



Smithsonian Institution



El Eden Ecological Reserve

**HabitatNet: A Global Biodiversity Project @ El Eden Ecological Reserve,
Quintana Roo, Mexico**

Author / Submittal Date: Daniel J. Bisaccio, February 10, 2008

**HabitatNet – Conservation Biology at Souhegan High School, Amherst, New Hampshire USA
SIMAB Codes: EE01 (El Eden, BioPlot 1) , EE02 (El Eden BioPlot 2)**

***“A Preliminary Report of Post-Hurricane Wilma Forest Successional Recovery
in a Yucatan Forest”***

Author: Daniel J. Bisaccio; HabitatNet – Conservation Biology - SHS

Abstract:

Using the Smithsonian Institution's Monitoring & Assessment of Biodiversity (SI/MAB) permanent biodiversity research protocols, Souhegan High School “HabitatNet – Conservation Biology” students and teachers began collecting biological diversity research data at a field site located in Quintana Roo, Mexico. The site (EEF1) was established at the El Eden Ecological Reserve – Quintana Roo, Mexico in October, 1995. Since 1995, two to three groups of students and teachers per year have returned to that site completing a one hectare set of data on a mature forest at the reserve. The pre-hurricane Wilma data was completed in year 2004 and initial post-hurricane data was discussed in a February, 2006 HabitatNet field report. This year, a student team from Norfolk Collegiate School (Norfolk, VA) as well as SHS Conservation Biology students began a post-hurricane herbaceous plant ground cover and tree seedling analysis in EEF1 as well as develop a second hectare biodiversity plot (EEF2).

The overall goals of HabitatNet are to (1) develop conservation biological literacy in high school students by affording them an opportunity to learn field methods and applications while collecting and interpreting biological diversity data and (2) establish baseline biological diversity data for HabitatNet / SIMAB field sites.

During October, 2005, Hurricane Wilma was recorded to be the most powerful Caribbean hurricane measured since accurate records were established in 1886 (NOAA). Hurricane Wilma crossed the biodiversity site with sustained winds of 140 mph and precipitation amounts totaling 60 inches over a three day period - October 21 – 23, 2005 (NOAA). This paper examines the early response of a post-hurricane mature forest’s herbaceous ground cover and the initial tree seedlings found in the light gaps generated by Wilma. Additionally, a second one hectare biodiversity plot was established.

Student and Faculty Researchers are listed in Appendix A.

Section 1 – Methods & Data: Forest Biodiversity Plot

Plot Selection and Establishment of EEF2

Selection of the plot site was crucial for both the educational and research values. Thus, the site selection was based on the following criteria:

- The area contained species representative and endemic to the ecosystem.
- Common or dominant species were represented.
- The plot was located within one vegetation type to give a true representation of the area's diversity.
- The plot had access for future student groups.

The forest plot was established using SIMAB protocols (Dallmeier, SIMAB,1992). As a new site, we first surveyed and delineate a one hectare plot (100 X 100 meters) into 25 quadrats, each 20 x 20 meters in size. The location of EEF2 is: N 21.21020, W 87.20869 and is located on the North side of the forest trail at the SW corner of line 1. Quadrat 26 (a control quadrat) is located on the South side of the forest trail.

Field Measurements

Tree tagging and identification began after the corner stakes of the quadrants were set. The process included locating, measuring, marking, and mapping all trees with a diameter at breast height (DBH) of 10 cm or greater. Diameter tape was used to measure DBH, avoiding any protrusions on the trunk. Where multiple stems occurred on a tree, all individual stem diameters of 1 cm were measured. Trees were tagged with an aluminum label facing toward the base line of the plot and set with a nail 1.3 M above the ground. The nails thus serve as a general guide for future measurements.

Trees were tagged with an individual number consisting of a sequence of two digits. Using (20-24) as an example, the first pair of numbers (20) identified the quadrat within the plot in which the tree was located, while the second pair (24) identified an individual tree within the quadrat. No other tree received that number. In each quadrat the tree numbers started at one and continued until the last tree was labeled.

Tree identifications have been verified by Juan Castillo (El Eden Ecological Reserve) with collections of all leaf types for each species of tree submitted to El Eden Ecological Reserve for future verification.

