2016 Coffee Berry Borer Summit
Hilo-HI, March 15th 2016

Overview of the Puerto Rico CBB Area-wide IPM effort

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CENTER FOR EXCELLENCE IN QUARANTINE & INVASIVE SPECIES
at University of Puerto Rico

UPR
Universidad de Puerto Rico

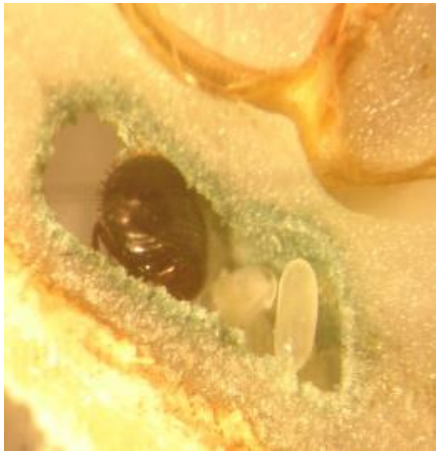
The coffee berry borer (*H. hampei)*

Females starting to colonize the coffee beans

Dr. Paul Bayman

- The coffee berry borer is the most devastating pest of coffee worldwide.

- It was introduced to Puerto Rico in 2007, now is in every coffee-producing region.



Female and its eggs inside the coffee bean

Managing the Coffee Berry Borer (CBB) in Puerto Rico: An Integrated Multidisciplinary Approach

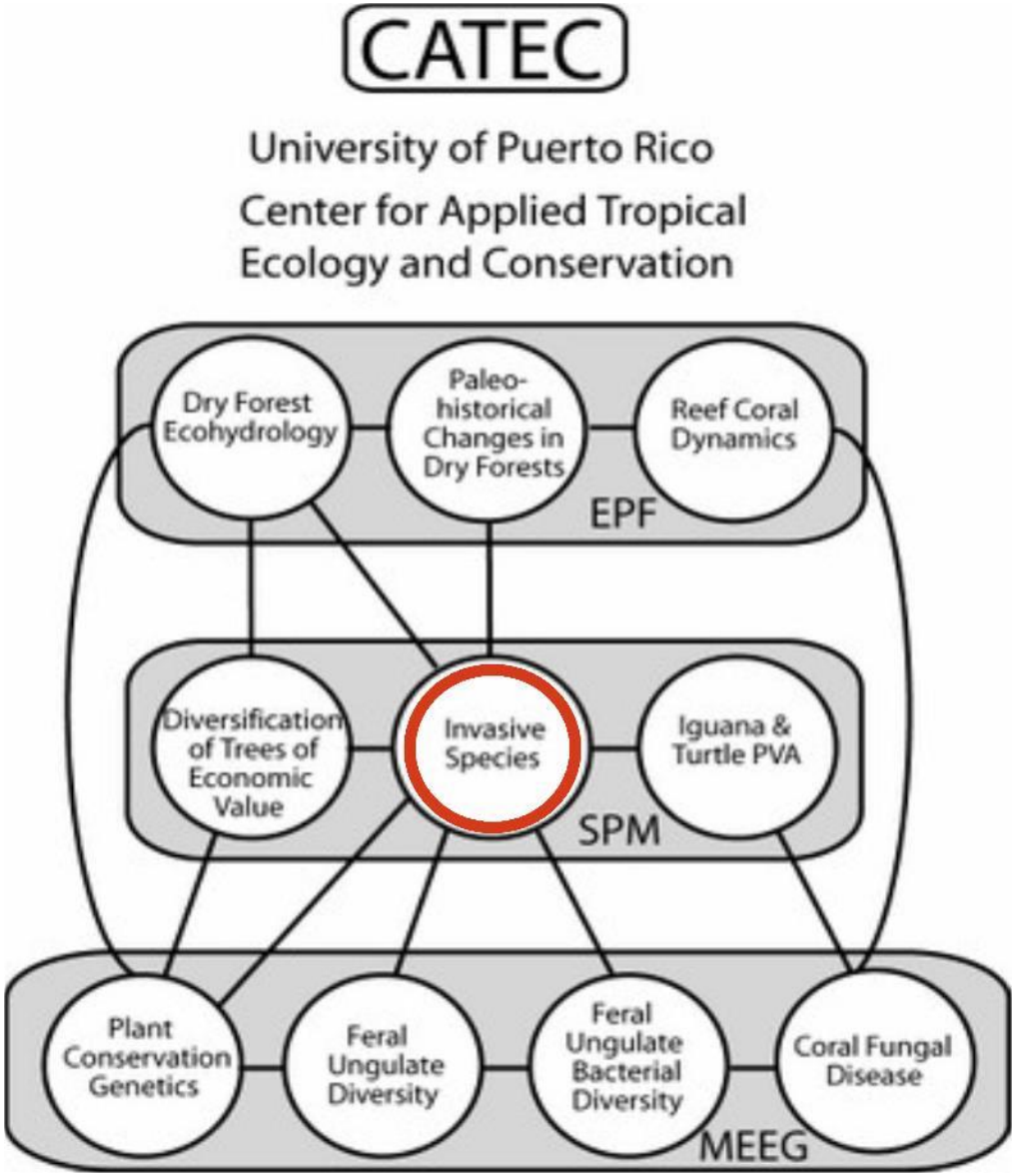
* Determine and understand spatial, temporal and ecological patterns of CBB infestation and damage.

* Use information about CBB infestation patterns to improve integrated pest control strategies.

* Promote cost-effective strategies for growers.

