ACCELERATING THE DISCOVERY OF HIGH CONSERVATION VALUE AREAS

A bioquality hotspot map for the Maya Golden Landscape

Maya Mountains, Belize (Steven W. Brewer, 2013)

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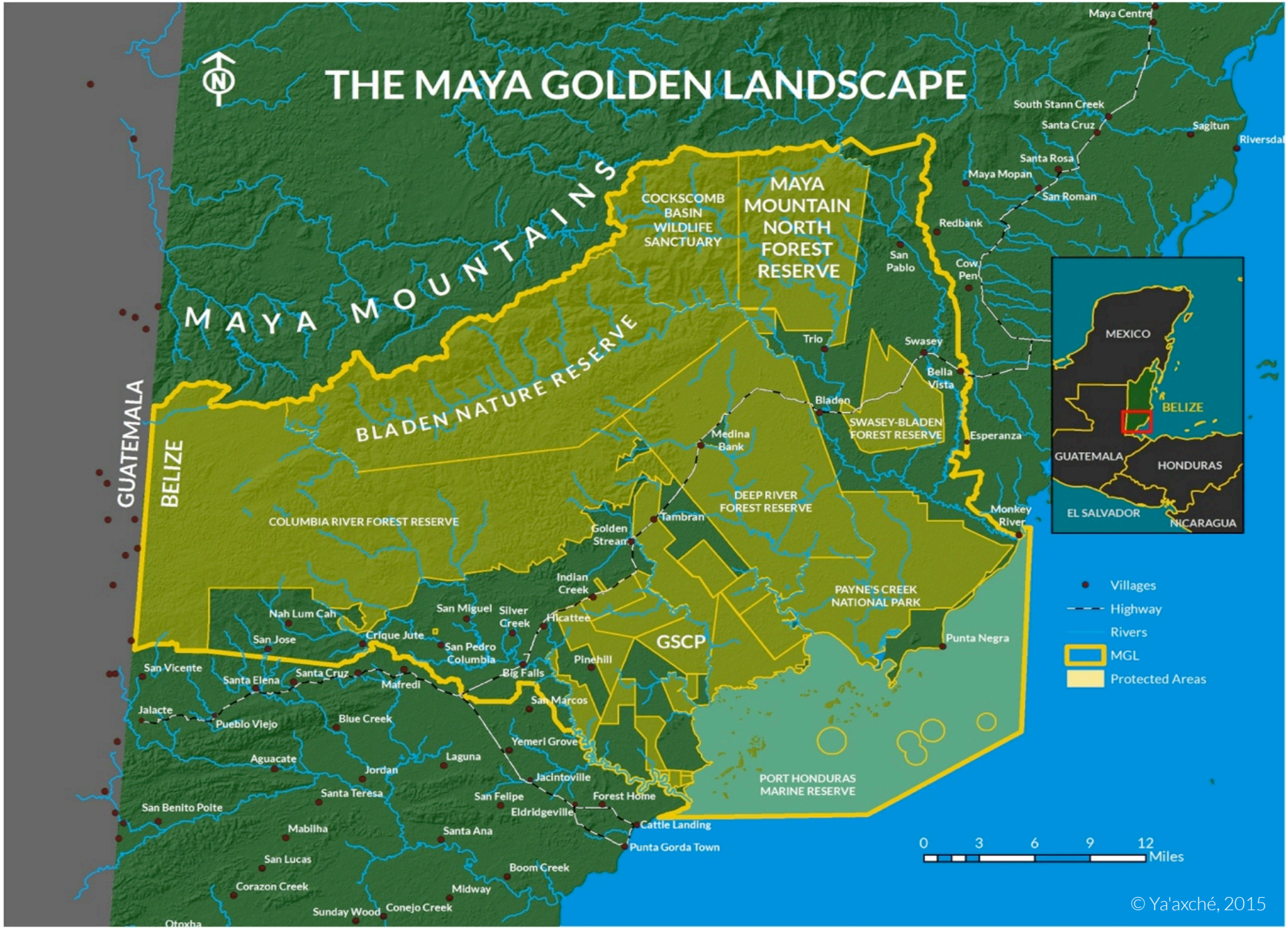
Study site


THE MAYA GOLDEN LANDSCAPE
N
MAYA MOUNTAINS
GUATEMALA
BELIZE
BLADEN NATURE RESERVE
COCKSCOMB BASIN WILDLIFE SANCTUARY
MAYA MOUNTAIN NORTH FOREST RESERVE
COLUMBIA RIVER FOREST RESERVE
SWASEY-BLADEN FOREST RESERVE
DEEP RIVER FOREST RESERVE
PAYNE'S CREEK NATIONAL PARK
PORT HONDURAS MARINE RESERVE
GSCP
Maya Centre
South Stann Creek
Santa Cruz
Sagitun
Riversdal
Santa Rosa
Maya Mopan
San Roman
Redbank
San Pablo
Cow Pen
Trio
Swasey
Bella Vista
Bladen
Esperanza
Medina Bank
Tambran
Golden Stream
Monkey River
Indian Creek
Hicattee
Silver Creek
San Miguel
Nah Lum Cah
San Jose
Crique Jute
San Pedro Columbia
Pinehill
Big Falls
San Vicente
Santa Elena
Santa Cruz
Mafredi
San Marcos
Jalacte
Pueblo Viejo
Blue Creek
Yemeri Grove
Aguacate
Laguna
Jordan
Jacintoville
Santa Teresa
San Felipe
Forest Home
San Benito Polte
Eldridgeville
Cattle Landing
Mabilha
Santa Ana
Punta Gorda Town
San Lucas
Boom Creek
Corazon Creek
Midway
Sunday Wood
Conejo Creek
Otoxha
Punta Negra
MEXICO
BELIZE
GUATEMALA
HONDURAS
EL SALVADOR
NICARAGUA
Villages
Highway
Rivers
MGL
Protected Areas
0 3 6 9 12 Miles
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Objectives

- Test the limits of herbarium datasets as a means to locate areas of high conservation value.
- Investigate the relationship between bioquality and landscape heterogeneity.
- Test the effectiveness of Species Distribution Models as a means to discover previously unknown populations of rare species, and bioquality hotspots.