Three quadrats (#16,#21,#26) were surveyed. Overall, 88 trees were measured and tagged (with 22 species noted in the cumulative 1200 m²).

Quadrat #	# tree species/ quadrat	# of trees/ quadrat	Canopy Density
16	15	29	75%
21	8	23	60%
26	7	36	60%
Overall tree density = .07	22 species present – all quadrats	88 total trees – all species	Avg. Canopy Density 63%

Significant Tree Species (Dominance & Frequency Values in the 1200 m² surveyed)

Tree Species	n	Total DBH	Frequency
<i>Ficus yucateensis</i>	8	137	.09
<i>Bursera simaruba</i>	20	395	.23
<i>Lysiloma latisilquum</i>	8	166	.09
<i>Glyricidia sepium</i>	9	161	.10
<i>Manilkara sapota</i>	6	217	.07
<i>Ficus maxima</i>	6	85	.07
<i>Metopium brownei</i>	3	48	.03
<i>Sabal yapa</i>	4	81	.04
<i>Lonchocarpus castilloi</i>	4	76	.04
<i>Caesalpinia guameri</i>	3	53	.03

Section 2: Herbaceous Ground Cover Data : Biodiversity Plot EEF1

Commencing with the first October, 1995 field assessment by HabitatNet students and teachers, several distinct habitat types at the El Eden Ecological Reserve were observed. Biodiversity Plot “*EEF1*” was defined and established based on the relative mature stand of forest tree species found at the location GPS: N 21.21025, W 87.20620 – point corner 1 for the hectare plot. The focus of that field session and subsequent field sessions were to develop a permanent long-term SIMAB Biodiversity Plot at the reserve for student, teacher, and environmental organizations to begin long-term biodiversity data research. Pre- and post-hurricane Wilma data for EEF1 is published on the HabitatNet website (Bisaccio, HabitatNet).

Canopy Density in the quadrats surveyed during field sessions (January, April, July) for the years 1996- 2004 indicate that the average canopy density for the biodiversity plot EEF1 is 83% during the month of January. Complete canopy density coverage for the BioPlot EEF1, by month is noted in Table A. Canopy Density, post-hurricane Wilma for EEF1 for the month of January, is listed in Table B.

January (n=9)	April (n=6)	July (n=10)
Canopy Density = 83%	Canopy Density = 77%	Canopy Density = 76%

Table A: Canopy Density for EEF1 by Month with n = number of quadrats surveyed during that month. Pre-Wilma 1996 – 2004.

Month / Year	January, 2006	January, 2007	January, 2008
Canopy Density	50%	57%	63%

Table B: Average Canopy Density for EEF1 post-hurricane Wilma.

Although canopy closure is approaching the pre-hurricane value, significant light gaps exist in the biodiversity plot. Using .5m² frames, herbaceous ground cover was determined for quadrat numbers 1,2,11, and 16 in EEF1. Each .5m² frame was randomly tossed 10 times in each quadrat with ground cover % values taken for each species of herbaceous plant (including tree species seedlings).

Ground Cover Data for Quadrats 1,2,11, 16. Canopy and understory tree species are noted (*).

Ground cover or species	Average Coverage
<i>Glyricidia sepium</i> *	1%
<i>Vitex gaumeri</i> *	1%
<i>Eugenia mayana</i> *	1%
<i>Thrinax radiata</i> *	1%
<i>Bursera simaruba</i> *	1%
<i>Bauhinia divaricata</i> *	2%
<i>Caesalpinia gaumeri</i> *	2%
<i>Lysiloma latisilquum</i> *	2%
<i>Palm (sp.)</i> *	2%
<i>Pithecellobium stevensonii</i>	4%
<i>Cidista potosina</i>	4%
<i>Brabaisia tubiflora</i>	4%
<i>Singonium sp.</i>	4%
<i>Serjania yucatanensis</i>	4%
<i>Dyospiros coneata</i>	4%
<i>Acanthaceae (sp.)</i>	4%
Leaf Litter	55%
Rock / Limestone	4%

Section 3: Fauna Observed at El Eden Ecological Reserve: January, 2008

Throughout the two week field session, faunal records were kept. On two evenings, a mistnet was set out for a 1 hour interval each night. During week 1, three fruit bats – *Artibeus jamaicensis* - (2 males, 1 female) were captured and week 2, five fruit bats (*Artibeus jamaicensis*) were netted (3 males, 2 females).

