

Final Report

Project: Serpentine areas of Guamuhaya Mountains: a hot spot of
Cuban flora which needs protection

Supported by

Rufford Small Grant for Nature Conservation

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I. Summary

Floristic surveys were conducted in the serpentine areas of Guamuhaaya Mountains in the Summer of 2005. We found 233 plants, 55 of them are endemic and *Rondeletia bicolor* (from the Coffee family – Rubiaceae) is restricted to a single area. The serpentine areas are strongly damaged by human activities such as grazing, quarrying, forestry and agriculture. A document supporting the proposal of El Tibisial and Gavilanes outcrops –the largest and better conserved areas, as reserves was prepared. This document includes (1) a plant species check list of each serpentine outcrop, (2) a commented list of the threats to plant species and/or communities with suggestions to their control, (3) data about endangered plant species, and (4) recommendations about the management and conservation of these communities. The Environmental Education Program is focussed on building capacity by providing training to environmental education activists. Over 15 environmental activists, representing protected areas in Central Cuba, attended the Environmental Training Workshop, which was held from July 15-17, 2004 in Santa Clara, Cuba. Two training courses one week long were taught to 29 undergraduates and 10 technicians from surrounding local reserves. Both courses were aimed to teach and practice census, monitoring and sampling techniques. Four team members participated in the First Workshop for the Conservation of Cuban Threatened Trees and compiled the Red List of Cuban Vascular Flora.

II. Project Progress

A. Goals and Objectives

The aim of this project is to obtain the necessary information to support the proposal of the serpentine areas of Guamuhaaya Mountains as a Flora Refuge (Protected Area).

Our objectives are:

- (1) to make a floristic survey of Guamuhaaya Mountains serpentine areas,
- (2) to identify threats to plants and/or communities,
- (3) to increase public and government awareness about the importance of these areas to Cuban plant diversity,
- (4) to gather information to categorize endangered native flora, and
- (5) to gather information to future management and conservation plans of these areas.

B. Results achieved (results numbers are related with objectives numbers)

(1) Floristic survey

The 16 ultramafic outcrops reported by Formel (1989) to the Guamuhaaya range were visited but only 5 of them are composed by serpentine rocks. The other outcrops are mixed with quartz and/or limestone covered by non serpentine plants.

A floristic survey was conducted in the five serpentine areas of Guamuhaaya Mountains. We found 233 plants, 55 of them are endemic (Table 1) and *Rondeletia bicolor* (from the Coffee family –Rubiaceae) is restricted to a single area (see [Anex](#) for a complete vascular plant list with their distribution).