A rarity-based approach to quantifying 'conservation value'

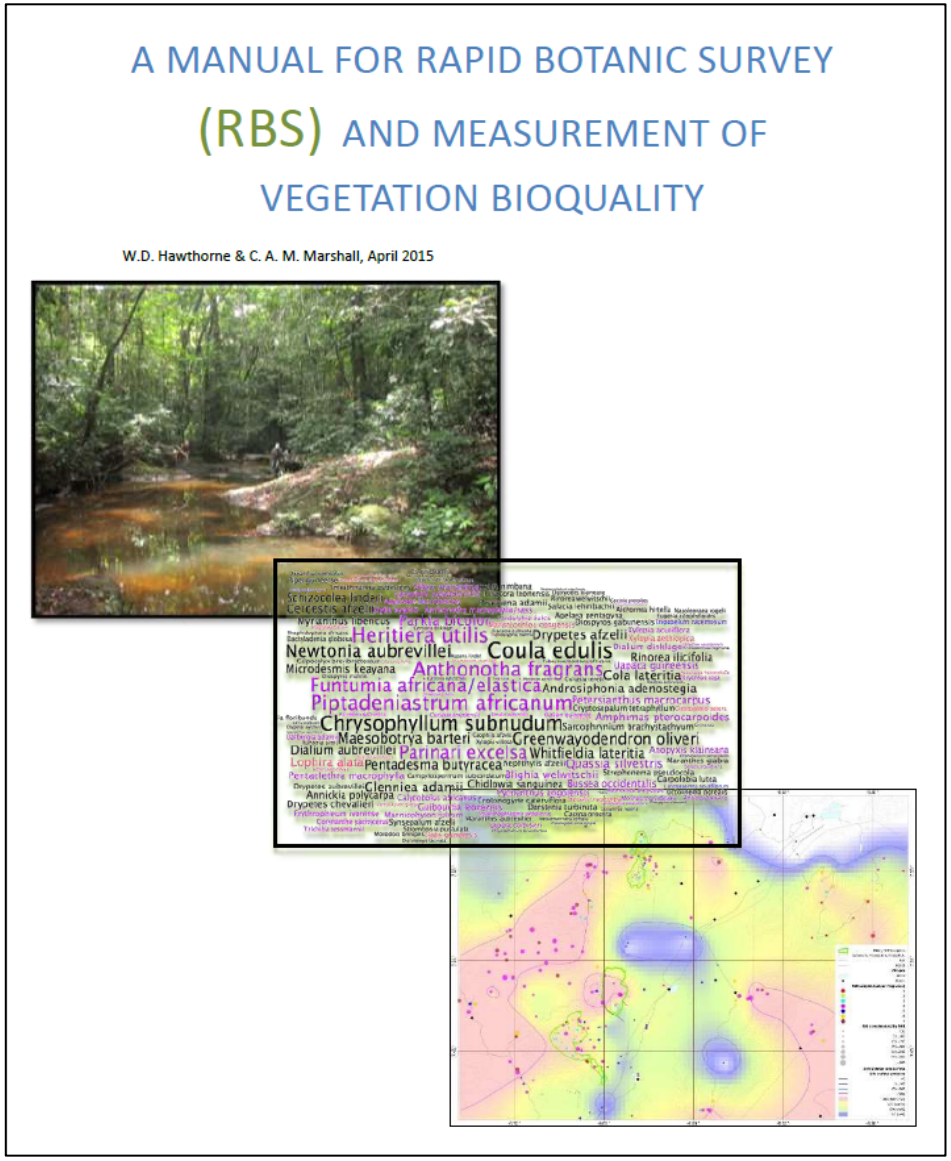
BIOQUALITY

'A term emphasising the relative concentration of various types (Stars) of species in a community, by contrast with "biological diversity" which emphasises absolute numbers. Bioquality by default emphasises the concentration of "high conservation value" gene-related elements (species, varieties, genes) of biodiversity in a community, in respect of their global rarity and distinctiveness.'

GENETIC HEATINDEX (GHI)

'A standardised and practical index of bioquality in a plant community.'

Hawthorne & Marshall, 2015



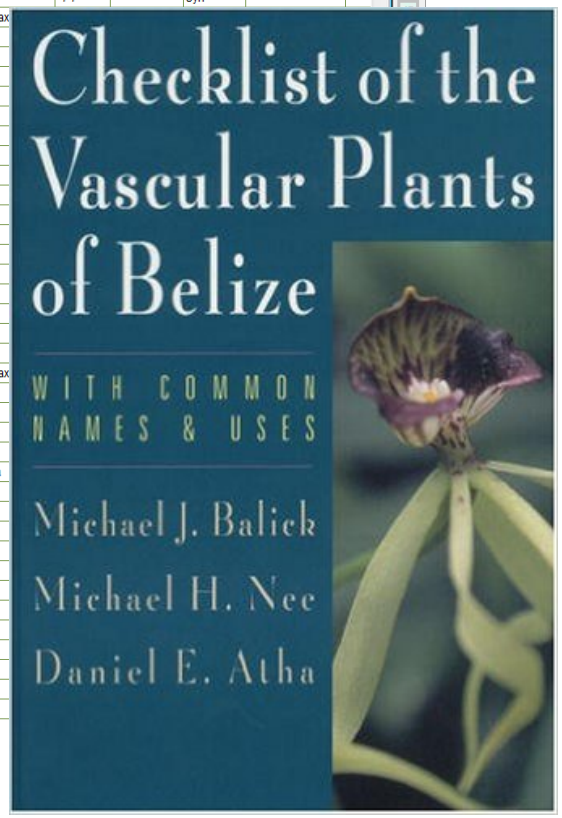
A vascular plant database for Belize

Advanced BRAHMS Gail Stott in Belize [C:\BRAHMS_DATA\BELIZE\DATABASE single-user]

