Human Impacts on the Maya Forest

Linking the Past with the Present

For the Future of El Pilar

Dr. Anabel Ford
BRASS/El Pilar Program
Report on the 2004 Field Season

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Acknowledgement

The BRASS/El Pilar Program owns much to the strong support and commitment of the Institute of Archaeology and its creative director, Dr. Jaime Awe. From the earliest collaborations dating back to 1983, Jaime Awe has taken a special interest in the success of the research I have directed. The development of El Pilar was clearly the inspiration of Jaime Awe who took care to promote the initial surveys and saw his future linked to the research and development of archaeology in Belize. Today, the Institute of Archaeology has transformed the thinking of archeology in Belize moving it from a quiet partner to a visionary leader in the development of destinations such as Caracol, in the promotion of the research with the rapid publication of the new symposium series, and in the nurturing of the unique qualities that have been discovered at El Pilar, a new and alternative in the crown of Belize archaeological destinations. The long term research program at El Pilar depends on collaboration and mutual respect, and the 2004 season is a product of that spirit.

Anabel Ford
Santa Barbara

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Introduction

The interdisciplinary and multifaceted El Pilar Program carried out its 2004 research and conservation program on several fronts consistent with the overall plan. The outlined objectives of the Mesa Redonda El Pilar process established collective goals for work at El Pilar and has been the guide for continued study of the El Pilar local area by the BRASS/El Pilar Program. As presented in the draft management plan the overall goals are:

(a) To preserve in perpetuity the El Pilar reserve to maintain cultural and natural setting

(b) To conserve and maintain the integrity of the El Pilar reserve in a manner that benefits local communities through tourism and education

(c) To promote sustainable models for using the Maya forest at the El Pilar reserve

(d) To provide visitor access, research and education opportunities for national and international visitors in a manner compatible with the cultural/natural environment

Research was focused on three interrelated endeavors; excavation, survey, and ecology. The field excavations were focused at the stone tool workshop site of Cahol Tok adjacent to the LDF chert site of El Pilar. The settlement survey program focused on developing and testing our predictive model for Maya settlement. The ecological efforts focused on the Maya forest garden, comparing the Maya forest species of El Pilar to the traditional forest gardens around El Pilar. Excavations at the workshop related site of Cahol Tok revealed the variety of land use activities that are part of the ancient Maya economy. At Cahol Tok, specialists used the resources of the Maya forest for support of the household economy.

The survey efforts provide a basis for understanding the extent of ancient Maya land use. The results point to an eclectic land use mosaic with variations in intensity based on farming choices. And the ecological evaluations of the contemporary forest gardens of traditional village farmers examined the relationship of the species of the Maya Forest to the traditional forest garden. The results demonstrate the strong structural ties from the forest to the garden and demonstrate the great conservation potential of traditional polycultivation where tiered and layered economic plants are mixed to create an economic landscape with analogies to the past. The BRASS/El Pilar field activities have helped to reinforce the importance of community management of the Maya forest both past and present.

Collaboration

The season's activities involved the continued collaboration with Grinnell College, with the French engineering school Ecole Supérieure des Géomètres Topographes (ESGT), and with Help for Progress. These institutions have a history of collaboration with the El Pilar Program and in working together, we are meeting critical goals of understanding the cultural and natural values inherent in the El Pilar Archaeological Reserve for Maya Flora and Fauna. Operating in coordination, data gathered and analyzed over the course of the 2004 season build the increasingly complex

picture of the ancient Maya landscape and provide a basic for understanding the cultural and natural resources of El Pilar. The ancient Maya landscape was occupied based on farming choices. To carry out those activities, tools were required. And to understand the nature of the agricultural activities, we have sought understanding from the vanishing segment of traditional forest gardeners who once provided the staples of local subsistence.

Objectives

The objectives of the 2004 season were multifold but each tangibly linked to the understanding of El Pilar (Figure 1). The archaeological field component focused on the Grinnell collaboration in the excavation and analyses of the workshop site adjacent to the chert site at El Pilar. With geographic engineers from ESGT, we compiled, refined, and tested the first stage predictive model for Maya settlements in the Belize River area using the Geographic Information System (GIS). In the laboratory, we addressed the ceramic analyses for El Pilar, working to complete the formal studies of the final year's excavations and systematizing the database for comparisons. Finally, we worked with Help for Progress and rare but valuable traditional forest gardeners who live adjacent to El Pilar, recording the plants of their gardens and evaluating their composition as compared to the Maya forest. These specific activities have filled gaps in our growing research database and provide clues to how the ancient Maya developed their complex society centered at El Pilar.

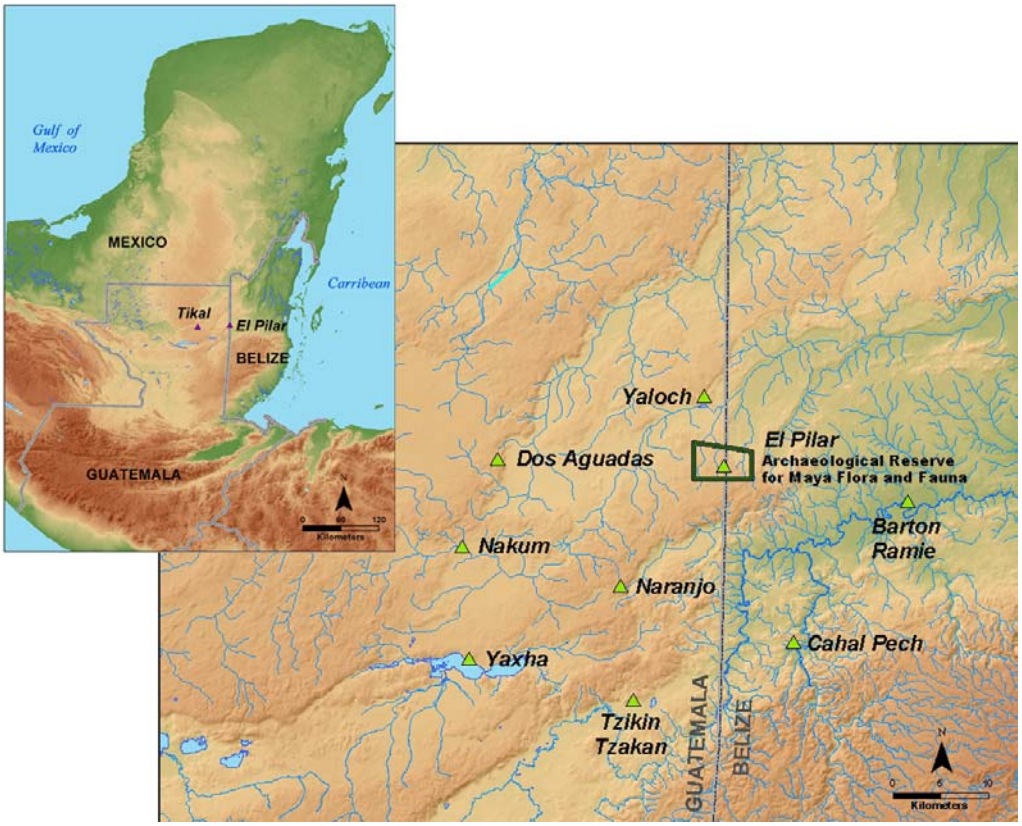
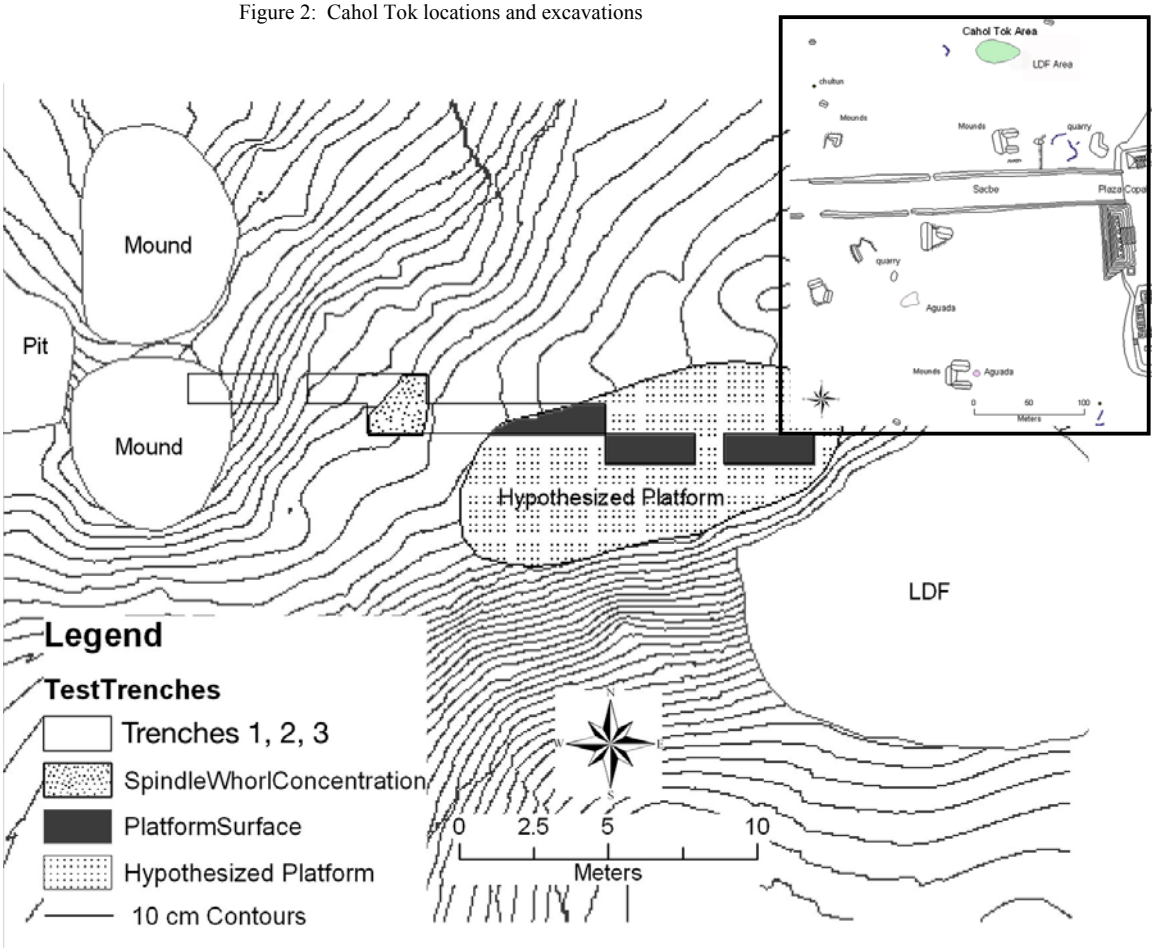


Figure1: Central Lowland Maya area with El Pilar and other centers indicated

Excavations at Cahol Tok ~ Grinnell College

Working collaboratively with the El Pilar Program, a six-person research team from Grinnell College, headed by anthropology professors Kathryn Kamp and John Whittaker, excavated an area adjacent to a deposit of lithic debitage known as the LDF Chert Site at the Maya center of El Pilar (Appendix I). The location named Cahal Tok (Place of Flint) is a limestone rise with scant structural evidence that appears to be associated with the designated LDF Chert Site (Figure 2). The excavations at the site took the form of five 1-meter wide trenches that crossed the defined area of investigation. They were excavated in detailed cultural levels through the shallow deposits down to bedrock. The results are both anticipated and surprising: there is ample data to support the presence of a workshop; the recovery of a large collection of broken spindle whorls was unprecedented. Analyses and experimental studies support the conclusions that this was a workshop site as well as a locus of a special, perhaps ritual, deposit of spindle whorls.

