. Habitat use by Black Rat Snakes (*Elaphe obsoleta obsoleta*) in fragmented forests. *Ecology* 82(10): 2882-2896
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix I. 2014. <cites.org/sites/default/files/eng/app/2014/E-Appendices-2014-09-14.pdf> Downloaded on 28 September 2014
- Ecological Management Plan of Fort Buchanan, PR. 2009 by ANAMAR Environmental Consulting, Inc.
- Puente-Rolón, A. and Bird-Picó, F. 2004. Foraging behavior, home range, movements and activity patterns of *Epicrates inornatus* (Boidae) at Mata de Plátano Reserve in Arecibo, Puerto Rico. *Caribbean Journal of Science* 40(3): 343-352
- Reynolds, G. and Gerber, G. 2012. Ecology and Conservation of the Turks Island Boa (*Epicrates chrysogaster chrysogaster* : Squamata: Boidae) on Big Ambergris Cay. *Journal of Herpetology* 46(4): 578-586.
- Reynolds, G., Niemiller, M., Hedges, B., Dornbug, A., Puente-Rolón, A. and Revell, L. 2013. Molecular phylogeny and historical biogeography of West Indian boid snakes (*Chilabothrus*). *Molecular Phylogenetics and Evolution* 68: 461-470
- U.S. Fish and Wildlife Service. 1986. Puerto Rican Boa Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 21pp.
- U.S. Fish and Wildlife Service. 2011. 5-Year Review of the Puerto Rican boa (*Epicrates inornatus*): Summary and Evaluation. US Fish and Wildlife Service, Boquerón, Cabo Rojo. 27pp
- Wunderle, J. and Mercado, J. 2004. Spatial ecology of Puerto Rican boas (*Epicrates inornatus*) in a Hurricane Impacted Forest. *Biotropica* 36(4): 555-571

Questions???