File Edit View Goto Tag FastSort Calculate Datalinks Tools

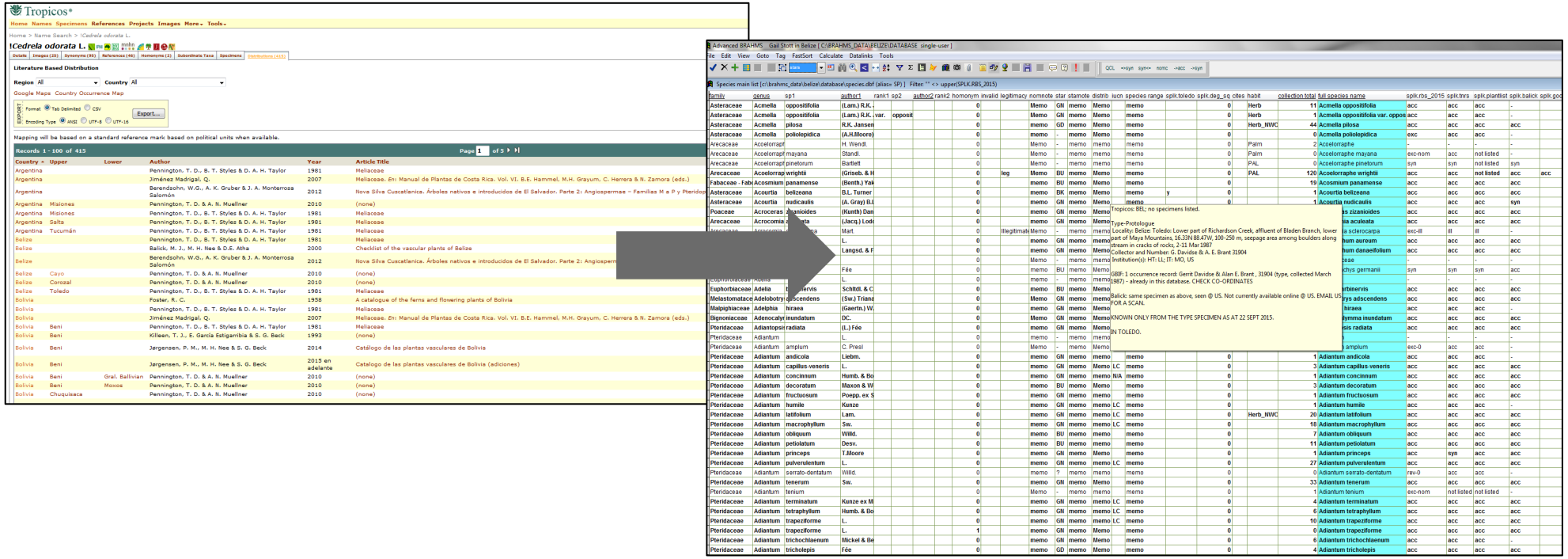
Species main list [c:\brahms_data\belize\database\species.dbf (alias= SP)] Filter: "" <> upper(SPLK.RBS_2015)