Table 1. List of the endemic vascular plants of Guamuhaya Massif

Endemic species	Endemic species
<i>Acuneanthus tinifolius</i> (Griseb.) Borhidi	<i>Myrica punctata</i> Griseb.
<i>Agave brittoniana</i> Trel.	<i>Neobrachea valenzuelana</i> (A. Rich) Urb.
<i>Andira cubensis</i> Bentham	<i>Ossaea lanata</i> (Naudin) C.Wright ex Griseb.
<i>Annona bullata</i> A.Rich.	<i>Passiflora cubensis</i> Urb.
<i>Baccharis halimifolia</i> var. <i>angustior</i> DC.	<i>Petitia domingensis</i> Jacq.
<i>Badiera virgata</i> Britton	<i>Phyllanthus discolor</i> Poepp.
<i>Begonia banoensis</i> J. Sierra	<i>Phyllanthus orbicularis</i> Humb. Bonpl. & Kunth
<i>Belairia savannarum</i> Bisse	<i>Platygyne hexandra</i> (Jacq.) Müll. Arg.
<i>Bourreria virgata</i> (Sw.) G.Don	<i>Polygala saginoides</i> Griseb.
<i>Brunfelsia nitida</i> Benth.	<i>Pseudocarpidium ilicifolium</i> (A.Rich.) Millsp.
<i>Casearia sylvestris</i> subsp. <i>myricoides</i> (Griseb.) J.E. Gut.	<i>Psidium balium</i> Urb.
<i>Chamaesyce brittonii</i> (Millsp.) Millsp.	<i>Rondeletia bicolor</i> Britton
<i>Chaptalia rocana</i> Britton & P. Wilson	<i>Rondeletia leonis</i> Britton
<i>Coccoloba retusa</i> Griseb.	<i>Scolosanthus crucifer</i> Wr.ex Sauv.
<i>Coccothrinax miraguama</i> (Kunth) León	<i>Securidaca elliptica</i> Turcz.
<i>Croton rectangularis</i> Urb.	<i>Simarouba leavis</i> Griseb.
<i>Encyclia phoenicea</i> (Lindl.) Neuman	<i>Suberanthus neriifolius</i> (A.Rich.) Borhidi & M. Fern. Zeq.
<i>Erythroxylum banoensis</i> Oviedo	<i>Symplocos martinicensis</i> subsp. <i>strigillosa</i> (Krug & Urb.) Mai.
<i>Erythroxylum claraense</i> Borhidi	<i>Tabebuia lepidota</i> (Humb. Bonpl. & Kunth) Britton
<i>Eugenia asperifolia</i> Berg.	<i>Tapura obovata</i> Britton & P.Wilson
<i>Evolvulus minimus</i> Ooststr.	<i>Terminalia neglecta</i> Bisse
<i>Garcinia aristata</i> (Griseb.) Borhidi	<i>Tetrazygia coriacea</i> Urb.
<i>Guettarda calyptrata</i> A. Rich.	<i>Vernonia cubensis</i> Griseb. var. <i>cubensis</i>
<i>Hyptis minutifolia</i> Griseb.	<i>Vernonia fallax</i> Gleason
<i>Ilex clementis</i> Britton & P. Wilson	<i>Vernonia menthaefolia</i> (Poepp. Ex Spreng.) Less
<i>Ipomoea clarensis</i> Alain	<i>Zamia ottonis</i> Miq.
<i>Machaonia subinermis</i> subsp. <i>armata</i> Borhidi et M. Fern. Zeq	
<i>Mesechites rosea</i> (A. DC.) Miers	
<i>Michania reticulosa</i> Wright	

(2) Threats for plants and communities

Threats were identified during plant surveys.

All these serpentine areas are very damaged by human activities such as grazing, quarrying, forestry, and agriculture. Grazing or agriculture produce the most drastic changes in plant diversity and community structure due to these activities occupy completely the outcrops and eliminate by burning the native flora. Although, pine forestry usually cover the whole outcrop this activity do not lead to a significantly change in species composition and richness. Species richness in pine forestry sites do not differ from non disturbed ones if fire is not used in land preparation.

The following table shows the threats identified in each serpentine area.

Threat	Capitolio	San Pablo	Limones	Gavilanes	El Tibisial
Quarrying	X		X	X	
Grazing	X	X	X		X
Agriculture	X	X			
Forestry		X		X	
Allien invasion	X	X			
Urbanization	X	X	X		

(3) Public and government awareness about the importance of these areas

- A document supporting the proposal of El Tibisial and Gavilanes outcrops as protected areas was sent to the National Center of Protected Areas (institution which entrust the design, management and control of the Protected Areas National System in Cuba). This document included:
 - (1) a plant species check list of each serpentine outcrop,
 - (2) a commented list of the threats to plant species and/or communities with suggestions to their control,
 - (3) data about endangered plant species, and
 - (4) recommendations about the management and conservation of these communities.
- The Environmental Education Program is focussed on building capacity by providing training to environmental education activists. Over 15 environmental activists, representing protected areas in Central Cuba, attended the Environmental Training Workshop, which was held from July 15-17, 2004 in Santa Clara, Cuba. The Workshop provided an opportunity for discuss and exchange experience on environmental education techniques, and to learn about the methodology of "Teaching Ecology in the School Yard" (TESY). This is an environmental education alternative easy to implement without expensive equipment. (This workshop was also supported by a BP Conservation Programme Award).
- Project achievements were diffused by interviews on national radio stations (Radio Rebelde, Radio Progreso, Radio COCO, Radio Metropolitana). A project updates were published in the Cuban National Botanical Garden website.
- The project results and the photographic material are being used in the Environmental Education Program that is carried out by the Botanical Gardens Network and the University of Havana. This information also used in different undergraduate and graduate courses (Botany, Phytogeography, Ecology and Conservation Biology, as study cases).
- Two training course one week long were organized for undergraduates and technicians from surrounding local reserves. Both courses were aimed to teach and practice census, monitoring and sampling techniques. A total of 40 people attended to both courses. One course on pollination biology was taught to undergraduates (30 students) and a training course on this subject was taught to undergraduates and reserves technicians (9 peoples). (Training courses were also supported by a BP Conservation Programme Award).