Research groups & interactions

National Science Foundation
WHERE DISCOVERIES BEGIN



Botanical Garden South, Río Piedras Agricultural Experiment Station

USDA/APHIS
DAPR and PRDNR
Welkom /Welcome /
Bienvenidos / Benvindos

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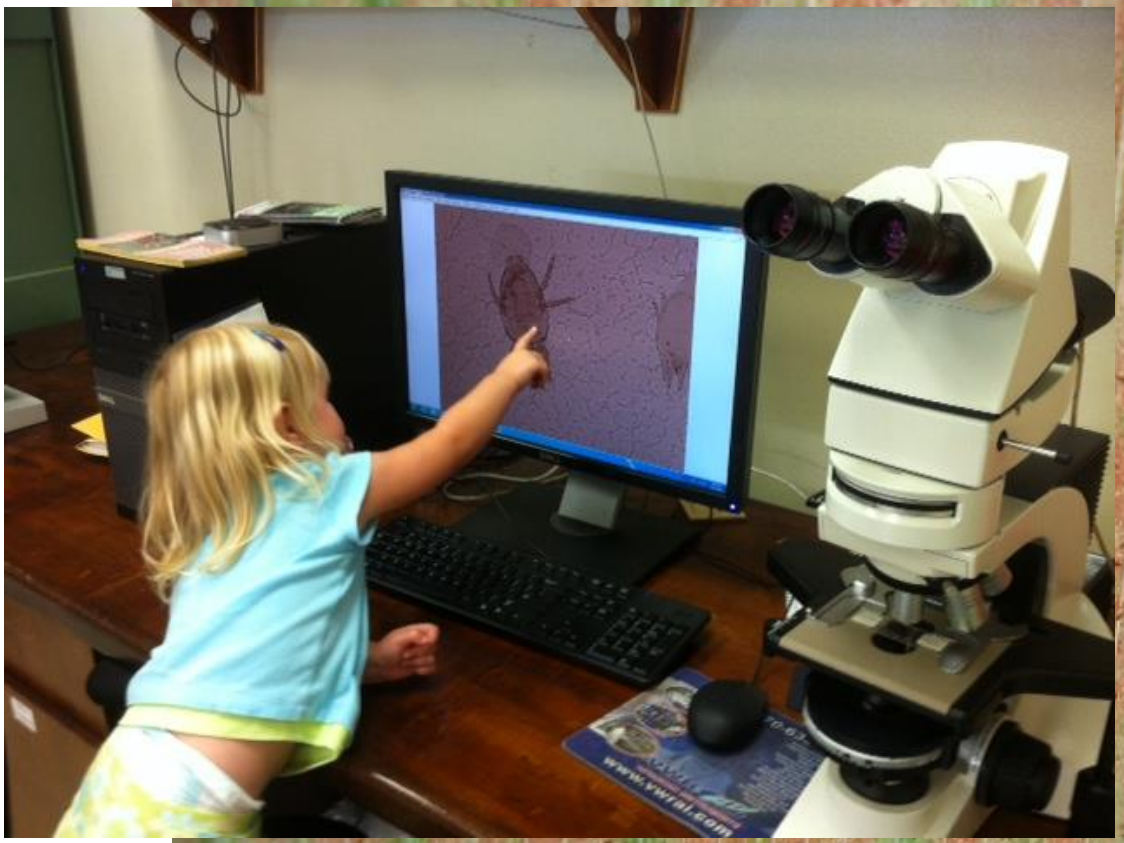
http://joselab.eea.uprm.edu

Tools, perceptions and earlier education



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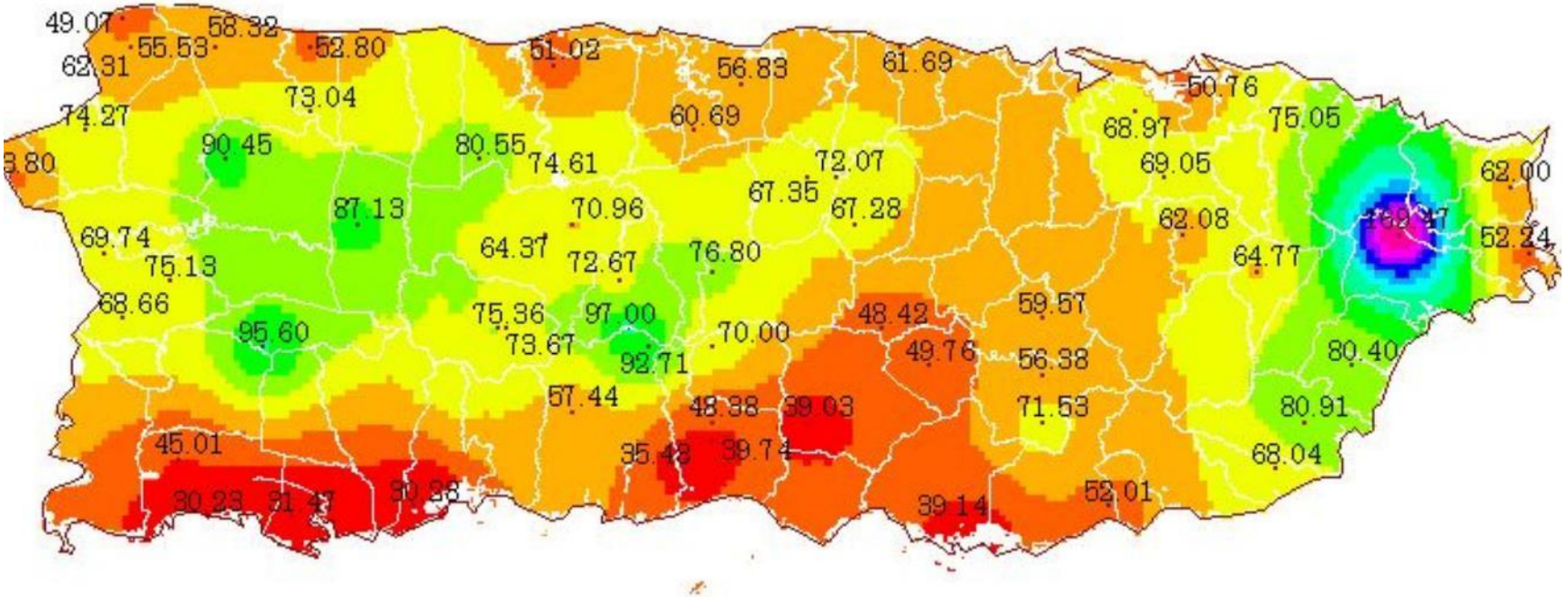
Caribbean basin - invasive species pathway