family	genus	sp1	author1	rank1	sp2	author2	rank2	homonym	invalid	legitimacy	nomnote	star	starnote	distrib	iucn	species range	splk.toledo	splk.deg_sq	cites	habit	collection total	full species name	splk.rbs_2015	splk.tnrs	splk.plantlist	splk.balick	splk.goodwinnew	splk.
Asteraceae	Orthopappu	angustifolius	(Sw.) Gleas					0			memo	GN	memo	Memo	LC	memo		0			1	Orthopappus angustifolius		/ /		syn		
Loranthaceae	Oryctanthu	cordifolius	(C. Presl) Ur					0			memo		memo	memo		memo		0		Epiphyte/H	16	Oryctanthus cordifolius	acc	acc		acc		Fore
Loranthaceae	Oryctanthus	phanerolomus	(Standl.) Kui					0			memo		memo	memo		memo		0			2	Oryctanthus phanerolomus	syn	syn	syn	syn		
Loranthaceae	Oryctanthu	spicatus	(Jacq.) Eich					0			memo	GN	memo	Memo		memo		0		Epiphyte/H	1	Oryctanthus spicatus	acc	acc		acc	y	Sava
Poaceae	Oryza	alta	Swallen					0			memo		memo	memo		memo		0			1	Oryza alta	rev-tax	syn		acc		
Poaceae	Oryza	latifolia	Desv.					0			memo	GN	memo	Memo	LC	memo		0			5	Oryza latifolia	acc	acc		acc		
Poaceae	Oryza	rufipogon	Griff.					0			memo		memo	memo		memo					2	Oryza rufipogon						
Melastomatacea	Ossaea	ciliata	Cogn.					0			memo		memo	memo		memo		0			0	Ossaea ciliata		/ /		syn		
Melastomatacea	Ossaea	micrantha	(Sw.) Macfa					0			memo		memo	memo		memo		0			15	Ossaea micrantha	rev-tax					
Melastomatacea	Ossaea	trichocalyx	Pittier					0			memo		memo	memo		memo		0			0	Ossaea trichocalyx						
Asteraceae	Otopappus	curviflorus	(R. Br.) Hem					0			memo		memo	memo		memo		0			2	Otopappus curviflorus	acc					
Asteraceae	Otopappus	guatemalensis	(Urb.) R.L. H					0			memo	GD	memo	Memo		memo		0		Herb-CLI	2	Otopappus guatemalensis	acc					
Asteraceae	Otopappus	scaber	S.F. Blake					0			memo	GD	memo	Memo		memo		0			3	Otopappus scaber	acc					
Asteraceae	Otopappus	verbesinoides	Benth.					0			memo		memo	memo		memo		0			2	Otopappus verbesinoides	acc					
Icacinaceae	Ottoschulzi	pallida	Lundell					0			memo		memo	memo		memo					5	Ottoschulzia pallida						
Ochnaceae	Ouratea		Aubl.					0			memo		memo	memo		memo		0			7	Ouratea	-					
Ochnaceae	Ouratea	guatemalensis	Engl.					0			memo		memo	memo		memo		0			1	Ouratea guatemalensis	syn					
Ochnaceae	Ouratea	insulae	L. Riley					0			memo		memo	memo		memo		0			15	Ouratea insulae	acc					
Ochnaceae	Ouratea	lucens	(Kunth) Eng					0			memo	GN	memo	Memo		memo		0		Shrub	59	Ouratea lucens	acc					
Ochnaceae	Ouratea	lucens	(Kunth) Eng	var.	podogyn	(Donn. S		0			memo		memo	memo		memo		0			1	Ouratea lucens var. podogyna						
Ochnaceae	Ouratea	nitida	(Sw.) Engl.					0			memo	BU	memo	Memo		memo		0		Shrub	58	Ouratea nitida	acc					
Ochnaceae	Ouratea	pyramidalis	L. Riley					0			memo		memo	memo		memo		0			1	Ouratea pyramidalis						
Oxalidaceae								0			Memo		memo	memo		memo		0			0	Oxalidaceae	-					
Oxalidaceae	Oxalis		L.					0			memo		memo	memo		memo		0			3	Oxalis	-					
Oxalidaceae	Oxalis	corniculata	L.					0			memo	GN	memo	Memo	LC	memo		0			1	Oxalis corniculata						
Oxalidaceae	Oxalis	frutescens	L.					0			Memo	GN	memo	Memo	LC	memo		0		Herb	45	Oxalis frutescens	acc					
Oxalidaceae	Oxalis	frutescens	L.	subsp	angusti	(Kunth)		0			Memo	GN	memo	memo		memo		0		Herb	23	Oxalis frutescens subsp. angusti	rev-tax					
Oxalidaceae	Oxalis	galeottii	Turcz.					0			memo		memo	memo		memo		0			0	Oxalis galeottii						
Oxalidaceae	Oxalis	latifolia	Kunth					0			memo	GN	memo	Memo	N/A	memo		0			1	Oxalis latifolia	acc					
Oxalidaceae	Oxalis	neaei	DC.					0			memo		memo	memo		memo		0			0	Oxalis neaei	syn					
Oxalidaceae	Oxalis	stricta	L.					0			memo		memo	memo		memo		0			0	Oxalis stricta	acc					
Oxalidaceae	Oxalis	yucatanensis	(Rose) L. Ri					0			memo		memo	memo		memo		0			0	Oxalis yucatanensis	rev-a					
Annonaceae	Oxandra		A. Rich.					0			Memo		memo	memo		memo		0			2	Oxandra	-					
Annonaceae	Oxandra	belizensis	(Lundell) Lu					0			Memo	BK	memo	Memo		memo	y	0		Tree	4	Oxandra belizensis	acc					
Annonaceae	Oxandra	proctorii	Lundell					0			Memo		memo	Memo		memo		0			1	Oxandra proctorii	acc					
Cyperaceae	Oxycaryum	cubense	(Poepp. & K					0			memo	GN	memo	Memo	LC	memo		0		Graminoid	0	Oxycaryum cubense	acc					
Fabaceae - Fab	Oxyrhynch	trinervius	(Donn. Sm.)					0			memo		memo	memo		memo		0			1	Oxyrhynchus trinervius						
Asteraceae	Oyedaea	lundellii	H.Rob.					0			memo		memo	memo		memo		0			4	Oyedaea lundellii						
Alliaceae	Pabellonia	oxypetala	(Phi.) Quez.					0			Memo	-	memo	Memo		memo		0			1	Pabellonia oxypetala						
Malvaceae	Pachira	aquatica	Aubl.					0			memo	GN	memo	Memo	N/A	memo		0		Tree	28	Pachira aquatica	acc					
Melastomatace	Pachyanthu	lundellianus	(L.O. Willian					0			memo		memo	memo		memo	Y	0		Shrub	8	Pachyanthus lundellianus	acc					
Bignoniaceae	Pachyptera	hymenaea	(DC.) A.H. G					0			memo		memo	memo		memo		0			1	Pachyptera hymenaea						
Bignoniaceae	Pachyptera	kerere	(Aubl.) Sand					0			memo		memo	memo		memo		0			0	Pachyptera kerere	acc					
Fabaceae - Fab	Pachyrhizus		Rich.					0			memo		memo	memo		memo		0			8	Pachyrhizus	-					