Figure 2: Cahol Tok locations and excavations



Excavations revealed that the major activities in the area dated to the Late Classic. This is consistent with the excavations in the LDF Chert site itself. The ceramic collection included more than 4,000 sherds, yet only 5% were considered diagnostic based on rim shape, slip characteristics, and vessel features. This compares with 20-25% for average midden and construction collections from the El Pilar area. Jars and bowls made up the main part of the diagnostics (Figure 3), not an assemblage that represents

domestic activities such as cooking. Interestingly, the jars were characteristically large, suggesting a consecration on dry storage.

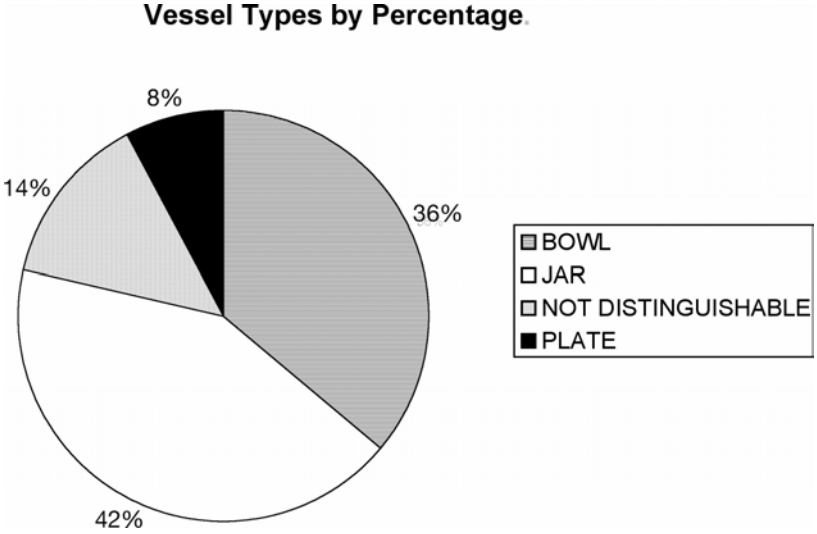


Figure 3: Ceramic Vessel Shapes

As expected, activities included specialized flint knapping that produced chert axes at the Cahol Tok locus, first on a cleared limestone shelf, then on a prepared cobble platform. Analyses indicate that smaller primary flakes were *in situ*, but that the larger debris was swept off the edge of the platform to the east, into the LDF Chert site, supporting its context as a dump. To the west of the first platform was another relatively insubstantial structure, possibly a second platform. Curiously, between the two platform structures we found a dense scatter of nearly 200 broken limestone spindle whorls. Replication experiments and other evidence suggest the whorls must have been purposely fractured. The deposit must have been a symbolic one, rather than the result of normal, accidental use, breakage, and discard. They remain an enigmatic deposit apparently unrelated to the chert manufacturing activities. Given that the ceramics are all Late Classic in date, there may be evidence of two facets, one related to the chert production and the other to the ritual spindle whorl deposit.

The investigations of Cahal Tok present yet another complexity to understanding the ancient Maya. The field excavations were undertaken to gain a better understanding of the chert tool production process at the LDF site. Indeed data were gathered that directly bore on this issue. The majority of the debris associated with the east, well-defined platform was related to the flint knapping. Flakes derived from bifacial production predominate in the deposits at Cahol Tok. The materials are skewed towards smaller flakes of soft hammer when compared with the LDF deposit. This is interpreted to be a result of the nature of production activities whereby the larger (hard hammer) materials would be swept off into the dump area. Interestingly, the characteristics of the debris are similar in the two phases of the deposit giving the impression of consistency of activities. Moving west and towards the ill defined structural remains, the lithic collections, while continuing to show a bias towards biface production, become more generalized and similar to common household activities: knapping poor materials, more

cortex flakes, high proportions of angular shatter, and evidence of indistinguishable bits of flakes.

The spindle whorls deposit was a surprise and was uncovered in relationship to the area between the knapping platform and the ill-defined structural remains. The deposit is a concentration, and we are certain that there is more to this problematic deposit. The whorls are not merely discards of natural use in a work area, but are instead some kind of intentional deposit. A total of 198 spindle whorl fragments were recovered in the special deposit representing 194 individual whorls. The high number of broken whorls is unusual and experimental breakage experiments could only replicate the breaks when deliberately impacted.

The extraordinary number and the variation within the spindle whorl assemblage argue that they were made, and probably used, by many different spinners (Figure 4). They are largely limestone and of a style common to the region. The size and estimated weight along with the estimated diameter of the perforation for the spindle suggest the use for cotton spinning. The common shapes grouped into four different cross sections and five different decorative patterns. A full 1/3 of the whorls had no designs on them.

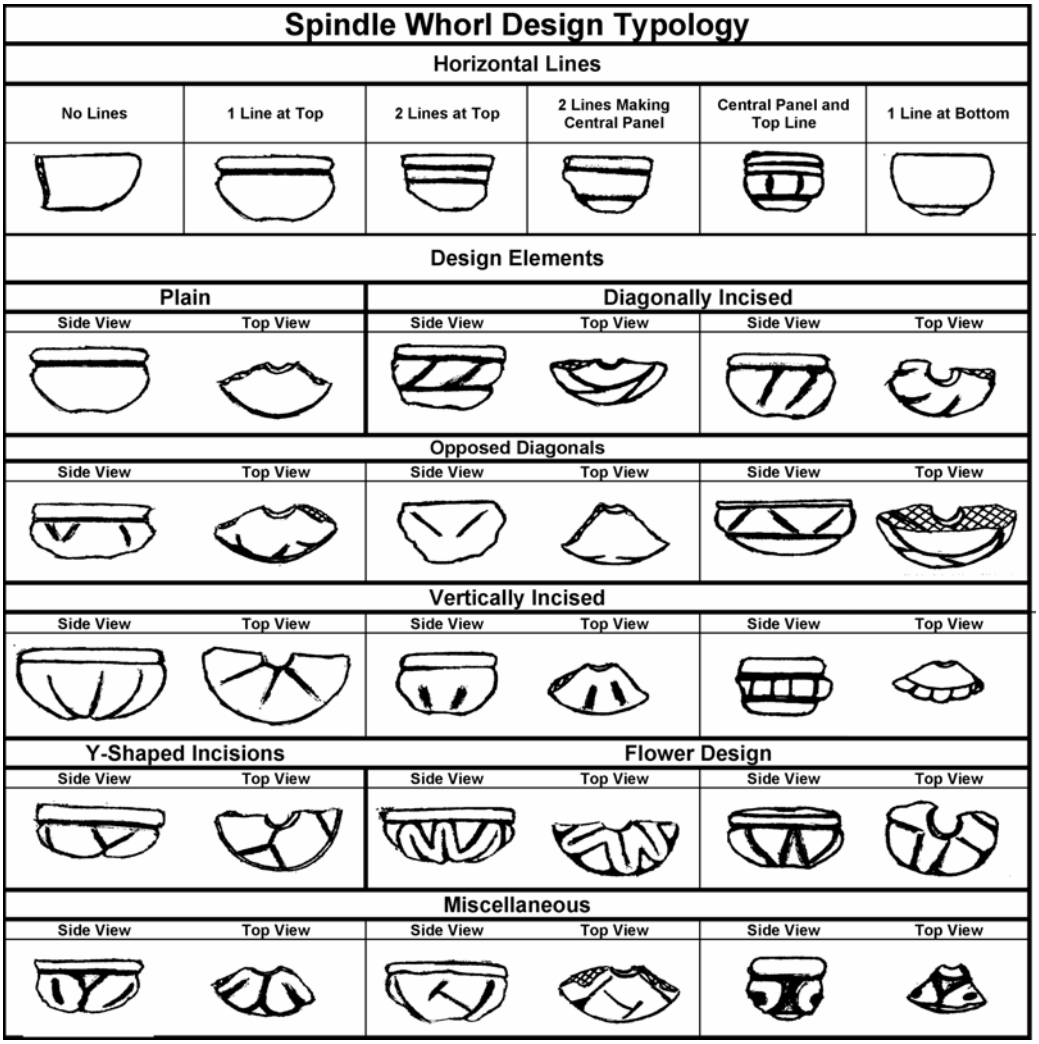


Figure 4: Spindle Whorl Designs

The spindle whorls could relate to the use of the western part of Cahal Tok for spinning activities. An offering of whorls would make sense if it accompanied the burial of someone involved in cloth making, or as a closing deposit for a spinning area. Seeing the whorls as evidence of a spinning workshop nearby would produce a nice symmetry of knapping, presumably by men, at one end of the site, and spinning, perhaps by women, at the other. There is no direct evidence, however, that spinning took place at Cahal Tok, as there is for knapping. In any case, it seems someone organized a gathering of whorls from many spinners into one offering. The chert debitage surely represents the work of many knappers in one place. Whether we see that as evidence of centralized control of production at a factory close to the high-status monuments, or as a back-alley industrial area where individual artisans came to work for companionship, efficiency, and convenient waste disposal depends more on our biases about the Maya than the evidence of this site.