(4) Information for categorizing endangered native flora

- Four team members participated in the First Workshop for the Conservation of Cuban Threatened Trees.
- Four team members compiled the Red List of Cuban Vascular Flora. (This book was published with the support of the Atlantic Botanic Garden)

(5) Information for managing and conservation plans of these areas

- The plant species inventory, the list of threats for plant species and/or communities, data about endangered plant species, and recommendations for managing and conservation is compiled in the document submitted to the National Center of Protected Areas (institution which entrust the design, management and control of the Protected Areas National System in Cuba).

C. Difficulties

- The tax of all products increased 5 or 10 % during the project then we have to readjust the budget. We prioritized field work more than lab analysis.

D. Impacts on conservation

- First inventory of vascular plants of Guamuhaya serpentine areas.
- More than 60 people (undergraduates, postgraduates, technicians) have received training in field work and/or environmental education techniques.
- The environmental workshop allows increase awareness about the main problems of these areas. Environmental activists also learned techniques that can be applied to work with teachers, adult people and children.
- Undergraduate student received training in fieldwork methods and flora identification during the project.
- Plant diversity data of the region is now available –after publication all the data will be published in the Cuban National Botanical Garden web site. Results were also presented in national and international meetings.
- One Master in Science thesis was successful presented and two BS theses are being prepared to be presented next June 2006.
- A new population of the critically endangered *Magnolia acunae* was found in an adjacent patch of tropical rain forest at El Tibisial.
- The palm of the genus *Coccothrinax* found at El Tibisial could be a new species. Cuban specialists are working with the material.
- Herbarium specimens from the region were collected for current studies on Cuban flora.

E. Professional Growth during reporting period.

Grants and Awards

BP Conservation Programme Bronze Award 2004

Grant from the BCSS Conservation Committee 2004, 2005

Grant from the BCSS Research Committee 2005

Alumni Grant from the BP Conservation Programme 2005, 2006

Symposiums and Meetings presentations

Berazaín Iturralde R., Areces Berazaín F., Lazcano Lara J.C., Gonzalez Torres L.R. La Lista Roja de la Flora Vasculare Cubana. II Congreso de Biología de la Conservación. Septiembre, 2005. Jardín Botánico Atlántico, Gijón-España.

Berazaín Iturralde R., Areces Berazaín F., Lazcano Lara J.C., Gonzalez Torres L.R. La Lista Roja de la Flora Vasculare Cubana. IX Encuentro Johannes Bisse In Memoriam, Enero 2005. Universidad Pedagógica José Martí; Camagüey. Cuba.

Gonzalez-Torres L.R., Berazaín R., Bécquer E., Matos J., Palmarola A., Vázquez A., Rodríguez Y., Torres A. Human disturbs in endemic-rich ultramafic plant communities: their consequences on floristic composition, richness and vegetation. 19th Annual Meeting of the Society of Conservation Biology. 15-19 July 2005. University of Brasilia, Brazil.

Rodríguez Calvo Y., Bécquer Granados E., González Torres L.R., Palmarola Bejerano A., Vázquez Glaría A. Relación del tipo de hábitat con el número de flores y de flores fecundadas por inflorescencia

en *Pachyanthus clementis* (Melastomataceae). IX Encuentro Johannes Bisse In Memoriam, Enero 2005. Universidad Pedagógica José Martí; Camagüey. Cuba.

Vázquez Glaria A., González Torres L.R., Bécquer Granados E., Palmarola Bejerano A., Rodríguez Calvo Y. Notas sobre la flora y vegetación de la región ultramáfica de Guamuhaya, Cuba Central. IX Encuentro Johannes Bisse In Memoriam, Enero 2005. Universidad Pedagógica José Martí; Camagüey. Cuba.

Gonzalez-Torres, L.R., Berazaín, R. Patrones regionales de diversidad de la flora ultramáfica de Cuba. Accepted to be presented at the V Internacional Conference on Serpentine Ecology. Siena, Italy, May 9-13.

Berazaín, R., Gonzalez-Torres, L.R., Areces, B., Lazcano, L. Flora ultramáfica amenazada de Cuba. Accepted to be presented at the V Internacional Conference on Serpentine Ecology. Siena, Italy, May 9-13.

Publications

Gonzalez-Torres, L.R. 2004. Patrones regionales de diversidad de la flora ultramáfica de Cuba. MS Thesis. Cuban National Botanical Garden, University of Havana.