BRAHMS Botanical Research and Herbarium Management System

A star framework for Belize



evenly distributed

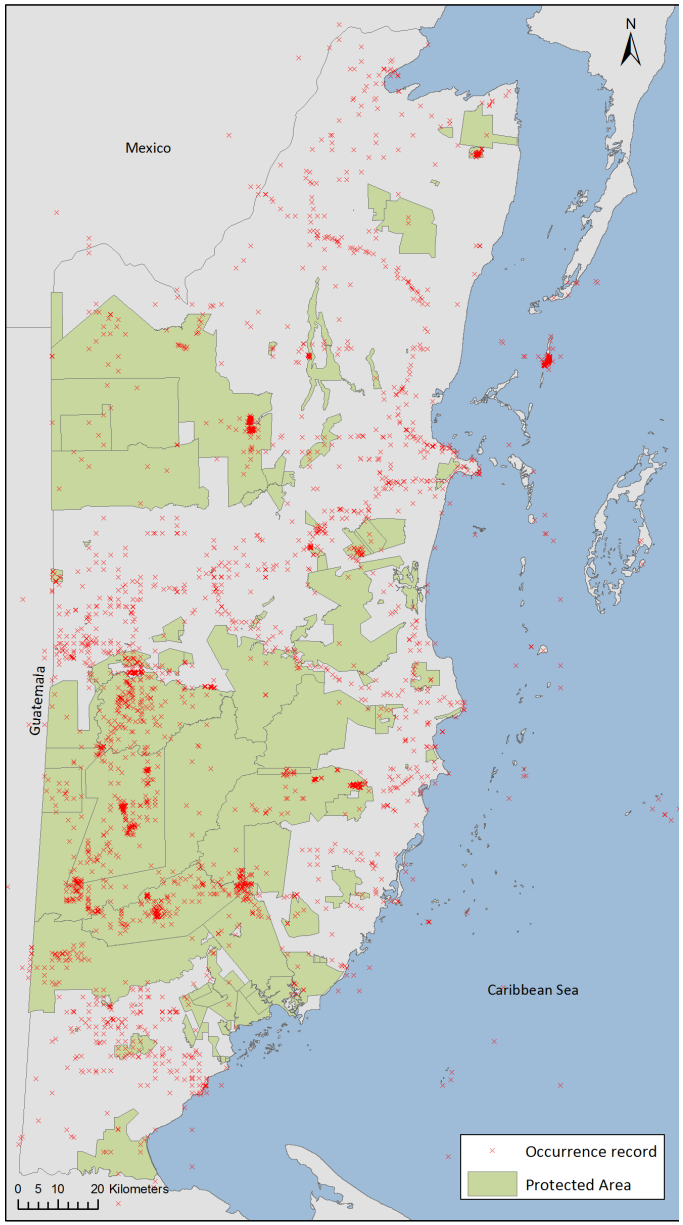
globally widespread

globally rare

very patchy distribution

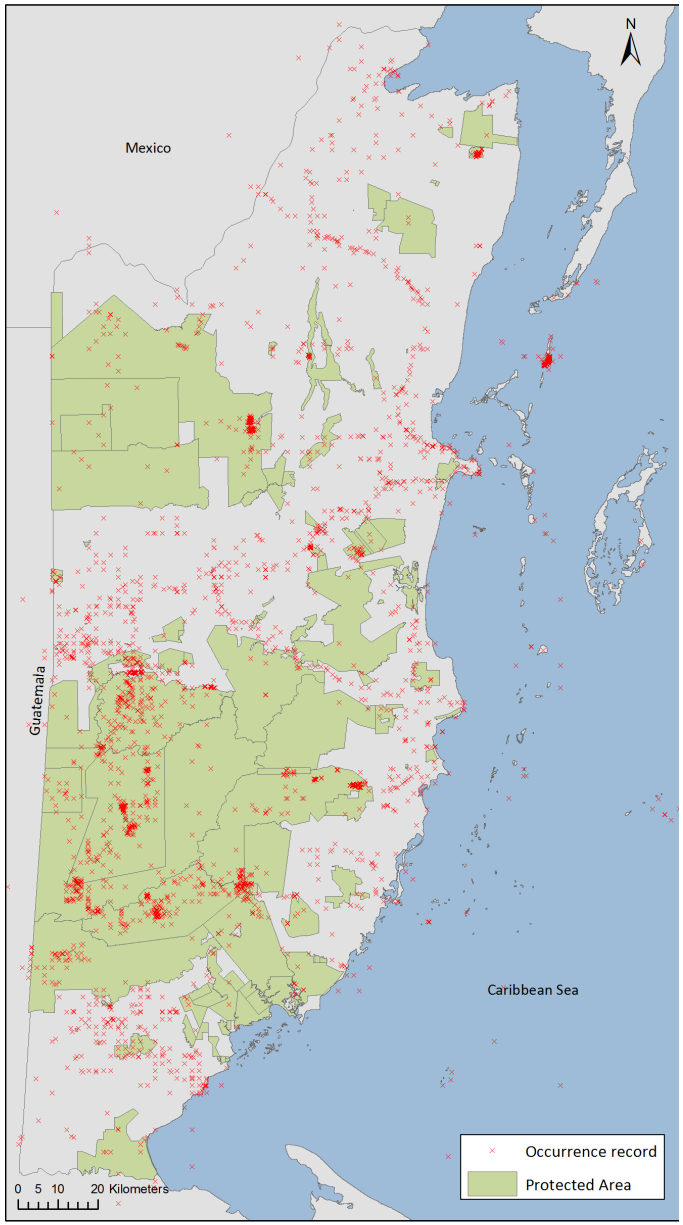
green	blue	gold	black
green / blue	blue	gold	black
blue	gold	gold / black	black

Testing the limits of herbarium datasets as a means to locate areas of high conservation value

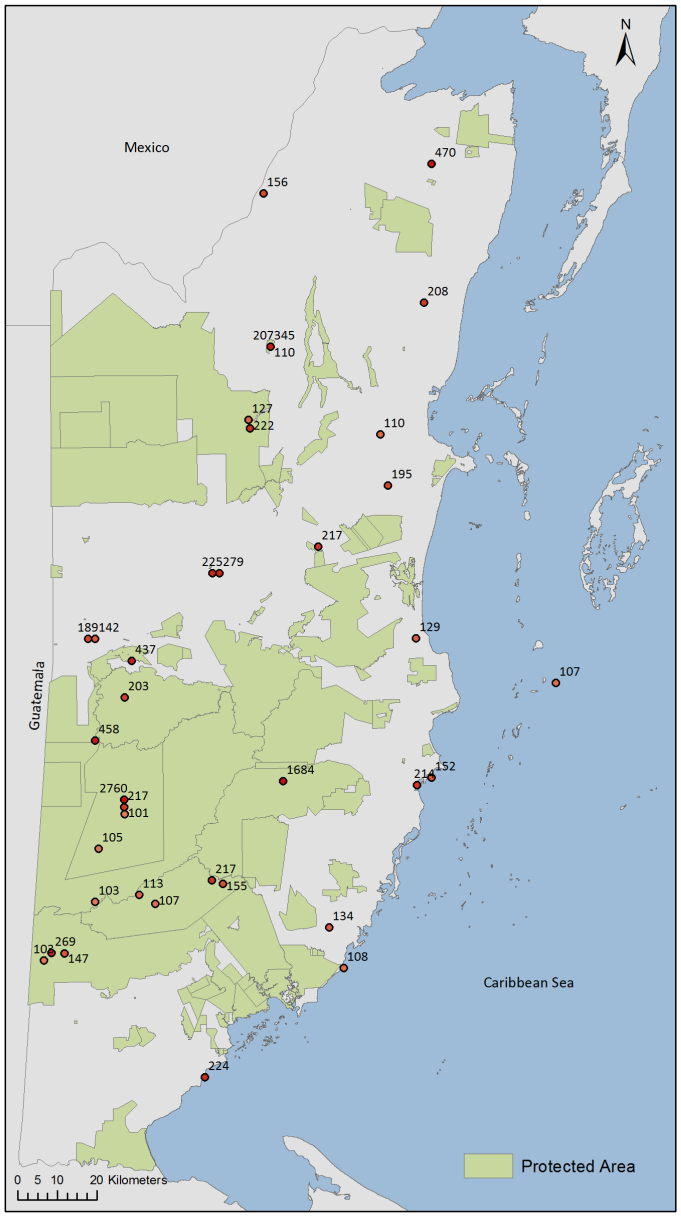


Location of occurrence records.