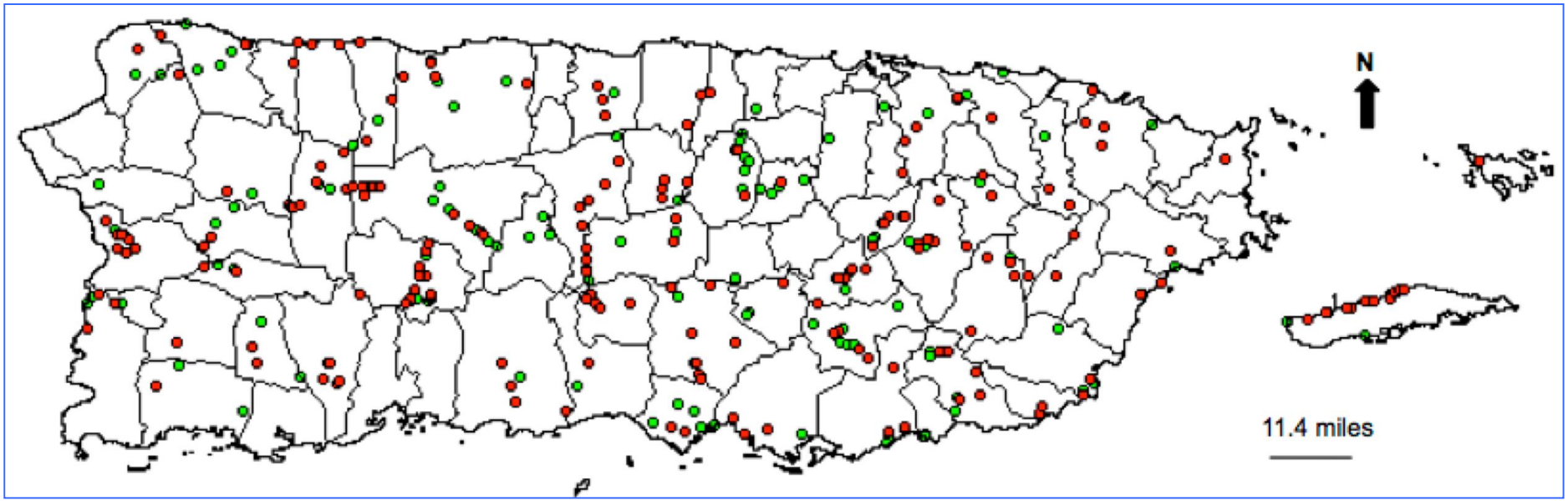
PUERTO RICO
MEAN ANNUAL PRECIPITATION
1971-2000



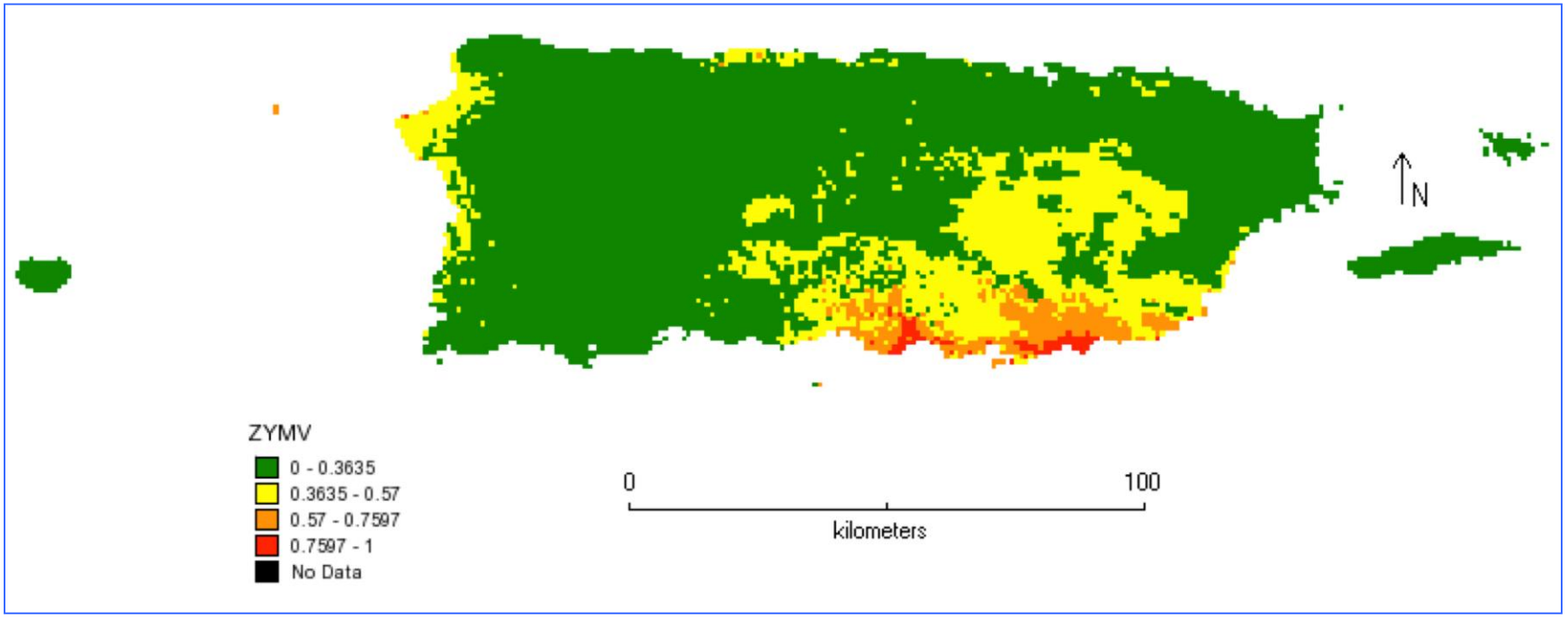
Annual Precipitation (Inches)