Berazaín Iturralde R., Areces Berazaín F., Lazcano Lara J.C., Gonzalez Torres L.R. 2005. Lista Roja de la Flora Vasculare Cubana. Documentos 4. Jardín Botánico Atlántico, Gijón.

Rodríguez, Y. 2006. Aspectos sobre la biología reproductiva de *Pachyanthus clementis*, un arbusto endémico de Guamuhaya. BS Thesis. Cuban National Botanical Garden, University of Havana. (to be presented in June 2006)

Vázquez, A. 2006. Flora y vegetación de las serpentinas de Guamuhaya. BS Thesis. Cuban National Botanical Garden, University of Havana. (to be presented in June 2006)

González-Torres, L.R. Vázquez, A., Berazaín, R. Bécquer, E. Palmarola, A. Plant diversity, vegetation and conservation of Guamuhaya serpentine areas. (In preparation).

Vázquez, A., González-Torres, L.R. Berazaín, R. Bécquer, E. Flora de la región ultramáfica de Guamuhaya. (Submitted to Rev. Jard. Bot. Nac. Univ. Hab.)

Palmarola, A., Vázquez, A., González-Torres, L.R. Berazaín, R. Bécquer, E., Cuza, A. Valoración de las serpentinas de Gavilanes y El Tibisial (Guamuhaya) como áreas protegidas para la conservación de la flora serpentinícola de Guamuhaya. (Submitted to Rev. Jard. Bot. Nac. Univ. Hab.)

Scientific Degrees

- One MS dissertation
- One Ph.D. thesis in progress
- Five BS theses in progress, two of them will be presented in June 2006.

III. FINANCIAL UPDATE (exchange tax 1 USD = 0.571527 GBP)

Item	Amount (in USD)
Field work related expenses	
Tents (1)	180.00
Backpacks (5)	600.00
Sleeping pads (8)	320.00
Sleeping bags (4)	160.00
Flash light, Pocket, tracker (2)	25.90
Scale, 6 inch metric ruler (6)	5.70
Conditioning film, Repl, 12 pk (10)	119.50
Calipers, Stainless, Venier (3)	65.70
Altimeter, Thommen, 0-6000 M (1)	259.00
Meter, pH soil moisture (1)	99.95
Compass, Partner II, Baseplate (6)	49.50
Scale, Pesola, Micro-line, 10g (1)	38.25
Scale, Pesola, Micro-line, 100g (1)	34.50
Scale, Pesola, Micro-line, 1000g (1)	39.90
Scale, Pesola, Micro-line, 2500g (1)	39.90
Scale, Pesola, Micro-line, 60g (1)	34.50
Calculator, metric conversion (1)	19.95
Clinometer, percente & degrees (1)	114.95
Batteries (10)	40.00
Front lens 1.6x	188.00
Transportation	1500.00
Field trip meals	2035.00
Hiking boots (8)	400.00
Emergency lamps (2)	58.50
Subtotal	6428.70
Workshop & office material	
Paper (20 box)	140.00
Notebooks (60)	36.00
Pens (2 box)	30.00
White Board Marker (20)	25.00
Meals	325.50
Laser Jet Cartridge (4)	360.00
Subtotal	916.50
Total in USD	7345.20
Total in GBP	4197.98

IV. Next Steps

1. Continue the Environmental Education program in the area.
2. Continue the studies on the ecology of these habitats to improve management actions.