Examining Cahol Tok in the social context of the ancient Maya civilization and the major center of El Pilar suggests a narrow focus of actions. The ceramic assemblage is truncated, with little evidence of cooking, a major domestic activity. The significantly high proportion of chert biface reduction flakes and the special deposit of spindle whorls all point to a concentration on craft production in general. There is no doubt that one of the crafts of the area relates to chert tool production. It seems that this activity was isolated from domestic activities at El Pilar and from other activities that may have related to the products. In addition, Cahol Tok could not have been the sole source of the deposition related to the LDF Chert Site at El Pilar as it extends 50 by 50 meters and is known to have a depth of at least 2 meters. Likely other such local ephemeral platforms may be located around the location of the proposed dumpsite. Yet, chert production was not the sole aspect of Cahol Tok. There within the context of the flint knapping, came the unusual deposit of spindle whorls. How were the chert specialized activities related to the spinning activities? Was Cahol Tok a locus of craft specializations that balanced the male flint working with the female spinning? Was the spinning deposit an unrelated event before or after the chert workshop deposits? These are difficult questions that cannot be answered with the data at hand.

The Maya Landscape and El Pilar

The Maya forest region is characterized by rolling limestone ridges covered by a deciduous hardwood forest. This verdant jungle thrives on an annual rainfall of 1000 to 3000 mm that falls mainly from June to January. A drought-like dry-season runs from January to June. Activities today are impacted by this wet/dry seasonal deluge and drought sequence, as they were in the Maya prehistory.

A composite mosaic of regional land resources underwrites the foundation of Late Classic Period settlement distribution and intensity in the Maya forest. Settlement densities are the greatest in the well-drained ridges across the region (Figure 5). Ridge lands are concentrated in the interior and are characterized by shallow, fertile, mollisol soils of excellent quality, representing only 1% of the world's tropics yet up to 50% of the Maya forest. These soils are superior for hand cultivation methods but are inappropriate for contemporary industrial methods, which relate to the conservation risks in the region today.

These well-drained zones preferred for Maya settlement are unevenly distributed across the region, resulting in dispersed settlement patterns. There is a distinct relationship between the availability of well-drained ridges, settlement density, and the regional Maya hierarchy. This is evident in the local settlement around El Pilar.

The ancient Maya occupation of the central lowland region can be traced back into the third millennium BC. The material archaeological record, however, is firm for the Middle Preclassic before 1000 BC. Steady settlement expansion typified the first millennium BC, based essentially on household farming decisions. In the Late Preclassic, around 250 BC, land use intensity diversified and civic-ceremonial centers made a full appearance across the region. Settlements expanded over the area, focused initially on rivers, then lakes and, ultimately, spread across the entire interior area.

There is ample evidence that the interior Petén area around Tikal dominated the region in the Late Classic Period, AD 600-900. During this time period, Maya settlement expansion and construction was at its maximum. Yet Maya cites do not fit traditional notions of urbanism, suggesting a value for "green space" that would allow for the forest garden. Even visual metaphors expressed values they placed on nature. Jaguars, monkey, and cacao figure prominently in Maya art and iconography. The presence and pervasiveness of these animals, as well as a myriad of water loving creatures have habitat implications for the Maya forest in ancient times.

The centralization process was sustained through AD 900, when the Maya civilization "collapsed." Major administrative and political centers, such as Tikal in the central Petén, witness abrupt halts in public projects; but settlements persist through the Terminal Classic Period (AD 900-1000). Settlement evidence between Tikal and Yaxhá, in the Belize River area, as well as in northern Belize attest to persistent occupation. Further, monument building continued at El Pilar through this period, to cease in the Postclassic.

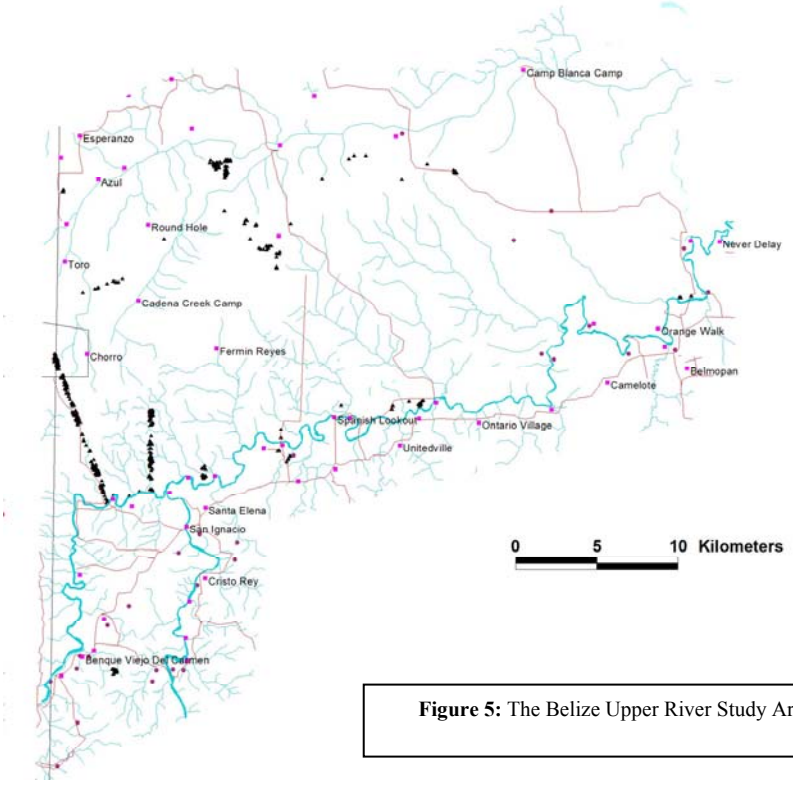


Figure 5: The Belize Upper River Study Area

Our research into the patterns of the settlement and the relationship of settlement choices with respect to farming activities has been a fundamental research theme of the BRASS/El Pilar program since its inception. Clear settlement and environmental patterns have been identified through the surveys of the

varied zones indicative of the Maya forest. Beginning with simple associations between broad vegetation categories in the '70s to more resolute correlations with geographic and soil characteristics in the '80s and '90s, we have used these variables to examine the settlement data in the context of the UCSB Maya Forest GIS. This powerful spatial base has provided new insights into the settlement preferences of the ancient Maya and demonstrated that the smallholder choices have a strong explanatory power.

Our GIS research focuses on the Late Classic period settlement distribution and uses the geographic variables of slope, water, and soil characteristics to identify patterns of settlement that would be best explained by farming choices. The development of the UCSB Maya forest GIS has involved the compilation, georeferencing, and verification of key data on the geographic and archaeological data. Settlement from the BRASS settlement surveys and the geographic data have been compiled on the basis of digitized, shared, and compiled digital and paper inputs from local regional and international sources.

Focusing on the local scale at 1:50,000, we have developed the Digital Elevation Model (DEM) from the topographic contours, the water input based on stream flow records on the topographic sheets, and the soil fertility and drainage characteristics based on the UK soils study of the Belize River area. These geographic data were refined and verified in the field and with the paper maps over the past 2 years. The settlement data derive from the BRASS surveys of 1983 and 1984. The original survey maps were scanned and georeferenced and the original CAD files were converted and read into the GIS. These fundamental data layers provide the first basis for the ancient Maya settlement predictive model. Our results at once provide a basis for understanding the ancient Maya land use strategies and a criterion for protecting the most sensitive areas from development. This season, we are focused on the local Belize River area. As we gain increasing confidence in the statistical analyses, we plan to take the focus down to the El Pilar site-specific scale as well as expand the results to the Maya region as a whole in an effort to test the cross scale qualities of the results.

Reconstructing Maya Settlement Patterns: At all scales, well-drained zones have been shown to be preferred by Maya settlement over time and across space. By the Late Classic, all the well-drained uplands evidence high settlement, resulting in dispersed patterns relative to the location of the well-drained zones. Our GIS research and model is designed to scrutinize the relationship between the availability of well-drained ridges, settlement density, and the regional Maya hierarchy. Using the BRASS settlement surveys as the principal dependent input, we have been able to examine the correlations of settlement against key independent geographic variables that are known world wide in impact settlement choices. With the first level results, we have conducted field validation and examination at the local scale with the survey of cleared fields in the north side of the Belize River area with the GPS. In addition, we targeted specific areas and located them with the GPS to verify low probability and high probability areas. These field efforts have provided data that are now compiled into the predictive settlement base and provide the foundation for future modeling across the Maya landscape.

Spatial distribution of Water, Soil and Vegetation: The porous limestone of the Maya forest leaks water to subsurface aquifers. Annual rainfall distribution is seasonal, focused

on June to January. Water collection in the interior area is limited to the wet season. This seasonal regime characterizes the region overall, except for drought periods. Given continuity in climate regime and lithology, the major impact on the environment is human land use. For our examination of the Belize River area local scale, we focus on spatial distributions of soil qualities with topography to correlate them with Maya settlement distribution (Figure 6).

We simulate the actual spatial distribution using landscape-weighting factors developed in our work using Weights of Evidence (*WofE*). The *WofE* origins are in mining geology. The essential tools have been integrated into a GIS software package, ESRI's ArcView 3.2. Gary Raines, who helped build the ArcView extensions for *WofE* analysis has worked in the development of GIS data standards (geology.usgs.gov/dm/), and has collaborated in our *WofE* predictive modeling to the Maya forest.