30 - 35	65 - 70	105 - 110	145 - 150
35 - 40	70 - 75	110 - 115	150 - 155
40 - 45	75 - 80	115 - 120	155 - 160
45 - 50	80 - 85	120 - 125	160 - 165
50 - 55	85 - 90	125 - 130	165 - 170
55 - 60	90 - 95	130 - 135	No Data
60 - 65	95 - 100	135 - 140	
	100 - 105	140 - 145	

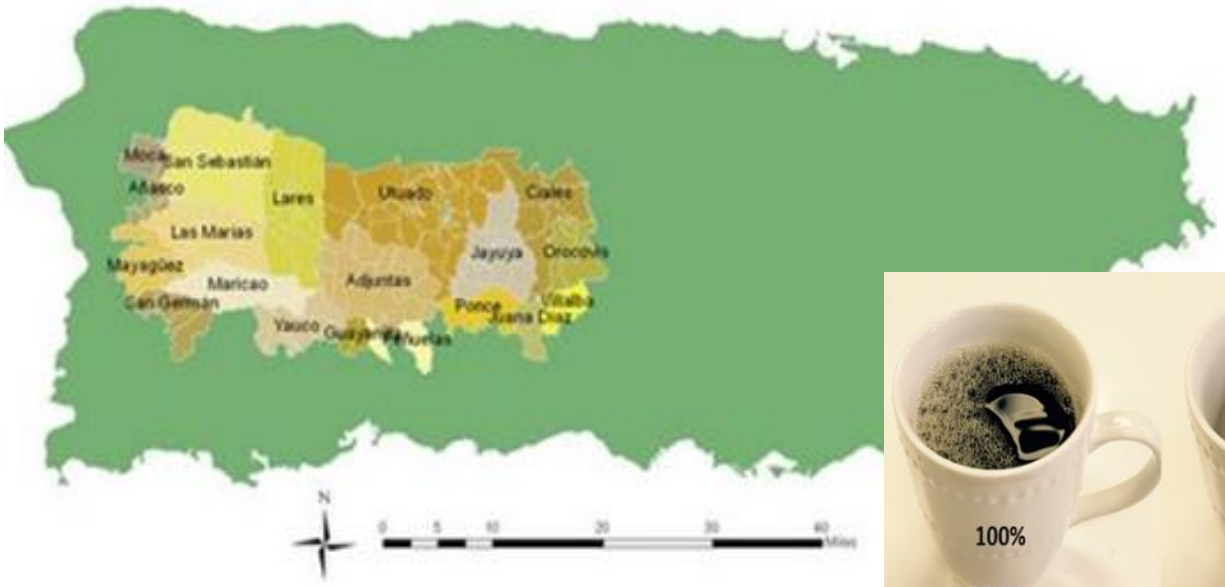
Momordica charantia collection sites and occurrence of *Potyvirus* in Puerto Rico. Virus detection was through potyvirus–ELISA serological tests. Map made with DIVA–GIS. Points in green represent a cluster of samples that were negative for *Potyvirus* and those in red were positive.



Potential distribution of the *Potyvirus*, **ZYMV**. Model is based on positive PRSV DAS–ELISA tests. Map was generated by MaxEnt with all 19 environmental variables plus altitude, 10 replicates



Coffee production in Puerto Rico



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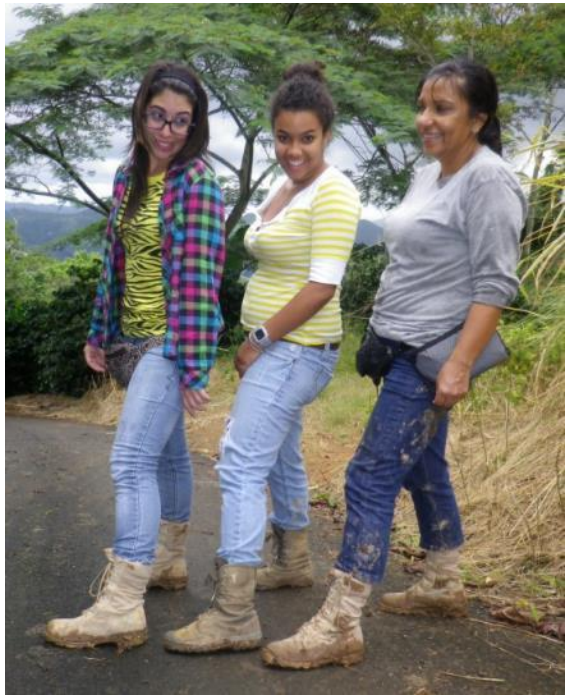
UPR Team