Anex. Distribution of vascular plant in the serpentine areas of Guamuhaya

Leyend: C -Capitolio, S -San Pablo, L -Limonos, G –Gavilanes & T -Tibisial

FAMILIAS Y ESPECIES	Outcrop				
	C	S	L	G	T
ACANTHACEAE					
<i>Thunbergia fragans</i> Roxb.			X		
AGAVACEAE					
<i>Agave brittoniana</i> Trel.					X
<i>Furcraea hexapetala</i> (Jacq.) Urban.					X
AMARANTHACEAE					
<i>Gomphrena dispersa</i> Standl.				X	
AMARYLLIDACEAE					
<i>Bomarea ovata</i> (Cav.) Mirb.					X
ANNONACEAE					
<i>Annona bullata</i> A. Rich.		X			X
<i>Guatteria blainii</i> (Griseb.) Urb.					
APOCYNACEAE					
<i>Angadenia sagraeii</i> (A. DC.) Miers.				X	
<i>Mesechites rosea</i> (A. DC.) Miers				X	
<i>Neobrachea valenzuelana</i> (A. Rich) Urb.					X
<i>Plumeria cubensis</i> Urb.				X	X
<i>Rauvolfia tetraphylla</i> L.		X			
<i>Urechites lutea</i> (L.) Britton		X			
AQUIFOLIACEAE					
<i>Ilex clementis</i> Britton & P. Wilson					X
ARECACEAE					
<i>Coccothrinax miraguama</i> (Kunth) León		X			
<i>Coccothrinax</i> sp.					X
<i>Sabal palmetto</i> (Walter) Lodd. ex J.A. & J.H. Schultes		X			
ASTERACEAE					
<i>Ageratina</i> sp.					X
<i>Baccharis halimifolia</i> var. <i>angustior</i> DC.					X
<i>Chaptalia dentata</i> (L.) Cass.			X		
<i>Chaptalia rocana</i> Britton & P. Wilson					X
<i>Critonia dalea</i> (L.) DC.					X
<i>Eleutheranthera ruderalis</i> (Sw.) Sch. Bip.		X			
<i>Koanophyllon villosum</i> (Sw.) R.M.King & H.Rob.			X	X	X
<i>Mikania micrantha</i> Humb., Bonpl. & Kunth					X
<i>Mikania reticulosa</i> C.Wright ex Sauvalle					X
<i>Pinillosia berterii</i> (Spreng.) Urb					X
<i>Senecio plumbeus</i> Griseb.					X
<i>Vernonia cubensis</i> Griseb. var. <i>cubensis</i>				X	X
<i>Vernonia fallax</i> Gleason		X			
<i>Vernonia menthaefolia</i> (Poepp. ex Spreng.) Less				X	X
BEGONIACEAE					
<i>Begonia banaoensis</i> J.Sierra					X
BIGNONACEAE					
<i>Parmentiera edulis</i> DC.	X				
<i>Tabebuia lepidota</i> (Humb., Bompl. & Kunth.) Britt.	X	X	X	X	X
BORAGINACEAE					
<i>Bourreria divaricata</i> (DC.) G. Don.	X	X			
<i>Bourreria virgata</i> (Sw.) G.Don	X	X			
<i>Heliotropium humifusum</i> Humb., Bompl. & Kunth.				X	
<i>Tournefortia hirsutissima</i> L.	X				X
BROMELIACEAE					

<i>Tillandsia flexuosa</i> Sw.			X	
<i>Tillandsia recurvata</i> L.				X
CACTACEAE				
<i>Rhipsalis baccifera</i> Gaertn				X
CAESALPINACEAE				
<i>Caesalpinia pauciflora</i> (Griseb.) C. Wright	X			X
<i>Chamaecrista lineata</i> (Sw.) Greene var. <i>lineata</i>				X
<i>Senna obtusifolia</i> (L.) Irwin & Barneby		X		X
CAMPANULACEAE				
<i>Hippobroma longiflora</i> (L.) G. Don			X	
CELASTRACEAE				
<i>Cassine xylocarpa</i> var. <i>attenuata</i> (A.Rich.) Kuntze				X
<i>Maytenus buxifolia</i> (A.Rich.) Griseb.				X
CLUSIACEAE				
<i>Clusia rosea</i> Jacq.				X
<i>Garcinia aristata</i> (Griseb.) Borhidi				X
CYPERACEAE				
<i>Abildgaardia monostrachya</i> (L.) Vahl.	X			
<i>Dichromena colorata</i> (L.) Hitch.		X		
<i>Rhynchospora tenuifolia</i> Griseb.				X
<i>Scleria melaleuca</i> C. & S.				X
COMBRETACEAE				
<i>Terminalia neglecta</i> Bisse				X
COMMELINACEAE				
<i>Commelina erecta</i> L.	X			X
CONVOLVULACEAE				
<i>Evolvulus minimus</i> Ooststr.			X	
<i>Ipomoea clarensis</i> Alain				X
<i>Ipomoea microdactyla</i> Griseb.				X
<i>Ipomoea tenuissima</i> Choisy		X		X
<i>Jacquemontia jamaicensis</i> (Jacq.) Hall.				X
<i>Jacquemontia verticillata</i> (L.) Urb.	X			
DENNSTAEDTIACEAE				
<i>Odontosoria</i> sp.				X
DICHAPETALACEAE				
<i>Tapura obovata</i> Britton & P.Wilson				X
DILLENIAEAE				
<i>Curatella americana</i> L.	X			X
<i>Davilla rugosa</i> Poir.			X	X
DIOSCOREACEAE				
<i>Dioscorea</i> sp.				X
<i>Rajania wrightii</i> Uline ex R.Knuth				X
ERYTHROXYLACEAE				
<i>Erythroxylum areolatum</i> L.	X			
<i>Erythroxylum banaoensis</i> Oviedo				X
<i>Erythroxylum clarensense</i> Borhidi				X
EUPHORBIACEAE				
<i>Acalypha chamaedrifolia</i> (Lam.) Müll. Arg.			X	X
<i>Chamaesyce brittonii</i> (Millsp.) Millsp.			X	X
<i>Chamaesyce hirta</i> (L.) Millsp.	X	X	X	X
<i>Croton argenteus</i> L.		X		X
<i>Croton glandulosus</i> L.	X	X		X
<i>Croton lobatus</i> L.	X			
<i>Croton nummulariaefolius</i> A. Rich.		X	X	
<i>Croton rectangularis</i> Urb.				X
<i>Phyllanthus discolor</i> Poepp.	X	X	X	X
<i>Phyllanthus orbicularis</i> Humb., Bonpl. & Kunth		X	X	X