Testing the limits of herbarium datasets as a means to locate areas of high conservation value

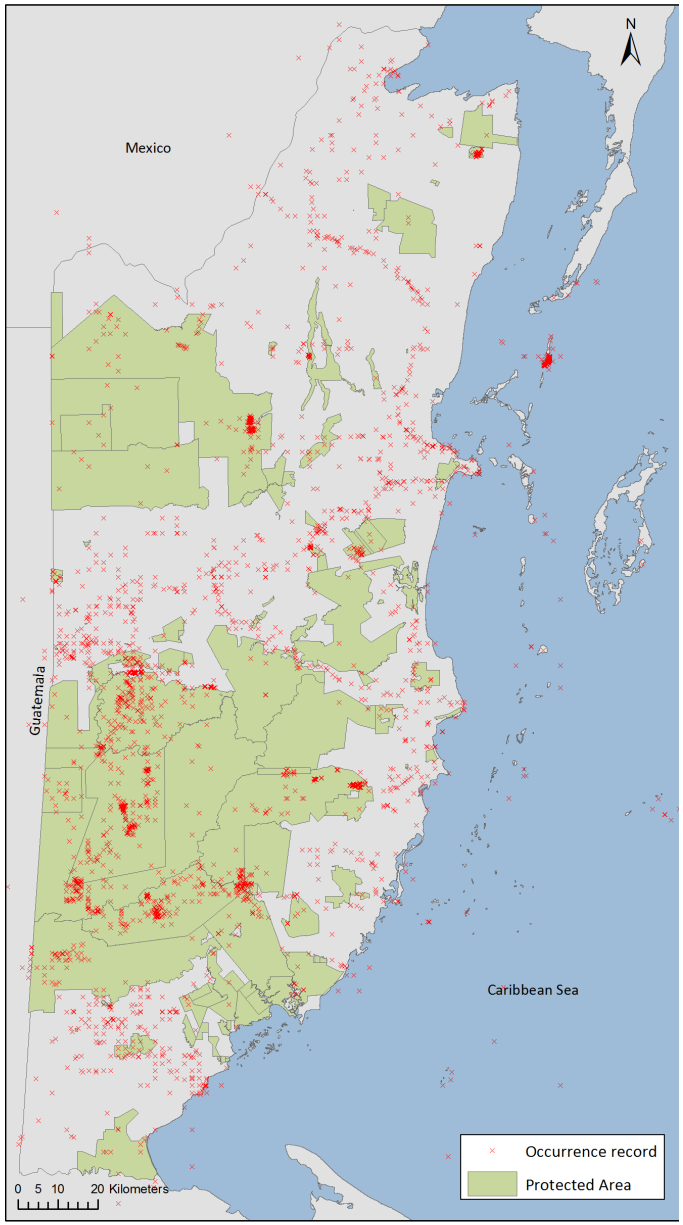


Location of occurrence records.

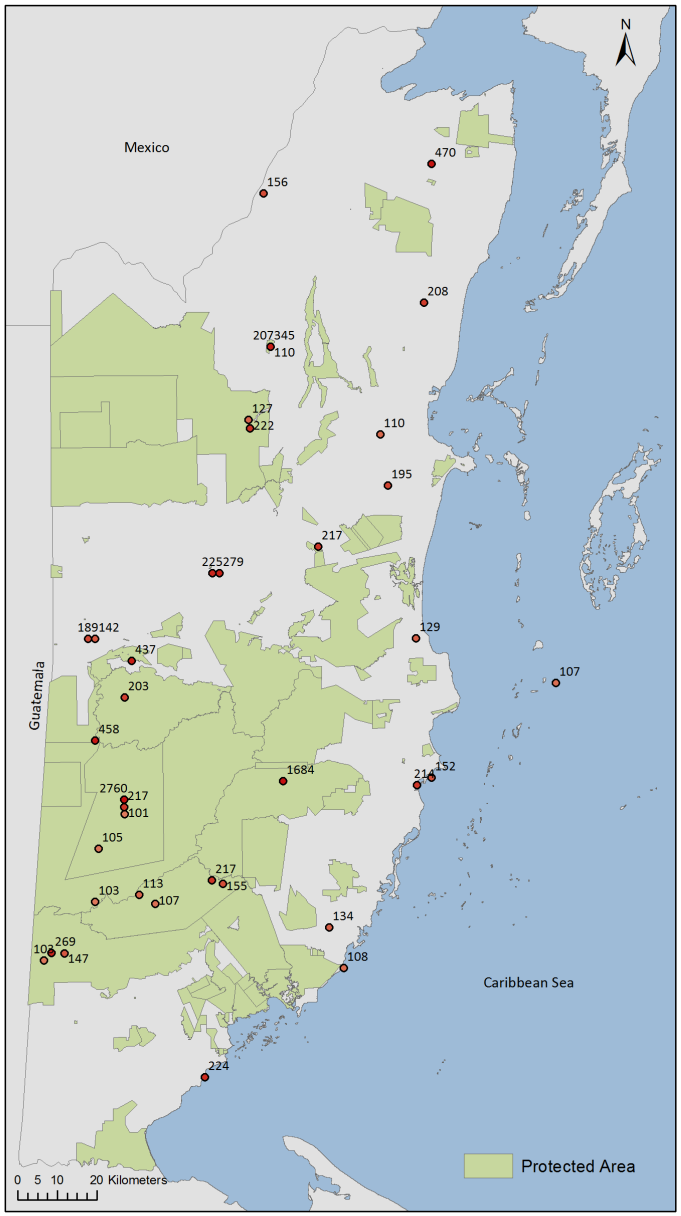


Locations where multiple records have the exact same coordinates.