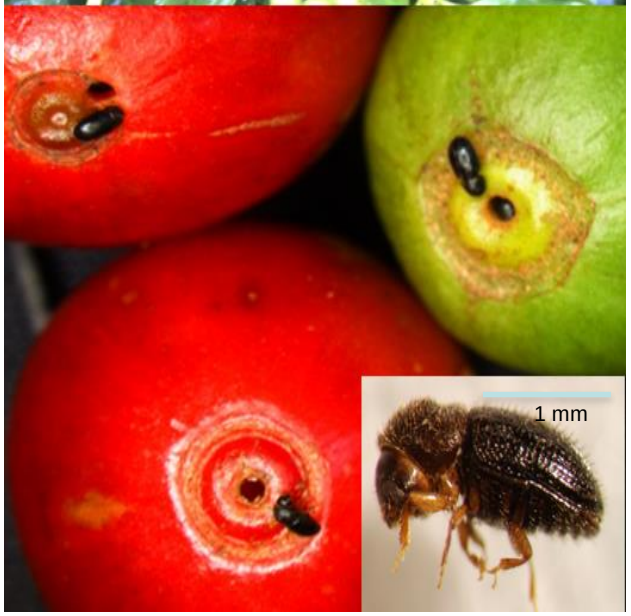


Production

Shade

Sun

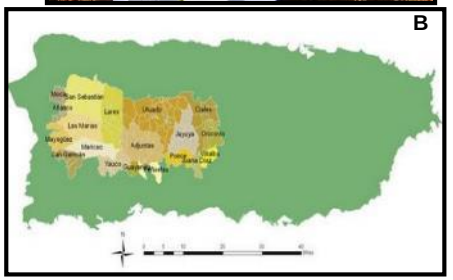
Intercrop