<i>Phyllanthus procerus</i> C. Wright ex Sauvalle		X		X
<i>Platygyne hexandra</i> (Jacq.) Müll. Arg.				X
<i>Sebastiania corniculata</i> (Vahl) Müll. Arg.			X	X
FABACEAE				
<i>Alysicarpus vaginalis</i> (L.) DC	X			
<i>Andira cubensis</i> Benth				X
<i>Belairia savannarum</i> Bisse	X			X
<i>Brya ebenus</i> L.			X	
<i>Clitoria</i> sp.				X
<i>Cojoba arborea</i> (L.) Britton & Rose.				X
<i>Desmodium incanum</i> DC.	X			
<i>Galactia savanarum</i> Britton	X			
<i>Macroptilium atropurpureum</i> (Moc. & Sessé) Urb.	X			
<i>Senna obtusifolia</i> (L.) Irwin & Barneby				X
<i>Stylosanthes viscosa</i> Sw.	X			X
<i>Zornia gemella</i> (Willd.) Vogel	X			X
FLACOURTIACEAE				
<i>Casearia guianensis</i> (Aubl.) Urb.			X	
<i>Casearia mollis</i> (Humb. & al.) Kunth. in Humb. & al.	X			
<i>Casearia spinescens</i> (Sw.) Griseb.	X			X
<i>Casearia sylvestris</i> subsp. <i>myricoides</i> (Griseb.) J.E. Gut.	X			X
<i>Casearia sylvestris</i> Sw. subsp. <i>sylvestris</i>				X
<i>Xylosma buxifolia</i> A.Gray				X
HIPOXIDACEAE				
<i>Curculigo scorazonaerifolia</i> (Lam.) Benth.	X			
LAMIACEAE				
<i>Aegiphila elata</i> Sw.		X		X
<i>Hyptis minutifolia</i> Griseb.			X	X
LAURACEAE				
<i>Cassytha filiformis</i> L.		X	X	X
<i>Cinnamomun cubensis</i> (Nees) Kosterm			X	
LYTHRACEAE				
<i>Cuphaea parsonsia</i> (L.) R. Br.	X	X	X	X
MALPIGHIACEAE				
<i>Byrsonima crassifolia</i> (L.) Humb., Bompl. & Kunth			X	X
<i>Stigmaphyllon diversifolium</i> (Kunth) Juss.				X
<i>Stigmaphyllon sagreanum</i> Juss.			X	X
<i>Stigmaphyllon tomentosum</i> (Desf.) Nied.	X			
MALVACEAE				
<i>Hibiscus costatus</i> A. Rich.		X		X
<i>Hibiscus cryptocarpus</i> A. Rich.		X		
<i>Sida acuta</i> Burm. F.	X	X	X	X
<i>Sida rhombifolia</i> L.		X		X
<i>Sida spinosa</i> L.		X		
<i>Sida urens</i> L.	X	X		
<i>Urena lobata</i> L.			X	
MELASTOMATAACEAE				
<i>Clidemia hirta</i> (L.) D. Don.		X		X
<i>Miconia albicans</i> (Sw.) Triana				X
<i>Ossaea lanata</i> (Naudin) C.Wright ex Griseb				X
<i>Ossaea microphylla</i> (Sw.) C. Wright ex Sauvalle		X	X	X
<i>Tetrazygia bicolor</i> (Mill.) Cogn.		X		X
<i>Tetrazygia coriacea</i> Urb.				
MIMOSACEAE				
<i>Aeschynomene americana</i> L.		X		
<i>Mimosa pudica</i> L.				X
MOLLUGINACEAE				