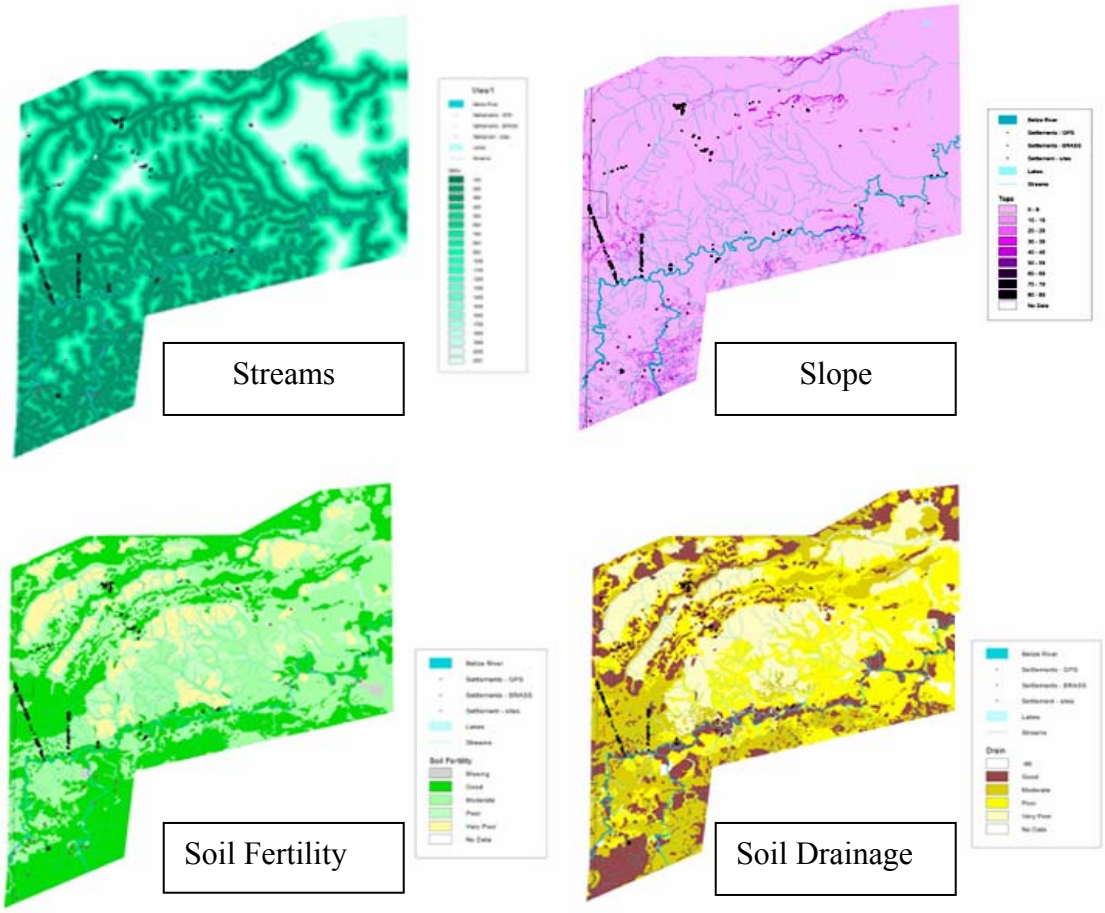


Figure 6: The Four Themes of the Weights of Evidence

The *WofE* analysis follows six steps: 1) select known points of some feature such as farming sites that are to be modeled, 1) select thematic maps that are suspected to contribute to the explanation of a distribution, 2) using the correlation analysis tools of *WofE*, convert selected map layers to binary or categorical form, 3) test for conditional independence comparing prior and posterior probabilities by class combinations,

eliminating those maps which do not contribute explanatory power, 4) create a set of weights to use for each layer using Bayesian methods, and 5) develop posterior probability and the associated uncertainty maps using the weighted layers. The probabilities are then used as environmental weights in the agent based land-use model. This is the method we used in the initial model development for 2003 and has been refined this field season. Our predictive model results are a significant improvement over our earlier efforts and demonstrate the significant value of the GIS in spatial analyses.

For our independent variables we used the following themes: topographic slope, soil drainage, and distance to streams. Topographic slope was based on digitized contour lines from the 1:50,000 maps and the SRTM data. Overall, the digitized data were more resolute. From these data we generated the Digital Elevation Model (DEM) that was used to provide slope data. Soil characteristics of drainage and fertility were based on data originally digitized by Scott Fedick from the soil maps of the Belize River area. These data were refined, georeferenced, checked against field data collections, and field verified before employed in the GIS analyses.

The context for our research is the Maya forest and the study area the Upper Belize River Area, essentially the domain of El Pilar. Working with the data from the Upper Belize River Area as our local scale, we used the independent variables of slope, water, soil fertility and soil drainage as input layers that would be the potential predictors of the dependent input of actual ancient Maya settlement locations. The following illustrations are of the independent variables.

These independent variables were analyzed with the *WofE* program and our preliminary results are promising. In our test of farming criteria for the location of settlements, we expected that good soil fertility and good soil drainage would play a major role in site selection. We anticipated that location of water would be important and that settlements would prefer areas of moderate relief. Our model with the settlement data from the BRASS surveys provides a good fit with the farming choices of households. We found that our preliminary model:

- Explains 75% of settlement locations
- Eliminated lakes, Strahler order, Belize River as contributory factors
- Determined that streams are important up to 400m
- Validated the model with GPS field data

We are still in the process of refining the model, and the results demonstrate that there are material foundations of Maya settlement (Figure 7). The results represent a mosaic of land use ranging from intensive settlement, extensive occupation, and limited use based on the settlement patterns. Land use would range from permanent homes, field houses, specialized activities, and unoccupied areas. Settlement locations are largely accounted for by smallholder farming choices, just the same choices that are made today by the vanishing traditions of the forest garden.

The overall pattern speaks to farming choices. Intensive land use where densities are greater than 100 residential units per sq km would be those areas of permanent occupation and home gardens. Areas with an average of 40 residential units with moderate settlement density would have been seasonally occupied zones where more extensive rotational field farming might be expected. Other areas with little occupation would have been more extensively cultivated and managed forests. Areas without

occupation are those areas with serious limitations: too steep, too wet, or too poor soil. These areas would serve for purposes other than cultivation, providing various economic resources for hunting and collecting.

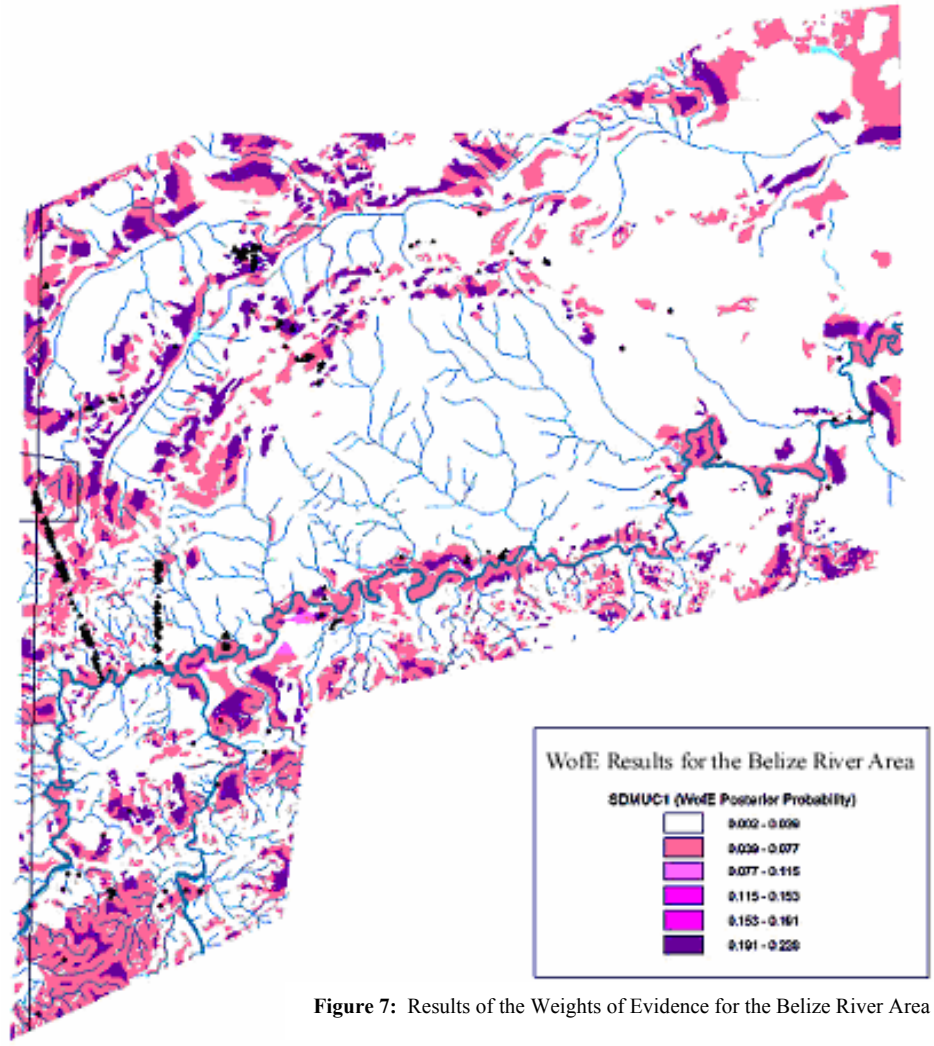


Figure 7: Results of the Weights of Evidence for the Belize River Area

Our model has another important potential. It could prove a major asset in the management of cultural resources of the Maya forest and give probability strategies for locating ancient settlements. With the refinement of the independent predictors, especially the slope characteristics, we expect that the model could be significantly improved. As development encroaches on the Maya forest, the cultural heritage is subject to loss. With the tiers of settlement probabilities based on the WofE model, we can begin to classify areas by their archaeological sensitivity. This could be a major development tool for the Institute of Archaeology. As we work on the model for the regional scale, this will be a distinct asset to include in the land management designs of the country.

These results provide a strong basis to extending the model to regional scale. We have good data for the DEMs and the water layers for the regional level. One of the major problems has been the comparability of the soil characteristics across national boundaries. We are presently working on the development of the regional model with the 1:250,000 scale soil data from Mexico, Guatemala, and Belize. Our foundation data are

those from Guatemala where the soil fertility and drainage are well mapped. We also have good soil layers for Mexico based on FAO criteria; these need to be transformed for comparability. We have determined that the best data set on soil for Belize is the 1959 Wright data; the paper maps are readily available. We have been developing these data by digitizing Wright's soils for Belize. Our data need to be comparable to the work we have done with Simmons for Guatemala, and INEGI for Mexico. We will use the digital elevation model of the Shuttle Radar Thematic Map (SRTM) with 90-meter resolution for the slope layer. For the streams we will use the Paseo Pantera Consortium data with our data georeferencing and corrections. Our initial regional scale data for the UCSB Maya forest GIS is now available on the Alexandria Digital Library www.alexandria.ucsb.edu/adl.

The Maya Forest Gardens of El Pilar

The ancient Maya were an agrarian society with a well-documented development process that transformed the Maya forest into a productive garden for their 2000-year civilizational process. In looking at the range of cultural adaptations to the Maya forest, we can see that human culture and the environment mutually influence each other in a dynamic, considered in the domain of historical ecology. Our work with the ancient Maya settlement patterns and the contemporary forest gardeners links these arenas both in time and space.

Examining the contemporary Maya forest from a historical ecological perspective enriches our interpretation of ancient Maya settlement patterns and the evaluation of the relationship between the forest and the traditional farmers of the region. The prevailing view is that the present forests of the Maya area are essentially anthropogenic, that they are a result of human interaction with the forest, manipulating the species composition to increase the value of the forest for the economy of the culture. By actively nurturing and providing preferential attention of some species over others in the forest and planting and caring for economic plants in the garden, there is a blur in the distinction between the wilderness and the garden. This is the realm of the forest garden, the legacy of the Maya and the heritage of the local traditional farmer. In an effort to explain Maya settlement patterns, long recognized as dispersed, we have begun to look at contemporary traditional forest gardens and at how they relate to the forest today.