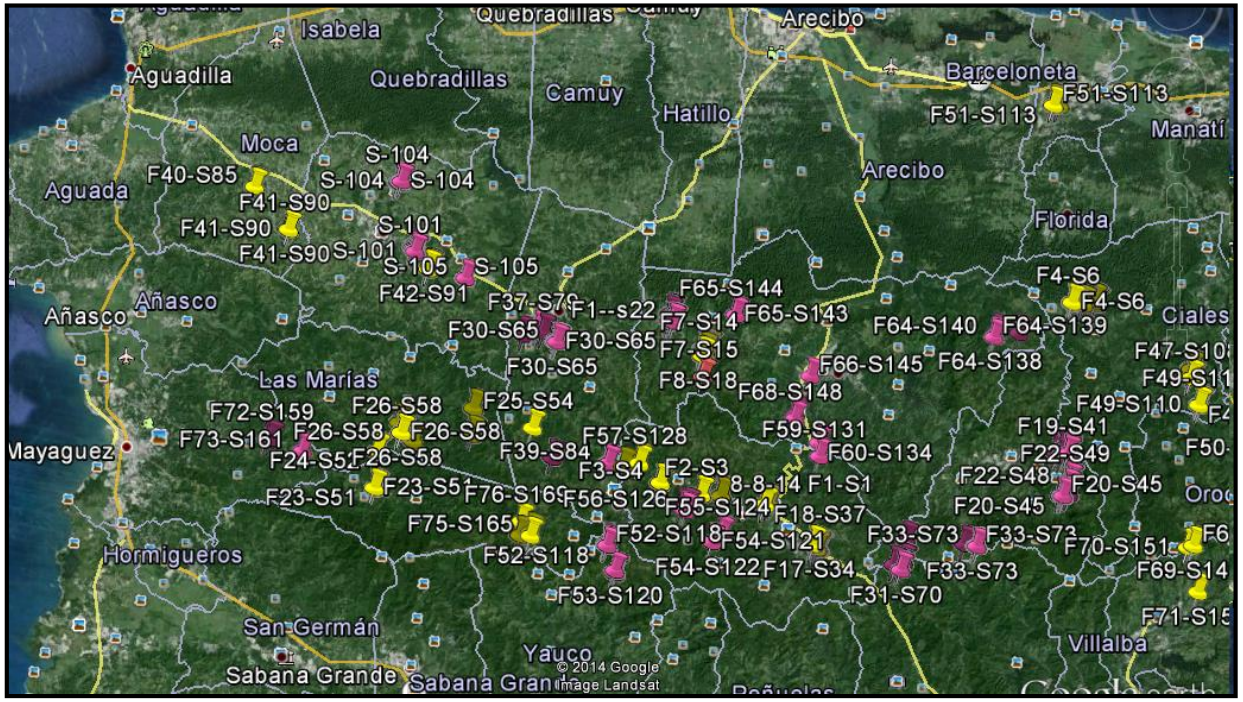

1 mm

STUDY AREA

Year 2014

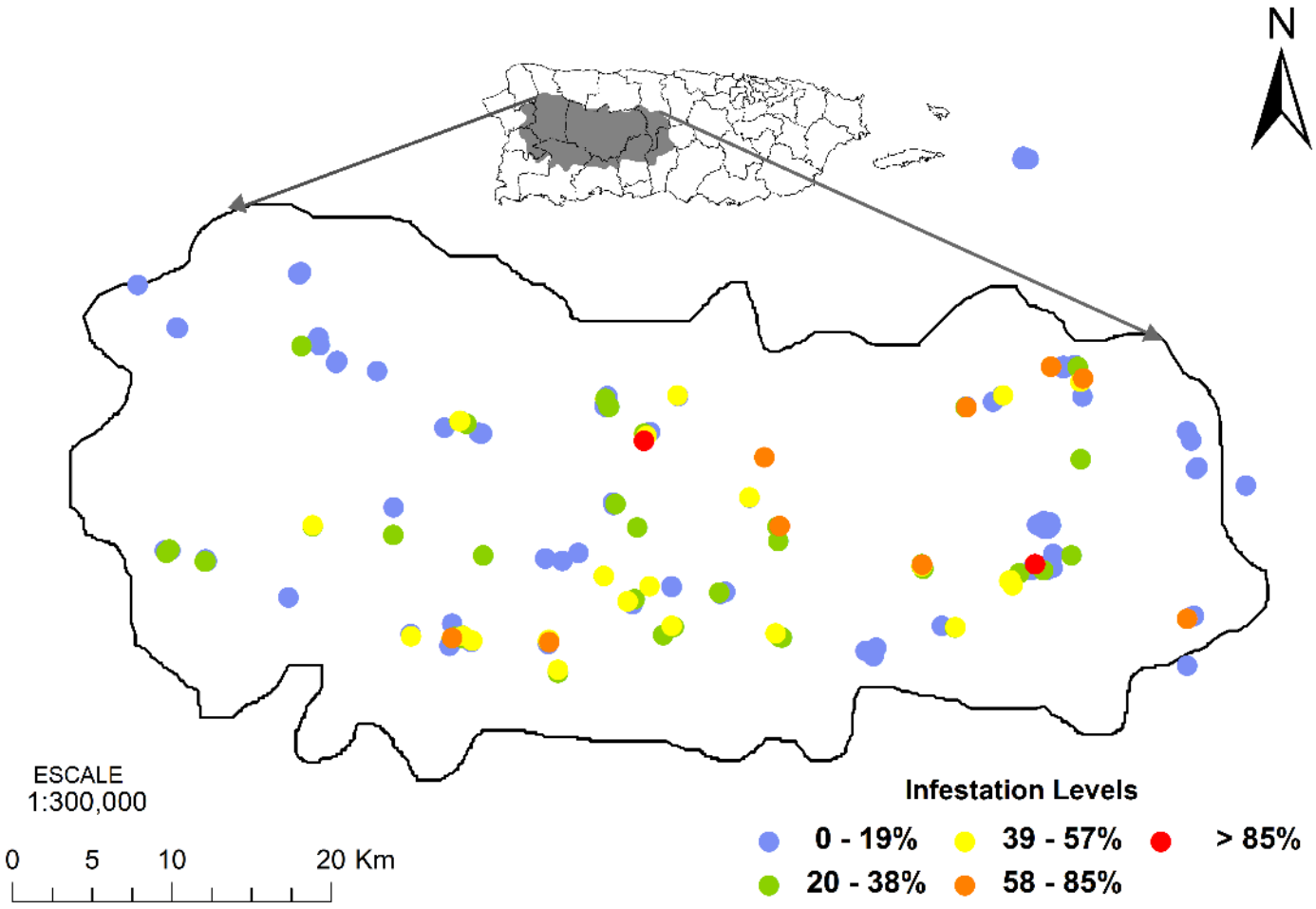
We sampled 214 plots.