<i>Mollugo nudicaulis</i> Lam.				X
MORACEAE				
<i>Ficus</i> sp.				X
MYRICACEAE				
<i>Myrica cerifera</i> L.				X
<i>Myrica punctata</i> Griseb.				X X
MYRSINACEAE				
<i>Myrsine coriacea</i> (Sw.) R. Br. ex Roem. & Schult.				X
<i>Myrsine floridana</i> A. DC				X
MYRTACEAE				
<i>Eugenia asperifolia</i> Berg.				X
<i>Eugenia axillaris</i> (Sw.) Willd.	X	X		X
<i>Psidium baliu</i> m. Urb.				X
NEPHROLEPIDACEAE				
<i>Nephrolepis minutifolia</i> (Rxb.) Jarrett ex Morton				X
NYCTAGINACEAE				
<i>Pisonia aculeata</i> L.				X
OCHNACEAE				
<i>Sauvagesia erecta</i> subsp. <i>brownei</i> (Planch.) Sastre				X
ORCHIDACEAE				
<i>Bletia</i> sp.				X
<i>Encyclia phoenicea</i> (Lindl.) Neuman				X
<i>Epidendrum nocturnum</i> Jacq.				
<i>Hormidium pygmaeum</i> (Hook.) Benth. & Hook. ex Hensl.				X
<i>Pleurothallis sertularioides</i> (Sw.) Spreng.				X
<i>Pleurothallis tribuloides</i> (Sw.) Lindl.				X
<i>Prostechechea cochleata</i> (L.) Higgins				X
<i>Oncidium luridum</i> Lindl.				X
PASSIFLORACEAE				
<i>Passiflora cubensis</i> Urb.	X			X
<i>Passiflora foetida</i> L.			X	X
<i>Passiflora suberosa</i> L.				X
PINACEAE				
<i>Pinus caribaea</i> var <i>caribaea</i> Morelet.				X
PIPERACEAE				
<i>Peperomia magnolifolia</i> (Jacq.) A Diert.				X
<i>Peperomia obtusifolia</i> Miq.				X
POACEAE				
<i>Andropogon glomeratus</i> (Walter) Britton, Sterns & Poggenb.	X	X		
<i>Andropogon leucostachyus</i> Kunth in Humb., Bompl. & Kunth.				X
<i>Andropogon virginicum</i> L.				
<i>Aristida neglecta</i> Leon			X	X
<i>Brachiaria fasciculata</i> (Sw.) S.T. Blake	X			
<i>Chloris cruciata</i> (L.) Sw.			X	X
<i>Chloris radiata</i> (L.) Sw.				X X
<i>Dactyloctenium aegyptum</i> (L.) Willd.	X			
<i>Digitaria argillacea</i> (Hitcch. & Chase) Fernald				X
<i>Echinochloa colona</i> (L.) Link	X			
<i>Eleusine indica</i> (L.) Gaertn.	X			
<i>Hackelochloa granularis</i> (L.) Kuntze				X
<i>Lasiacis divaricata</i> (L.) Hitcch.				X
<i>Panicum acuminatum</i> Sw.			X	
<i>Panicum leucothrix</i> Nash				X
<i>Paspalum alterniflorum</i> A. Rich			X	
<i>Paspalum notatum</i> Flugge			X	
<i>Paspalum rupestre</i> Trin.	X			
<i>Pennisetum</i> sp.				X