We are not the first to imagine this connection. Rosita Arvigo, in her quest to understand the use of medicinal plants of the Maya area, came to apprentice with Elijio Panti. Panti is among the vanishing numbers of people who have known the forest as a garden. His strength was concentrated on the medicinal qualities, but certainly he knew how to use the whole repertoire of assets the Maya forest offers. With Panti, we have some of the wisdom codified through the valiant efforts of Arvigo's team. But the Maya forest is much more than a pharmacy. It provides all the necessary resources for everyday life: ornaments, food, spices, dyes, poisons, construction and household products, toys, beverages, rituals, and fodder among the many. Indeed, the historical foundations of lumbering and chicle so essential to the historical development of the Maya forest are dependent on the forest as a garden. Logically, the inhabitants, those who depended on the forest for their survival, must have crafted the economic qualities of the forest. Thus, the forest garden must be a result of the cumulative strategies for survival. The Maya forest demonstrates the Maya mastery of nature as a legacy of their

construction of biological capital. They made nature a product of their culture. It is the contemporary forest gardeners who can reveal the secrets of the Maya forest and who can show how to balance cultural prosperity with conservation.

In beginning to examine the biodiversity of the Maya forest, we had seen evidence that supported the diminishing diversity of landscapes that appeared to relate to the length of time they had been exposed to human habitation. Considering Conservation International's data on the 25 most endangered tropical zones of the world, we note:

- West Africa: 9,000 plant species
- Southeast Asia: 12,000 plant species
- Mesoamerica: 24,000 plant species
- Amazon: 48,000 plant species

Based on this global pattern, we proposed to look at the Maya forest scale to see if the global pattern would hold at the regional level. Our working hypothesis was that where there was intense human evidence in the Maya forest there would be less biodiversity and where there was less evidence there would be more biodiversity. As we began to work with the data, we found that the overall biodiversity was comparable among the sample sites of high, medium, and low settlement density. Further, that the dominant species of each sample area was similar and that the plant species of the oligarchy were overwhelmingly of economically important species (~90%). And importantly, those same species were highly adapted to cutting and burning, the major management tool of humans in the tropics. These initial results presented a new view of the Maya forest, one where we could see that the entire landscape was managed and now was growing wild, or feral. The cultural selection of the ancient Maya is evident in the structure of the Maya forest today, a structure that has developed in the context of the Maya civilization and is considered the second most biodiverse place on earth. These new insights turned our attentions to the Maya forest as a feral garden.

We set out to document that the Maya forest is a feral garden. Examining the contemporary forest from this perspective, we discovered that: 1) the alpha diversities, known as biodiversity, of the Maya forest is low compared to similar forests that have not been occupied intensively over millennia; 2) the beta diversity, the difference in species composition among widely-spaced samples of these forests, is small and that the forest is relatively uniform when compared to other tropical zones; and 3) the oligarchies, the top species by abundance/space, of these forests are comprised principally of species that were and continue to be of economic value to the people in the area.

Our data suggest that the forest of the ancient Maya still bears the evidence of manipulation. The development of the ancient Maya from at least 2000 BC has modified the nature of the forest to favor species that are useful to the inhabitants. This cultural selection process has reduced biodiversity in comparison to a forest like the Amazon where no civilization emerged. In addition, the Maya construction of their biological capital in the standing Maya forest increased economic species, yet maintained an eclectic structure of the forest as well as the utility that supported the Maya population. Finally, the cultural selection process was an active part of the forest management in both zones of intensive and extensive occupation, homogenizing the forest across the landscape.

The native Maya forest is now a feral forest, but there are still traditional forest gardeners who know the values and maintain them in their intensive home gardens, their distant out fields, and in their purposeful reserves (Figure 8). We have come to know a number of these living treasures, who, like Elijio Panti, have cultivated the nature of the forest, nurtured desirable sprouts, eliminated competition, and appreciated balances they experienced. These forest gardeners are the core of a new emerging network that can showcase the ecological history of the Maya forest. We seek to introduce their forest gardens, their strategies, and their strengths to support the conservation of El Pilar.

Figure 8: Marcelo Medina and Alfonso Tzul discuss crop rotation

To compare the feral forest to the managed garden, we used the data on the forest as a foundation. Our initial efforts were in collaboration with Help for Progress, HfP, who were involved in the development of the El Pilar Forest Garden Network. In coordination with HfP, we have begun to evaluate the traditional forest gardens in the El Pilar area. The individuals are self identified and have a strong interest in the management of the useful diversity in the forest and in their cultivated areas. They all have intensively managed areas and areas they may call a reserve. The gardens follow a range that are polycultivation plots of home gardens and out fields that are managed by farmers who are involved in household endeavors and market enterprise. Not every villager or every farmer has the qualities of a forest gardener. Research conducted by Help for Progress has demonstrated that the select calling of forest gardeners requires skill, practice, and experimentation. The forest gardeners possess unique qualities that separate them from the average cultivator. They are independent thinkers who have keen observation skills. They have used many methods to guide their occupation. They are prone to experimentation and gather data that they use from empirical experience.

The forest gardeners seek to learn empirically from nature as well as from other experiences (Figure 10). Examples of their insight into the workings of the forest are found in their way of cataloging plant resources as they encounter them in their own gardens, fields, and reserves, as well as in the work at El Pilar. They are able to identify potentials and willing to take opportunities in their garden experiments that they think will result in improvements. But as the agricultural sector has transformed, and the "Green Revolution" overwhelmed the time honored traditional techniques, the recognition of direct empirical strategies have become isolated from the core agricultural setting and left the accumulated wisdom of traditional management strategies invisible and unknown. What we do not know we do not value; nowhere is this more evident than among the contemporary Maya forest gardeners, many who are only now, through the development of the El Pilar Forest Garden Network, realizing their greater potentials. They are the heroes of the Maya forest and can show an alternative for conserving the Maya forest.

Figure 9: Forest gardeners learn techniques from each other at a Network meeting

While forest gardeners were a vital component of the subsistence sector in historic times, their role has diminished with the advent of modern demands that require new skills and capital. While the knowledge they have was legitimately exploited to underwrite the early lumbering operations and provided the success of the chicle industry in their times, the intimate knowledge of the forest as a garden supported even archaeological projects that were required to domicile in the jungle for seasons at a time. The Maya mastery of nature is evident in the forest itself and the traditional forest gardeners have continued to manage this valuable asset that is presently threatened. Their personal and confident understanding of the relationship of plants, their habits and habitats, their importance to animals and the animal's importance to them and their values have become virtually invisible. This is curious, as never before has their knowledge been in more demand as the Maya forest is exposed to the greatest perils in its co-evolution with humans and the developed world is on a heightened quest for conservation designs.

Our collaborative team of the El Pilar Program, including the BRASS/El Pilar project and the Help for Progress organization, has recognized the value and potential of the forest gardeners for some time. In the vision for the management of the El Pilar Archaeological Reserve for Maya Flora and Fauna, we have envisioned their participation, their development of the forest garden values that can frame the ancient

Maya monuments at El Pilar, and their transfer of knowledge by teaching the next generation how to care for the El Pilar forest as a garden. This is the way to conserve the valuable unwritten empirical data that are housed in the wisdom of the forest gardeners.

Our challenge was how to find the forest gardeners and how to collectivize the knowledge of their experience. From this grew the notion of the El Pilar Forest Garden Network. This new concept and group are beginning to recognize their gifts and share their knowledge among each other. This is the first essential step to gathering the empirical information together. We have many types of gardeners gravitating to the emerging network. Most have specialties, the areas of forest gardening that they are most conversant with: ornamentals, fruits, and seeds. Some have concentrated on the variety of fruit and hardwood trees, others are focused on food, still another knows much of the fodder of the forest, while another is more comfortable in the management of the garden. And there are the gardeners that know more of the hunting, medicinal, or foraging aspects.

Each forest gardener shares a common base that emerges when together, yet each has explored his or her specialty and has discovered and learned from that individual experience. It is these collective and unique experiences that need to be shared, transferred, and maintained for the conservation of the Maya forest and that can be showcased at El Pilar. Further, we propose then that this traditional Maya land use, both contemporary as in the past, can provide a way to use and conserve the Maya forest and is an alternative to the modern and introduced strategies.

We have begun to work with approximately 20 forest gardeners in the El Pilar area. We have initiated our research by inviting them to share their work and interests in their gardens. We began by asking them the plants that they nurture and grow in their gardens. From this basis we have assembled a foundation database on the nature of the forest garden, the plants that are cared for, their uses and their origins.

In addition, we have begun to work with Environmental Studies students of Sacred Heart Junior College. We have called our student group *Enlaces* as they link the academic to the practice. They have joined the El Pilar Forest Garden Network to continue our inquiry with more in-depth studies. They have focused on a gardener in turn; they intend to interview each forest gardener of the El Pilar Forest Garden Network to gather in their stories and life history as related to their interest in their forest garden. They have also begun to gather systematic species data from proscribed plots in the forest gardens to build a data set on the gardens that we can compare to the forest. They are also developing maps and voucher specimens they hope to lodge in the governmental herbarium.

Our initial data come from on-site interviews and accounts from farmers themselves who have identified and demonstrated their involvement with the forest as a garden (Figure 10). From these target interviews with 18 traditional forest gardeners we have found that there are over *350* species of plants within these gardens, clearly maintaining biodiversity in the forest garden. Moreover, *53%* of the garden species are native to the Maya forest, suggesting that the forest structure provides an important quality to the gardens. Importantly, the oligarchy identified in the Maya forest is an embedded component of the forest gardens. In other words, the dominant species found in the wild lands of the feral Maya forest are critical components of the traditional managed forest garden. This lends support to the ancient Maya selection creating the forest as a garden.