A remote sensing field camera was deployed and captured a gray fox (*Urocyon cinereoargenteus*). Other mammals observed were 2 white collared peccaries (*Tasyassu tajacu*) on the forest trail and a coati mundi (*Nasua nasua*).

During the 2 week period, 43 bird species were observed. Both in the mature forest and swamp forest (tintal) the Ferruginous Pygmy Owl was attracted to recorded calls played on a MP3 player. Notable species are listed below.

Common Name	Scientific Name	Habitat & Notes
Great Egret	<i>Casmerodius albus</i>	Savannah pond
Snowy Egret	<i>Egretta thula</i>	Savannah pond
Little Blue Heron	<i>Egretta caerulea</i>	Savannah pond
Roadside Hawk	<i>Buteo magnirostris</i>	Forest w/ snake in talons
Ferruginous Pygmy Owl	<i>Glaucidium brasilianum</i>	Forest, Tintal
Plain Chachalaca	<i>Ortalis vetula</i>	Numerous social groups/ tintal
Grey-necked wood-rail	<i>Aramides cajanea</i>	By main field station
Squirrel Cuckoo	<i>Piaya cayana</i>	Secondary growth forest
Vermiculated Screech Owl	<i>Otus guatemalae</i>	Mature forest night hike
Pauraque	<i>Nyctidromus albicollis</i>	On road /secondary growth
Yucatan Jay	<i>Cyanocorax yucatanicus</i>	ALL habitats – several groups
Brown Jay	<i>Cyanocorax morio</i>	ALL habitats
Tennessee Warbler	<i>Vermivora peregrina</i>	Tintal / Forest
Yellow Warbler	<i>Dendroica petechia</i>	Tintal
American Redstart	<i>Setophaga ruticilla</i>	Tintal by main field station
Black & White Warbler	<i>Mniotilta varia</i>	Forest
Hooded Warbler	<i>Wilsonia citrina</i>	Titnal / Forest
Rose-breasted Grosbeak	<i>Phuecticus ludovicianus</i>	EEF1 / Q. 16
Orange Oriole	<i>Icterus auratus</i>	Secondary growth forest

A reptile and amphibian survey was conducted both weeks by Kelsey Reider. A methods description and results will be appended to this report (Reider is currently at a field station in Peru.) once received.

Appendix A – Field Researchers who compiled the data used in this report

Week 1: January 19- 25, 2008

Dan Bisaccio (Faculty)
Heather Jersild (Faculty)
Kelsey Reider (Faculty)
Ford Combs
Wyatt Hill
Annika Jersild
Mary Kelly
Clayton Kenerson
Chris Klevan
Ben McCarthy
Jesse Rabinowitz
Sam Stokes
Ian Tupper
Chris Whitney

Week 2: January 26- February 2, 2008

Dan Bisaccio (Faculty)
Melissa Chapman (Faculty)
Kelsey Reider (Faculty)
Jordan Curro
Megan Rizzi
Sam Wilson
Aislinn McNamara
Hannah Nielsen
Caroline Sheldon
Courtney Dougal
Hillary Steckel
Mike Thompson
Katie Martel

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We could not have conducted our vegetation projects without the support and botanical expertise of Juan Castillo. Thank you. Additionally, we extend our sincerest appreciation to the El Eden Ecological staff who cleared trails, prepared our food, and miraculously repaired much of the reserve's buildings devastated by Hurricane Wilma.

Resources Used in Compiling this Report:

Bisaccio, D. "Field Report Numbers. 1-6: El Eden Ecological Reserve" HabitatNet website
Dallmeier, F. SIMAB Website – Smithsonian Institution, Washington, DC
Emmons. Neotropical Rainforest Mammals. University of Chicago Press: Chicago, IL
Howell, Webb. A Guide to the Birds of Mexico and Northern Central America.
Will, T. Checklist of Birds/ Yucatan. Gettysburg University, PA

"If the land mechanism as a whole is good, then every part of it is good, whether we understand it or not. If the biota, in the course of eons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the forest precaution of intelligent tinkering"

A SAND COUNTY ALMANAC – Aldo Leopold