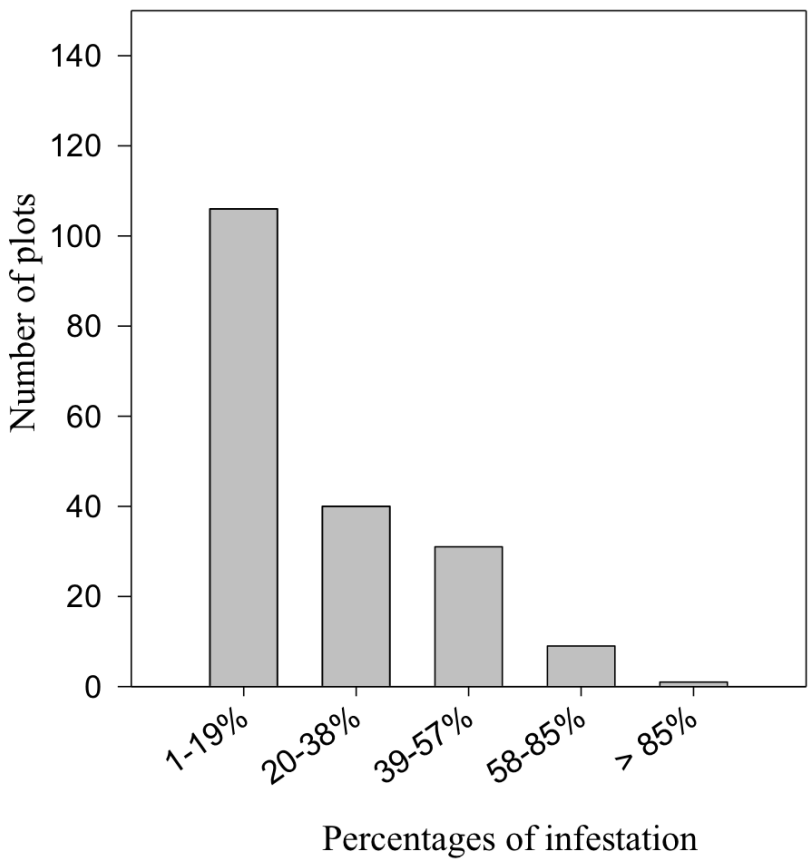


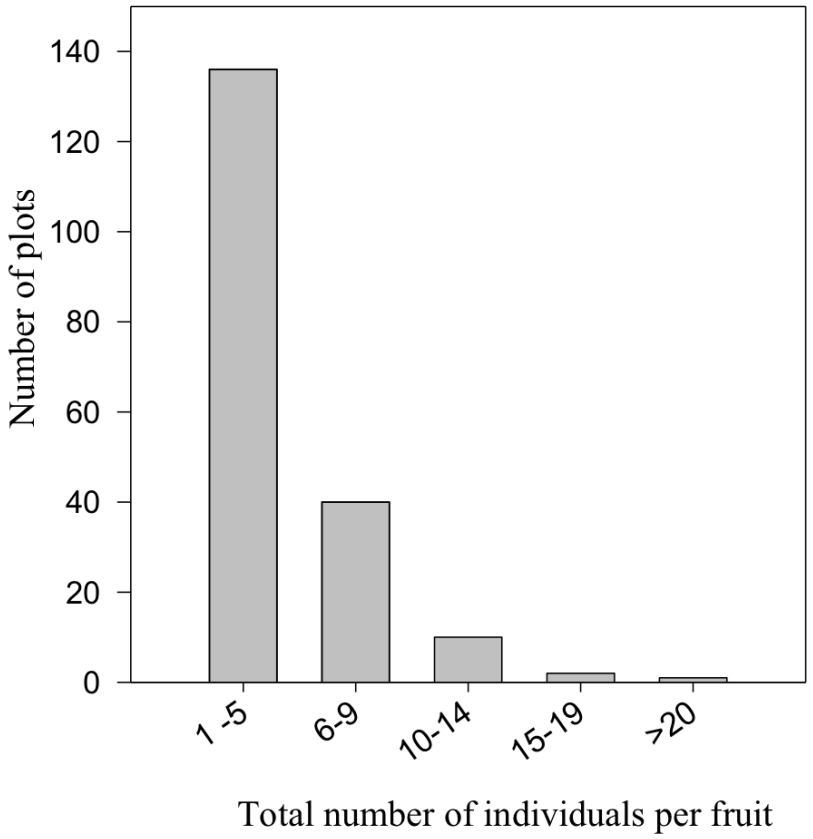
In each plot we took the coordinates, altitude, plants height, density of plants, yield estimates ... + samples for lab.

Distribution of sites sampled and infestation percentages of the coffee berry borer *Hypothenemus hampei.*



Distribution of the percentages of infestation and total number of individuals per fruit of the coffee berry borer *Hypothenemus hampei* in Puerto Rico (2014-15)

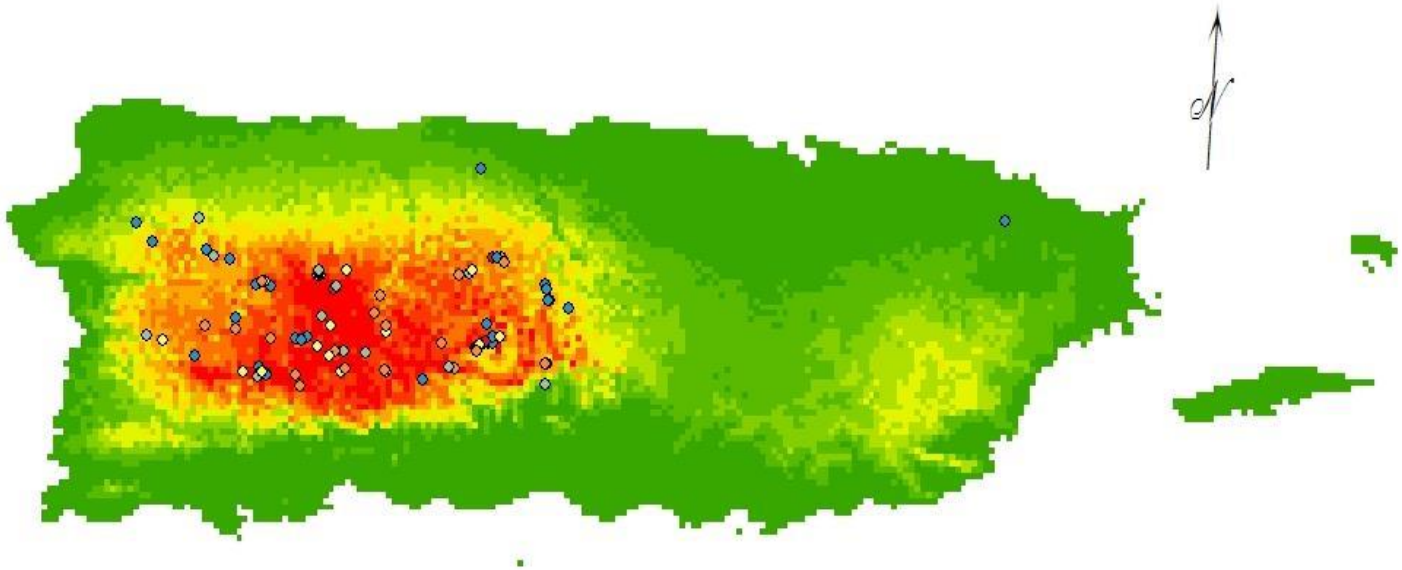




Bioclimatic variables

- Use in ecological niche modeling
- Representing:
  - Annual trends
  - Seasonality
  - Extreme or limiting environmental factors