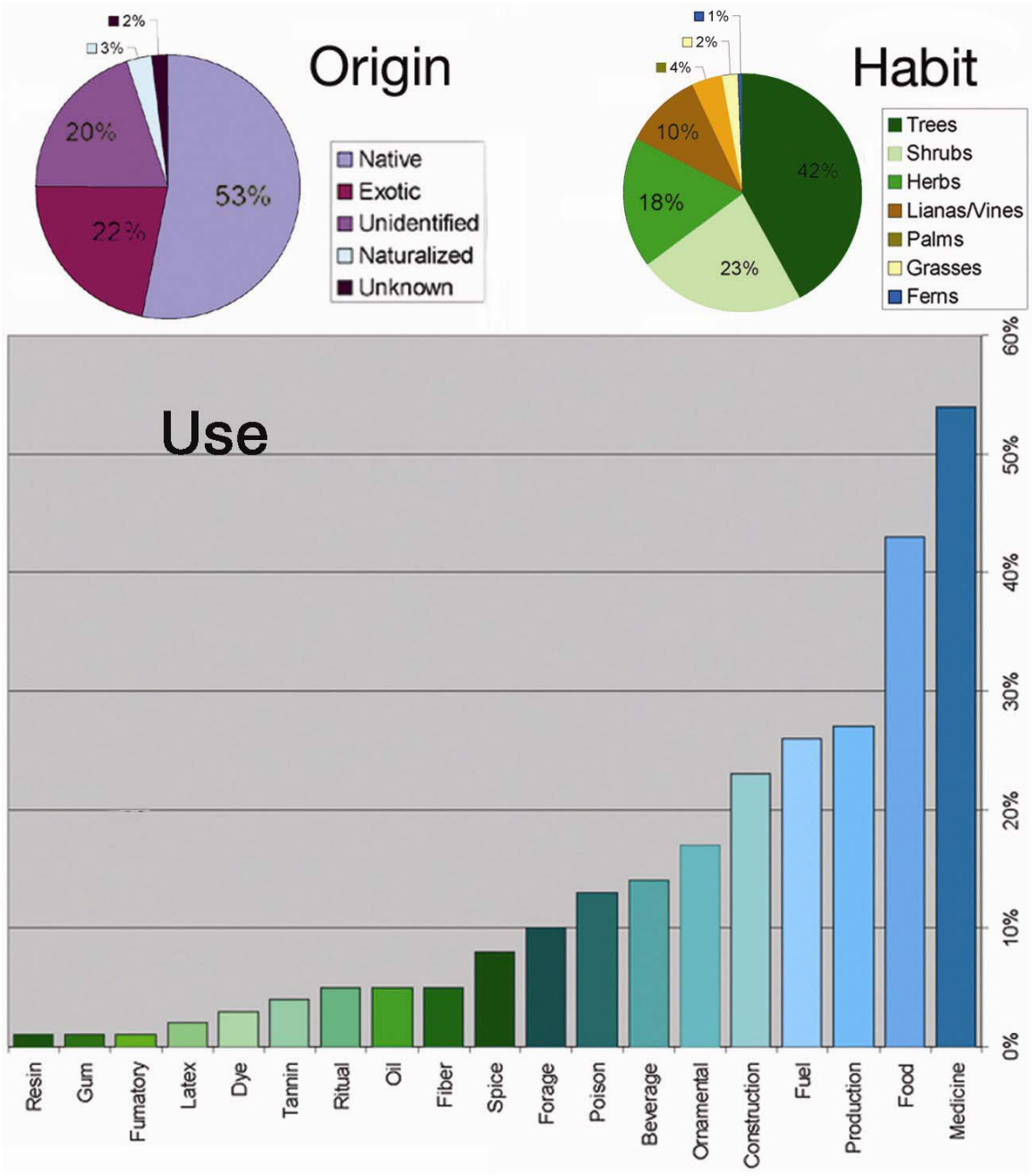


Figure 10: Habit, Origin, and Use of Plants in the El Pilar Forest Garden Network

The diversity of the gardens is dazzling. An inexperienced visitor may not fully comprehend the forest garden at first view. It is biodiverse and complex, representing layers that mimic the native forest in complexity and diversity. Further, is does not give the appearance of a carefully managed space: there are tumbles of compost, bee hives and trash, along with covering vegetation under which you may be shown a nursery of mahogany trees. Yet this is indeed a carefully managed garden. Each gardener can show you the newly sprouting cedar under a protective cover of leaves or a nursery of saplings ready to transplant in amongst green vines. Insects are fostered and leaves are piled in

ways that are protective of roots and shoots. It is an entirely distinct way of management but one that empirically has worked over the ages. The amazing qualities of the forest garden can be seen in our species list and in our summary. The collective forest gardens have a wide diversity of plants and the species include:

- *150 trees*
- *81 shrubs*
- *64 herbs*
- *37 lianas or vines*
- *15 palms*
- *8 grasses*
- *4 epiphytes*
- *2 ferns*

The plants are nurtured for medicine, ornaments, food, spices, dyes, poisons, construction, household products, toys, beverages, rituals, fodder and many more household needs (Figure 11). These forest gardens may at first look more like a compost heap and untamed jungle, but as you spend time with the farmers, you come to understand the management strategies and the alliance that actively engages in the verdant environment. While plants introduced over the past 500 years influence these contemporary gardens, more than 90% of the native forest oligarchy is nurtured in the traditional forest garden suggesting that the structure of the forest and the forest garden is much the same.

Figure 11: Efrain Quewell climbs to a corozo palm to harvest a sheath for use as a sled while Enlace Henry Sanchez helps

These native traditionalists are the heroes of the Maya forest. They are attentive to innovations and willingly share ideas and experiences. As the elder generation of forest gardeners was approached with innovations, they were eager to incorporate them in their cultivation efforts. Agricultural extension officers who were active in the 60s and 70s would have the potential to influence strategies and plantings. When new concepts were promoted, these farmers were among the first adapt them to their fields. Yet, when the seeds and processes of the "Green Revolution" were introduced to the Maya forest agricultural enterprise, problems emerged. The experimental hybrid maize developed in the temperate climes away from local native predators worked well for the experimental area, but once reintroduced to Mesoamerica, they turned out to be problematic, requiring significant capital outlay to maintain, in contrast to the hardy local

maize varieties. Other issues arose. The hybrids were designed for machine planting and machine reaping, yet the traditional farmers plant and reap by hand. Further, the shucking of corn was also intended to be a machine process, but these farmers still store and process the ears of maize by hand so the loose fitting husk now works as a disadvantage for long-term storage. While hybrid maize can out-produce native races because of ear and kernel size, this advantage was only captured in the first few years of use as production diminished for local insect predation. The continued use of hybrid seeds made investment in petrochemicals synthesized for monocrop production a requisite, changing fieldwork habits and demanding scarce capital for the application to maize fields. In interviews, the El Pilar Forest Garden Network participants argue that they now reject the Green Revolution techniques and vocalize their mistrust in the manner in which they were introduced. They are actively working to find and propagate traditional heritage seeds and cultivate in the more time-honored polycultivational manner where field management was a dynamic of changing household needs, participation, and use.

The knowledge of how to manage the forest as a garden is vanishing. The self identified forest gardeners who are becoming involved with the El Pilar Forest Garden Network are the unsung and yet invisible heroes of the Maya forest, actively conserving the inherent values of the forest as they manage their household affairs. This intangible knowledge must be supported and continue as the future of the Maya forest depends on it. The development of the El Pilar Forest Garden Network is one way to encourage exchange and development of the traditional forest garden knowledge and to increase the visibility of this unwritten style of resource management. Another important way to encourage this conservation alternative is to promote the forest garden at El Pilar, bringing the forest gardeners into the management regime at El Pilar, maintaining a forest garden at Tzunu'un, developing the verdant landscape around the monuments of the site, and training the enlightened future landscape managers to carry forth the traditional knowledge of the forest as a garden. This would showcase "archaeology under the canopy."

The *Enlaces* are a promising link for the development and investment in El Pilar. They are trained in environmental studies, they have education with an AA degree, and they are involved with the El Pilar Forest Garden Network. They have connections in the villages and links to the wider system and they are appreciative of the practice as a critical component of conservation. Along with the forest gardeners, they are the link to the successful future of forest gardening and the conservation of the Maya forest. Their biodiversity studies, on-site interviews, and GPS mapping are a feature of the developing web page that brings the spirit of the forest garden to the global community (Appendix II). With fresh views and interests, there is promise of new garden-to-market enterprises that will cultivate the conservation of the Maya forest as a garden, exploring new local and international ventures that can bring economic opportunities to the rural component and increase the visibility of traditional strategies as alternatives for maintaining the culture and nature of the Maya forest.

Summary

Our season's work continues to develop the broad goals that have emerged from the collective review process for El Pilar. Weaving together excavations, survey, and the ecology of the Maya forest has provided new inputs that shape our understanding of El

Pilar and Maya land use past and present. Collaboration with educational institutions in the region and internationally continues to provide new sources of inspiration. Forging links with Sacred Heart Junior College and the promotion of its graduates into research of the program has been a fruitful endeavor and promises to provide important links for an educated employment pool from the village in support of the El Pilar Archaeological Reserve for Maya Flora and Fauna.

The work of the El Pilar Program with local partners has strived to develop a model that can be propagated around the region, and the El Pilar Forest Garden Network is one facet of that model. Connections from the contemporary forest garden and to the forest at large highlight the community potential to support the integrity of the local area and demonstrate the role that local villagers can play in the education and promotion of conservation in the Maya forest as a garden.

The results of the 2004 field season provide an important base for the El Pilar Archaeological Reserve for Maya Flora and Fauna. The research of the season focused on the cultural and natural setting of the locale in the excavations, in the predictive model, and with the forest garden. Collaboration and sharing are the cornerstones of the work, understanding the intricacies of occupation from the excavations, appreciating the variation of the land use from the weights of evidence analysis, and learning about the traditional forest garden all combine to promote a complex mosaic of land use that might have been known before.

The modern Maya farmers' traditional techniques, passed down for generations, reinforce patterns of Maya land use. The El Pilar Forest Garden Network, with the help of the young and inspired Enlaces, is protecting traditions as well as the forest environment. The future of the El Pilar Archaeological Reserve and the future of conservation in the area depend upon the local community for its protection. The ancient Maya patterns speak to an appreciation for land use as essential to the survival of their environment; the modern forest gardeners are sensitive to this as well. The Enlaces give hope for the future, as they are educated in environmental studies, show interest in learning from their elders, and are intent on spreading that knowledge to next generations.

Appendix I

Excavations at Cahol Tok

Grinnell College

Appendix II

Maya Forest Garden Website Contents

www.mayaforestgardeners.org

Name of Page: Home (www.mayaforestgardeners.org)
Description: The main page that people would start at – will include links to all the above pages, a short welcome message, as well as an ¨interesting fact¨ Ticker (it would refresh itself every time the page is refreshed)

Content

Welcome to the El Pilar Forest Garden Network Homepage!

Traditional Maya farmers have been living off the land for centuries, nourishing their futures through the use of sustainable agricultural techniques, using the forest as a garden. The EPFGN seeks to relegate these techniques to farmers throughout the El Pilar area, in order that they may sustain their livelihoods by using the forest as a garden, harvesting plants for use as medicines, dyes, construction materials, natural poisons, ornaments, food, spices, household products, toys, beverages, fodder, for use in ritual ceremonies and more...