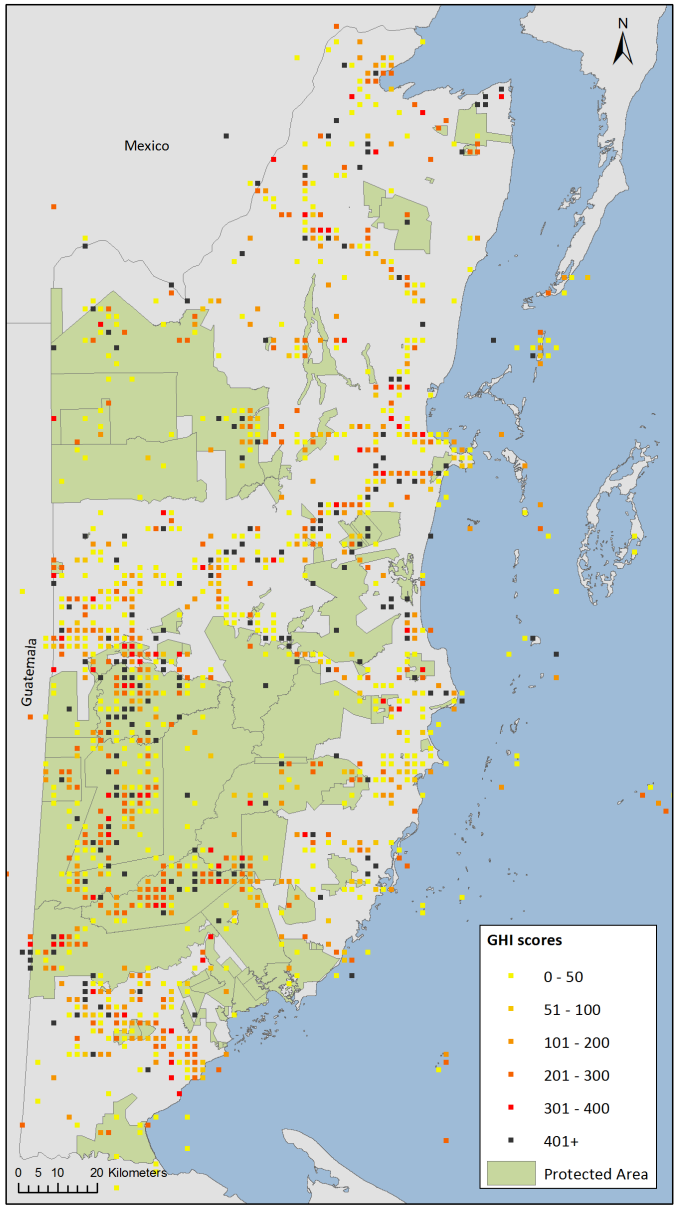
Testing the limits of herbarium datasets as a means to locate areas of high conservation value



Location of occurrence records.



Locations where multiple records have the exact same coordinates.



A preliminary bioquality hotspot map for Belize.

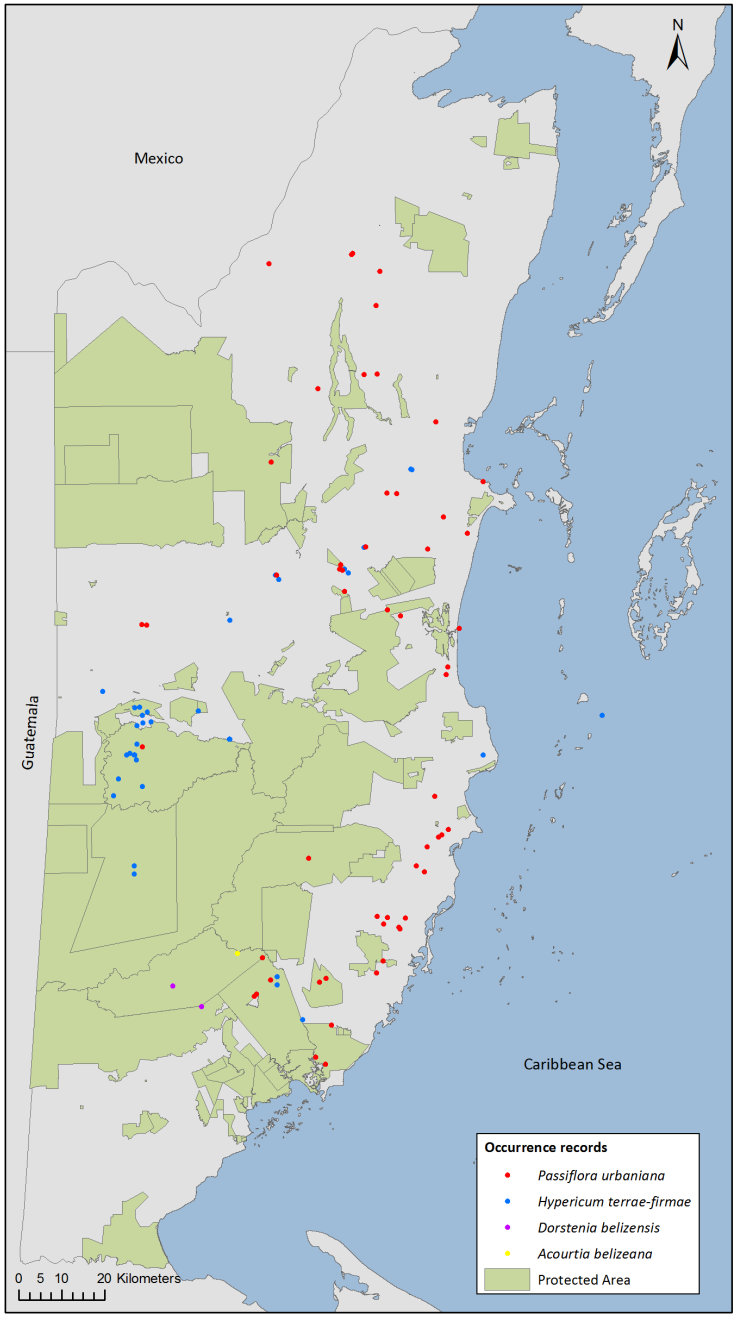
Investigating the relationship between bioquality and landscape heterogeneity


Bladen savanna, looking towards the Maya Mountains (Steven W. Brewer)

Do GHI scores change significantly as a function of changes in topography (slope, aspect & elevation) and geology (soil type)?