CBB in Puerto Rico



0 0.1 0.2 0.4 0.6 0.8 Kilometers

Suitability levels

0-10 10-20 20-30 30-40 40-50 50-60 60-70 70-80 80-90 90-100

Infestation levels

- 0-20
- 21-40
- 41-60
- 61-80
- 81-100

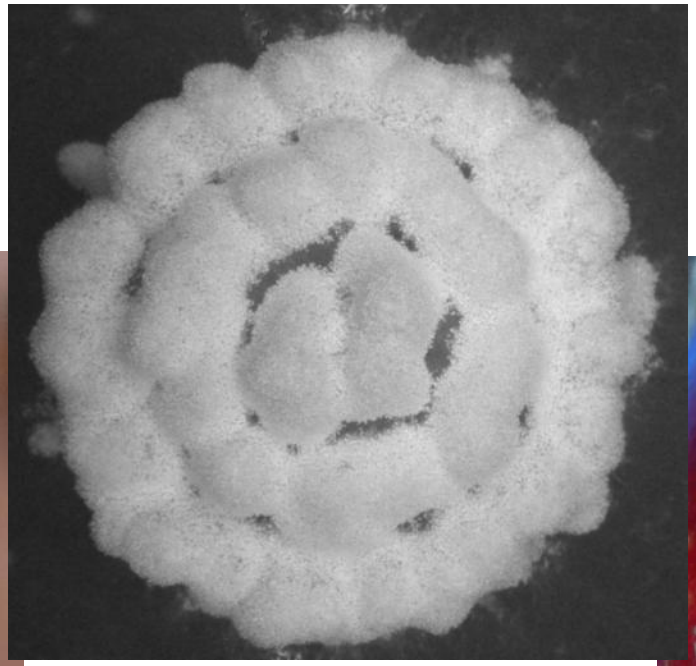
Analysis of variable contributions

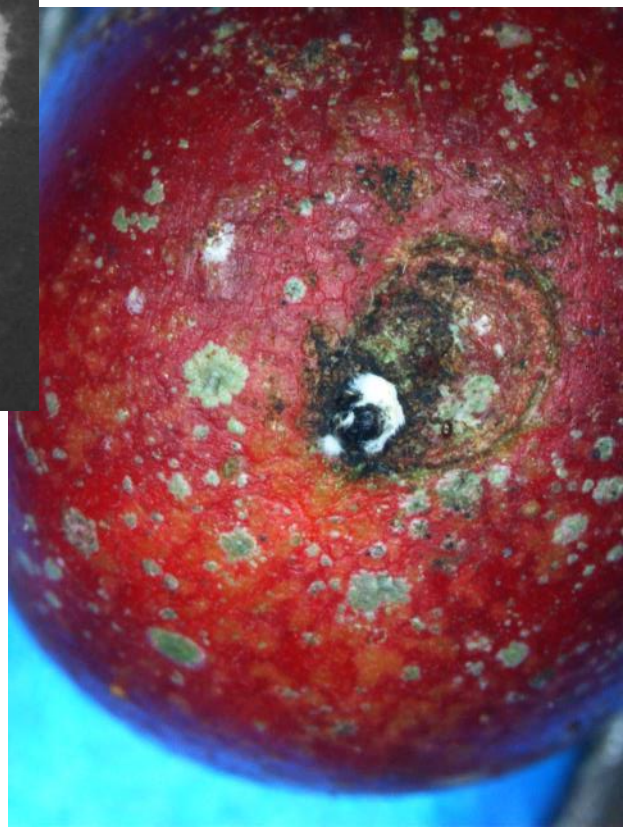
Variable	Description	Percent contribution
ATITUDE	Elevation (mts)	24.4
BIO1 =	Annual Mean Temperature (^{O}C)	0.5
BIO2 =	Mean Diurnal Range (Mean of monthly (max temp - min temp)) (^{O}C)	0.2
BIO3 =	Isothermalituy (BIO2/BIO7) (*100)	4.9
BIO4 =	Temperature Seasonality (standard deviation * 100)	0.6
BIO5 =	Max Temperature of Warmest Month (^{O}C)	0
BIO6 =	Min Temperature of Coldest Month (^{O}C)	0
BIO7 =	Temperature Annual Range (BIO5-BIO6)	2.9
BIO8 =	Mean Temperature of Wettest Quarter	0.3
BIO9 =	Mean Temperature of Driest Quarter (^{O}C)	0.3
BIO10 =	Mean Temperature of Warmest Quarter (^{O}C)	0.7
BIO11 =	Mean Temperature of Coldest Quarter (^{O}C)	0.3
BIO12 =	Annual Precipitation (mm)	0.8
BIO13 =	Precipitation of Wettest Month (mm)	4.1
BIO14 =	Precipitation of Driest Month (mm)	1.9
BIO15 =	Precipitation Seasonality (Coefficient of Variation)	15.3
BIO16 =	Precipitation of Wettest Quarter (mm)	33.3
BIO17 =	Precipitation of Driest Quarter (mm)	3.4
BIO18 =	precipitation of Warmest Quarter (mm)	1.3
BIO19 =	Precipitation of Coldest Quarter (mm)	4.8

Research on CBB in Puerto Rico

USDA Agricultural Research Service

Collect, identify and test native strains of Bb and nematodes for biocontrol of CBB





Establish demonstration plots with traps, Bb and complete collection of fruits

outreach to growers and the public


siembra en la sombra:
café, agroecología
y agroforestería
11 de abril
uprrp cs. nat. A-211
9:00 - 3:00
dave buchen

conferenciantes invitad@s:

inge armbrecht univalle col agroecología y biodiversidad
maria cristina gallego u cauca col hormigas y la broca
ivette perfecto u michigan usa servicios ecosistémicos
john vandermeer u michigan usa la roya del café
ana t. mosquera u javeriana col Vanilla agroforestal
elena biamón finca gripiñas pr caficultura orgánica
alejandra bonilla uprrp pr oportunidades de investigación
yobana mariño uprrp pr la broca en sol vs. sombra
isabel parés iitf-usfs pr árboles y cambio climático
mariangie ramos upr utuado educación en agroforestería

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Acknowledgments

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Acknowledgment

http://joselab.eea.uprm.edu