The website hopes to reach out to young forest gardeners, giving them a link to the great knowledge base that is held in the minds of the traditional Maya farmers of Mesoamerica.

We believe native populations should be active participants in their own development plans. Through the EPFGN, the traditional Maya farmers are developing their own lands in order to preserve their livelihoods as well as designing and evaluating their own creations of forest gardens, so that they may guarantee the existence of natural resources for future generations.

The Maya forest gardeners are on the right track. They are promoting sustainable livelihoods by growing their own fruits and vegetables, depending on the local economy by buying from the local markets and hiring local labor. They are sustaining the biodiversity of the forest by nurturing many of the plants that naturally grow there, and harvesting sustainably from the forest. These farmers aren't slashing and burning; they are preserving and serving their communities. They are a model for other developing nations suffering from the same problems.

"Most experienced environmentalists and conservationists have discovered that unless people have a direct stake and interest in conservation, then the best designed projects in the world stand little chance for long-term success. Meanwhile, scientists have begun to demonstrate how native peoples can teach us new models for sustained natural resource use and management. Their ancient indigenous traditions, developed through millennia of experience, observation, and experiment, are extremely relevant in providing future options for sustainable natural resource management."

-Posey, D. A. "Traditional Knowledge, Conservation, and 'The Rain Forest Harvest'" in Plotkin, M. and L. Famolare, Eds. (1992). Sustainable Harvest and Marketing of Rain Forest Products. Washington, DC, Island Press. pg. 46.

The Network continues to grow and with your help can improve its resources, abilities and effectiveness in conserving the biodiversity of the Mesoamerican tropics, providing economic stability to Maya forest gardeners, keeping Maya traditions alive, and promoting sustainable practices across the globe.

Name of Page: About the Network
Description: A short history of the EPFGN project, as well as our goals, and how we're working towards them

Content

The ancient Maya lifestyle was that of the Forest Gardener, which has unraveled over the last 500 years. We are trying to weave the tapestry of the gardeners and their knowledge back together through the El Pilar Forest Garden Network.

HISTORY: The Network emerged in 2004 to join local farmers in Belize and Guatemala together and spread the concept of forest gardening, one that reaches back to their heritage and the ancient Maya. These farmers live in the surrounding area of El Pilar, an ancient Maya center that straddles the Belize-Guatemala border. Drawing on their ancestral knowledge of plants in the Maya forest, these gardeners and farmers

are helping each other to keep their traditions alive, discovering new uses for the biological diversity contained in the forest, and providing economic incentive for conserving the tropical forest.

GOALS:
-To create a network of forest gardeners, helping to promote sustainable livelihoods
-To keep the knowledge of plants within the community and ensure that traditions and cultures are passed on
-To create an easily accessible website and database for forest gardeners to share information about useful plant propagation, care, and use in addition to their meetings
-To be a repository/resource of information for future forest gardeners
-To inform the global community of the important conservation work of the forest gardeners in the Maya forest
-To start a network of possible economic expansion of Maya forest products beyond the local markets
-To sustain the heritage of the Maya while conserving the tropical forest

IMPLEMENTATION: Today there is a Network of several dozen forest gardeners in Belize and Guatemala. The gardeners meet intermittently to collaborate and share their techniques with each other. Meetings take place at the Be Pukte Cultural Center in Bullet Tree Falls, Cayo District, Belize as well as in the field at forest gardens in Belize and Guatemala. Nurseries are being set up to propagate plants useful to the farmers with the support of Help for Progress, a non-government organization in Belize (www.helpforprogress.org).

A group of aspiring environmentalists nicknamed the "Enlaces" or "links" (in Spanish) are helping to bridge the generation gap between older Maya farmers and a new generation of potential forest gardeners. They are conducting interviews, collecting data on trees in each forest garden and mapping each garden using a handheld GPS system, with the support of BRASS/El Pilar (www.marc.ucsb.edu).

Name of Page: Eco-Archaeology – Then and Now

Description: This is the page to describe (in short) archaeological research that has been found to support the case for poly-cultivation at El Pilar, the story of the Gardeners in the network today, and how (with this project, and the Enlaces) they are actively working, and passing on their knowledge to future generations

Content

Where is the Maya forest?

The Maya Forest is the largest contiguous humid, subtropical forest remaining in Central America, spreading through Mexico, Belize and Guatemala. The Maya lived in present-day northern Central America, from the Yucatan of southern Mexico to northwestern Honduras. They settled on all fertile, well-drained ridges and hills throughout the Maya forest. These are the places where permanent settlements are found.

How does the "contemporary" traditional farmer use their landscape?

In all self-sustaining communities there is a need for land that is set aside for cultivation. Because of uncertainties of weather, demands of schedules, and given varied access to productive lands, traditional farmers have diverse strategies for meeting family food needs.

Close to their homes, they cultivate plants that require more intensive labor techniques and therefore consume more time (for example, those plants needing frequent watering); plants that are very valuable (so they can protect them from harm or monitor their growth closely); and plants that they harvest regularly or are a burden to carry a long distance. These plots are called **home gardens**, **infield**, or **intensive**.

On the other hand, those plants that don't require such intensive demands can be farther away, out in the fields, and are generally 1-2 hours' walk from their homes (4-8 km). These plots are called **forest gardens**, **outfield** or **extensive**. They may set up a field house on this land so less time is spent traveling to and from each garden.

These garden plots create a pattern called "infield-outfield" that fits with the archaeological settlement patterns we find in the Maya forest.

How did the ancient Maya use their landscape?

The Maya were a self-sustaining community dependant on agriculture for their survival. Most of the population was involved with cultivation in some form or other. They faced the same uncertainties that the contemporary forest gardener faces today, like heavy rains, soil erosion, and population demands.

Maya residences occur in a variety of habitats, suggesting the tapestry we find in the contemporary forest garden. The archaeological evidence shows that urban areas, like those of our time, were densely settled, averaging two structures per hectare. These densely settled communities were surrounded by home gardens. Bordering these permanent communities were sparsely settled outfields and forest gardens, seasonally occupied depending on the demands of food production. This fits the model defined by the infield-outfield pattern that we see in contemporary settlements.

Today we find that there is a higher percentage of useful plants in forested areas where the Maya lived than forest where people did not live. This suggests that the Maya manipulated their forest, favoring plants that were useful to them, therefore changing the composition of the forest.

Why is the Maya forest called a "feral forest"?

At the height of the ancient Maya civilization, the forest was domesticated. Since the abandonment of their cities, the Maya forest returned to an untamed, or feral, state. We know that the Maya domesticated their forest because the total number of plants (biodiversity) found in the forest is high, yet when you compare different forest areas to each other, they are similar. Of the dominant species in the forest, 90% are useful in the daily life of the people today and all of these plants are found in the forest garden. The Maya influenced the structure of the forest by caring for plants useful to them. This has created what we see as a continuum of a managed feral forest and a nurtured forest garden. This heritage lives on in the contemporary forest gardens.

What is the footprint of forest gardens in antiquity?

"…contemporary gardens are modern artifacts, produced out of the interaction of Maya conceptions and habits with changing social and historical processes; they are not relics preserved from the past."

-Patterson, S. D. (1992). In Search of a Mesoamerica Floricultural Tradition: Ceremonial and Ornamental Plants Among the Yucatecan Maya. Geography. Los Angeles, UCLA**:** pg 116.

How does the language of the Maya reflect their intimacy with nature?

The composition of the Maya forest today exhibits the imprint of ancient human habitation and resource management. This resource relationship is characterized in the Mayan language among contemporary farmers and underscores the subtleties and ranges of their economic and cultural alliance with the forest. For example, the Mayan word for climax forest, K'ax, is used in significant combinations which suggest complex adaptations and interactions with the environment. Kanan K'ax describes a "well cared for" forest and also means "learned from"; it involves teaching and caring, evoking a concept of stewardship. K'ax il kab refers to a forest with beehives; and Ka'kab K'ax indicates a forest with good agricultural soil quality. These linguistic terms describe a continuum of economic qualities of the forest and denote long-term human coexistence with the environment.

Look at the examples below:

Ka'ana K'ax: a leafy grove, virgin forest or woodland with tall trees/ Floresta, selva virgen o montes de arboles elevados

Ka'kabk'ax: a grove where the land is good for sowing/Monte de arboleda de tierra buena de sembrar

Kakab lu'um: fertile land/Tierra fertil

Keelenche': scrubland, short forest, on the first half on the path to recuperation; after it has been cut down/Monte bajo, selva baja, monte a mitad de camino de su total recuperacion; Despues de haber sido tumbado
K'ax: Forest, grove, mountain, a field where there is bush/Bosque, arboleda, montana o monte, campo donde hay monte
U k'ax kah: Land of the town/Tierra del pueblo
K'aax: A forest in the sense that it is a place filled with wild trees/Monte en su acepcion de lugar poblado de arboles silvestres
K'axil kab: A forest for beehives/Monte para colmenas
U k'axil kol: Cropland that has not been sown/El monte de la milpa que no esta sembrado
Ich k'ax: Mountain or forest/Montana o monte
Num k'ax: A closed forest, without having a path through it/Monte de arboles, cerrado, sin haber camino en el
Pach: A place to make cropland, to open the land again and work it/Lugar para hacer milpa, abrir de nuevo la tierra y labrarla
Pach k'ax: To choose the land where the farmer will make his crops/Escoger monte el labrador donde hacer milpa
Pachlu'um: To choose a place or land/Elegir lugar o tierra
Pachal kol: Land worked like this/Tierra labrada asi
Pachbilkol: Newly worked land/Tierra nuevamente labrada
Pokche': Barren or deserted land with trees, or a forest with small trees, bushes and grass and weeds. A forest that recently served as a sown field. /Campo yermo o desierto con arboles, o bosque de arboles pequenos, matorral y hierbazal y maleza de matas. El monte que ha servido recientemente para sementeras.
Pokche'kol: An old, abandoned field/Milpa vieja abandonada
Pokche' k'ax: Scrubland that is not big/Monte bajo no crecido
Pu'uk: Forest, hill, low mountain range, mountain range of small altitude, with vegetation/Monte, cerro, sierra baja, cordillera de poca altura**,** con vegetacion
Sakmul: Woodland or pile of stones made by hand/Monte o monton de piedra hecha a mano
Wits: High mountain range or bush like this, rocky/Sierra alta y grande o monte asi, peña enriscada.
Wits much: Small mountain range or bush/Sierra o monte pequeno.
Yalan ak': Bush or desert, barren/Monte o desierto, yermo.