<i>Schizachyrium gracile</i> (Spreng.) Nash in Small				X
<i>Setaria geniculata</i> (Lam.) P.Beauv.				X
<i>Setaria gracilis</i> Kunth.	X			
<i>Setaria tenax</i> (Rich.) Desv.	X			X
POLYGALACEAE				
<i>Badiera virgata</i> Britton				X
<i>Polygala longicaulis</i> Humb., Bompl. & Kunth.				X
<i>Polygala paniculata</i> L.			X	
<i>Polygala saginoides</i> Griseb.			X	X
<i>Securidaca elliptica</i> Turcz.			X	X
POLYGONACEAE				
<i>Coccoloba diversifolia</i> Jacq		X		X
<i>Coccoloba retusa</i> Griseb.				X
PORTULACACEAE				
<i>Portulaca</i> sp.	X			
PTERIDACEAE				
<i>Adiantum</i> sp.				X
<i>Pteridium aquilinum</i> (L.) Kunh			X	X
RHAMNACEAE				
<i>Colubrina elliptica</i> (Sw.) Brizicky & Stern				X
<i>Colubrina ferruginosa</i> Brongn.	X			X
RUBIACEAE				
<i>Acuneanthus tinifolius</i> (Griseb.) Borhidi				X
<i>Chiococca alba</i> (L.) Hitchc.				X
<i>Guettarda calyptata</i> A. Rich.		X	X	X
<i>Guettarda combsii</i> Urb.	X	X		X
<i>Guettarda scabra</i> (L.) Lam.			X	
<i>Guettarda valenzuelana</i> A. Rich.				X
<i>Machaonia subinermis</i> subsp. <i>armata</i> Borhidi & M. Fernández Z.				X
<i>Mitracarpus</i> sp.	X		X	X
<i>Psychotria revoluta</i> DC.		X	X	X
<i>Richardia brasiliensis</i> Gómez	X			X
<i>Rondeletia bicolor</i> Britton				X
<i>Rondeletia leonis</i> Britton				X
<i>Rondeletia odorata</i> subsp. <i>grandifolia</i> M. Fernández. Zeq. & P. Herrera		X		X
<i>Scolosanthus crucifer</i> Wr.ex Sauv.		X		X
<i>Suberanthus neriifolius</i> (A.Rich.) Borhidi & M. Fernández Z.	X	X	X	X
SAPINDACEAE				
<i>Serjania diversifolia</i> (Jack.) Badlk.				X
SAPOTACEAE				
<i>Chrysophyllum oliviforme</i> L.		X		
<i>Sideroxylon foetidissimum</i> Jacq.				X
SCHIZEACEAE				
<i>Anemia hirsuta</i> (L.) Sw.			X	
SCROPHULARIACEAE				
<i>Buchnera elongata</i> Sw.	X		X	X
SIMARUBACEAE				
<i>Simarouba leavis</i> Griseb.				X
SMILACACEAE				
<i>Smilax domingensis</i> Willd.				X
<i>Smilax havanensis</i> Jacq.	X			X
SOLANACEAE				
<i>Brunfelsia nitida</i> Benth.				X
<i>Cestrum diurnum</i> L.		X		
<i>Cestrum laurifolium</i> L'Hér.				X
<i>Lycianthes lenta</i> (Cav.) Bitter.	X			X

<i>Solanum schlechtendalianum</i> Walp.				X
STERCULIACEAE				
<i>Melochia cf. savannarum</i> Britton				X
<i>Melochia villosa</i> (Mill.) Fawc. & Rendle	X	X	X	
<i>Waltheria indica</i> L.	X			X
SYMPLOCACEAE				
<i>Symplocos martinicensis</i> subsp. <i>strigillosa</i> (Krug & Urb.) Mai.				X
THEACEAE				
<i>Ternstroemia peduncularis</i> DC.			X	X
TURNERACEAE				
<i>Piriqueta cistoides</i> (L.) G. Mey	X			X
<i>Turnera pumilea</i> L.	X			
<i>Turnera ulmifolia</i> L.	X			X
ULMACEAE				
<i>Trema micrantha</i> (L.) Blume				X
VERBENACEAE				
<i>Citharexylum spinosum</i> L.				X
<i>Petitia domingensis</i> Jacq.	X	X		X
<i>Pseudocarpidium ilicifolium</i> (A.Rich.) Millsp.				X
<i>Stachytarpheta jamaicensis</i> (L.) Vahl.				X
<i>Stachytarpheta incana</i> Moldenke	X		X	X
VIOLACEAE				
<i>Hybanthus havanensis</i> Jacq.				X
VITACEAE				
<i>Cissus</i> sp.				X
ZAMIACEAE				
<i>Zamia amblyphyllidia</i> D. Sterenson				X
<i>Zamia ottonis</i> Miq.	X			