Can GHI scores calculated for trees (or other components of the flora) be used as a proxy for overall (whole flora) GHI?

Testing the effectiveness of Species Distribution Models as a means to discover previously unknown populations of rare species, and bioquality hotspots

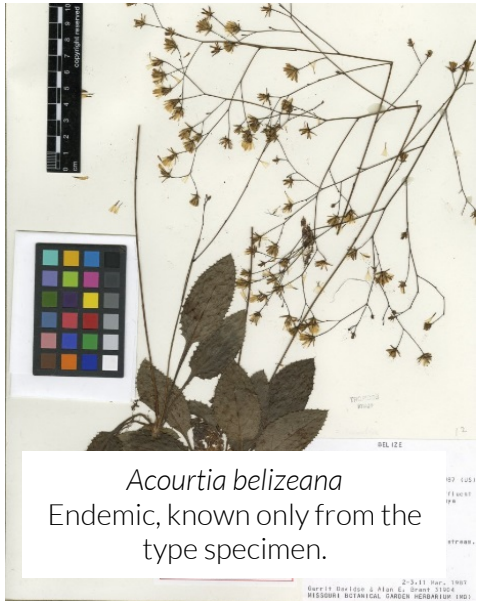


Hypericum terrae-firmae
Endemic, known from 70 occurrence records.

Passiflora urbaniana
Endemic, known from 70 occurrence records.

Some rare species are much rarer than others!

Dorsetnia belizensis
Endemic, known from 2 occurrence records.



Acourtia belizeana
Endemic, known only from the type specimen.

A high resolution bioquality map for the Maya Golden Landscape

Are bioquality hotspots adequately protected by the existing National Protected Area System?

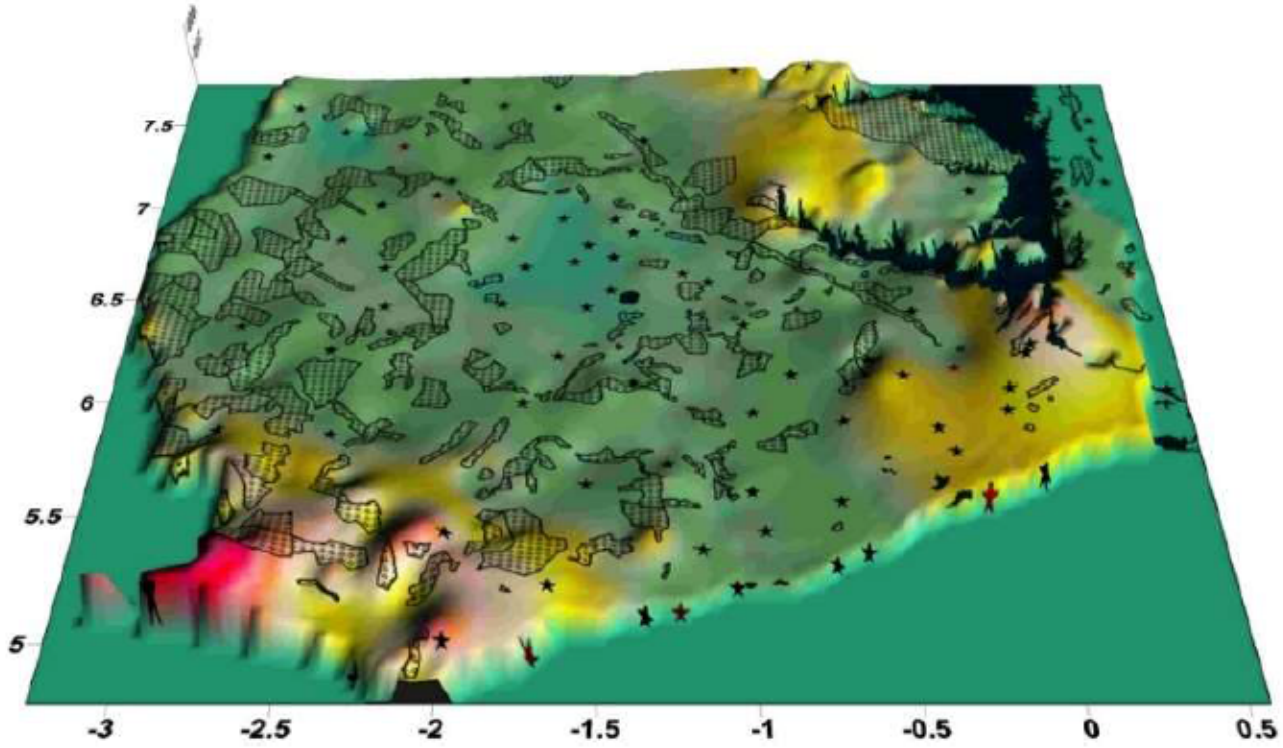


Figure 1 Ghana, showing forest reserves as outlines. The colours and the apparent landscape altitude indicate bioquality. Note the red 'peaks' or hotspots of GHI in the SW (species rich, wet evergreen forest); and around the south and west of Volta lake, which is the lake in the NE quarter of the map (dry, species poor forest). Following this survey, an increased proportion of the hotspot areas in particular received complete protection.

Extracted from Hawthorne & Marshall, 2015
A manual for Rapid Botanic Survey & Measurement of Bioquality


THANK YOU