What is "archaeology under the canopy"?

The objective of archaeology under the canopy is to reveal and frame the Maya archaeological monuments of El Pilar in the context of traditional forest gardening practices, creating a way to educate local and international visitors on the values of the Maya forest. At the same time, it will provide a vehicle for continuing the wisdom of the forest garden in the context of ecotourism.

Who are the Enlaces and how are they helping the forest gardeners pass on their knowledge to future generations?

Ronnie Martinez, Winceslao Cabb, Henry Sanchez, and Abimael Waight currently make up the group of graduated students from Sacred Heart Junior College in San Ignacio, Cayo, who are continuing the forest garden work of the BRASS/El Pilar Program's 2004 field season. The Enlaces are an enthusiastic, educated, intelligent, and humorous group whose help with the El Pilar Forest Garden Network has been essential. They have forged partnerships with the forest gardeners around El Pilar and are currently working, in coordination with a local non-governmental organization, Help for Progress, on a nursery for the forest gardeners to grow and share plants. They are helping the forest gardeners pass on their knowledge to future generations by learning from them and utilizing that knowledge to teach others. Each of the Enlaces hopes one day to have his own forest garden, helping to preserve the forest and utilize it in a sustainable manner. They are literally bridges between the older generation of Maya forest gardeners and a younger generation (embedded in their name "Enlaces" or "links" in Spanish). They are beginning to understand the traditional Maya agricultural systems and how they can contribute to a sustainable future.

Name of Page: Market Potentials and the Future of Forest Gardening
Description: What the future of forest gardening can be

Revealing the Maya secrets of balancing conservation and cultural prosperity.

What is the future of forest gardening?

Sustaining the tropical forest as well as the culture and heritage of the Maya is one of the main goals of the EPFGN. In order to do this, however, new goals need to be introduced for the future:

Adopting the concept of the forest garden in urban areas
Creating innovative approaches to products
Finding new ways of passing on wisdom
Searching out the local and international markets and introducing new products to them
Finding a way to make forest gardening an honored skill instead of a peasant tradition
Promote involvement and incorporation of conscious conservation of Maya sites to develop the ecotourism market

Marketable products now produced in the Maya forest by forest gardeners that could be introduced to new markets, whether they are local, national or international:

Ramon (*Brosimum alicastrum*)
Uses: As fodder for chicleros
As a "living fence post", also used as supplemental shade for animals
Nut used for meal/flour
New Mayan Café De Mojo-Thomas Lipton of TJ enterprises-calling for forest gardeners to ship their freshly collected ramon nuts for international enterprise

Guanábana, Sour Sop (*Annona muricata*)
Uses: Fruit drinks, shakes, ice cream
Tamarind, Tamarindo (*Tamarindus indica*)
Uses: Fruit drinks
Mango (*Mangifera indica*)
Uses: Fruit drinks
Food
Palms (like *Attalea cohune*)
Uses: For fuel-as charcoal
Food
Thatching
Oil
Ornamentals
Uses: Importation of cut flowers, foliage, and plants
Papaya (*Carica papaya*)
Uses: Leaves used for digestive properties of proteolytic enzymes used in herbal teas
Food
Achiote, Annatto (*Bixa orellana*)
Uses: The seeds are used as an organic red dye in condiments, cosmetics and colorings.
To color cheese, bakery products, soups, sauces, pickles, smoked fish as a cost-effective alternative to beta-carotene

Natural food colors make up more than 95% of food colors but only 75% of the capital gain

Xate (*Chamaeodora elegans*)

Uses: In floral arrangements (already exported to the US)
Harvesters clip one leaf off each palm but leave the plant alive to harvest again later-sustainable
Harvesting peaks in December and March-April

Chicle (*Manilkara zapota*)

Uses: As a base for chewing gum
As a waterproofing agent
Largest concentration of high grade chicle is in the Maya Bioregion (Reining and Heinzman 1992)
Tapping begins mid-late September

Allspice, Pimenta gorda (*Pimienta dioica)*

Allspice is a medium sized tree of the Maya forest and part of the forest-gardens of the El Pilar Forest Garden Network. It is also seen in many of the plazas of El Pilar. They grow in groups, bloom in the dry season and ripen by August. The fruits of these trees can be collected, dried in fresh air or over a fire, and utilized as a spice whole in famous Escabeche, a chicken and onion soup of the Yucatan, or ground as a spice in sweet cakes. These trees are easily recognized by their smooth exfoliating bark and shiny leaves that have a distinct spicy essence.

Uses: Condiment
Preserving and curing fish
Flavoring and curing meat and bakery products
Harvested in late June-September

By harvesting xate, chicle and allspice, "a family can earn up to three times the average daily wage…versus clearing forest and planting corn or raising cattle."

-Reining, C. and R. Heinzman. "Nontimber Forest Products in the Petén, Guatemala: Why Extractive Reserves Are Critical for Both Conservation and Development" in Plotkin, M. and L. Famolare, Eds. (1992). Sustainable Harvest and Marketing of Rain Forest Products. Washington, DC, Island Press.)

Cacao (*Theobroma cacao*)

Uses: Beverage
Food
Spice

Vanilla (*Vanilla planifolia*)
Uses: Spice

Name of Page: Forest Gardening
Description: Why doing forest Gardening is better for the gardener, - what s/he gets out of it (more economic independence, disposable income, food for the family)
More than one case study b/c there is no typical forest gardener; there is a gradient; Beatrice (healing herbs) vs. Guadalupe (food production) vs. Leonardo Obando (feed for animals)

Content

In 18 Forest Gardens we found that there are over 350 species of plants that the farmers themselves identify as nurturing.

The species include: 150 trees, 81 shrubs, 64 herbs, 37 lianas or vines, 15 palms, 8 grasses, 4 epiphytes, and 2 ferns.

These plants are nurtured for use as medicine, ornaments, food, spices, dyes, poisons, construction, household products, toys, beverages, rituals, fodder and more…And 53% of these species are native to the Maya forest. These forest gardeners are the ultimate conservationists and unsung heroes of the Maya forest!

What is a forest garden?

Forest Gardening is as much a lifestyle as it is an agricultural practice that includes trees, vines, shrubs, vegetables, grasses and herbs. A forest garden is an unplowed, tree dominated plot that sustains biodiversity and animal habitat while producing plants for food, shelter, medicine and profit. It can be fertilized by household refuse (compost), organic material (dead weeds), ashes from kitchen fires, and manure, enriching the soil and productivity without the use of chemically manufactured fertilizer.

Alfonso Tzul, a modern Maya agriculturalist and retired agricultural extension officer, describes how forest gardens came to be:

God created plants and animals and the world around us. Trees grew in the forest, seeds spread, birds sang, and animals flourished. All was already there. Man came along and preferred this plant, favored that seed,

enjoyed those birds, and supported those animals, creating and using the forest as a garden to sustain those plants and animals. The job of the forest gardener is to manipulate the forest by adding, removing and nurturing plants, to make sure that certain species grow where they will be most economically viable.

Heriberto Cocom, a master Maya forest gardener describes forest gardening:

Forest Gardening is a practice that was used by the ancient Maya of the past. And now we are introducing it to our Maya people today…to continue the forest gardens. For example, a forest garden means having….planting many species of plants; for instance mahogany, cedar and plants that produce fruit to eat, also that produce fruit for the animals like the ones with four feet, and also birds and medicinal trees and plants, and trees for construction.

There is no typical Forest Gardener. Some focus on medicinal plants, others on horticulture, and yet others on trees for construction or ornamentals for sale at the market. The possibilities are endless, but the essential idea remains: that the forest can be manipulated for economic gain without destroying it.

Click on the names of the forest gardeners below to see the different types of forest gardening represented in one small corner of the world, the Maya forest.

Links to The Forest Gardeners:
Russell and Sergio Aldana-combined, their land contains 5 natural springs that help to keep their crops healthy

Alcario Cano-uses his land mostly for lumber extraction and keeps it forested as reserve land

Heriberto Cocom-president of Amigos de El Pilar, master forest gardener, the son of a Maya snakebite healer (story)

Carmen Cruz-a Maya craftsman, Carmen makes benches from vines and branches of trees; he has a large amount of forested land which he keeps as forest

Guadalupe Landero-produces agricultural products, especially okra and coconut oil

Lucas Medina-the youngest forest gardener, farms organically and paints (story)

Marcelo Medina-father of Lucas, has many fruit trees and corn (story)

Jan Meerman-owner of Green Hills Butterfly Farm in Belize, Jan is a Dutch ecologist who has been living in Belize since 1989 and is helping keep the forest diverse on his land by keeping his own version of a forest garden (http://biological-diversity.info)

Leonardo Obando-uses his land as a more traditional farm, with cattle, pigs, chickens and horses, but also has bees and keeps reserve land to preserve the forest, as well as a section of ramon trees for fodder

Carlos Quewell-selectively harvests timber as well as foodstuffs from his land

Efrain and Raemundo Quewell-harvest some plants, especially timber, but also keep land as reserve

Zacarias Quixschan- a very good example of successful forest gardening, Zacarias has a large amount of land on which he plants corn and beans together; has habanero peppers, moxan and his own nursery among many other kinds of plants and fruit trees in Guatemala

Jorge Rivera-grows food for his family and a little to sell at the market

Sanchez-this forest garden contains most of the subsistence for the family, but some products are also sold at the market

Narciso Torres-experimental forest gardener always willing to share plants and teach about their uses and propagation (story)

Rodolfo Tun-a teacher, Rodolfo's land is solely reserve land at the moment; he is working to turn it into a forest garden

Alfonso Tzul-a forest gardener and agriculturalist in San Antonio, Belize who is testing the combination of corn planted between small banana and orange trees; has many fruit trees among other trees for harvesting

Beatrice Waight-traditional Maya medicinal healer who grows her own herbs for healing as well as food for her family

Name of Page: FAQ … Poly-Wha?
Description: Frequently Asked Questions about Polycultivation

Content

1. **What is Polycultivation (and how is it different from monocultivation)?**
   "All farming systems were originally polycultures providing a range of basic requirements for subsistence." –Francesca Bray 1994

The objective of the monoculture crop is to produce large amounts of grain for a large population that can't necessarily grow that grain on its own. It does not meet the daily nutritional needs of the population, however, because it is only a single food source. The objective of polycultivation is to resolve

smallholder's self-sustaining needs. A smallholder can't eat only grain, and therefore needs to harvest a variety of foods to meet his or her nutritional needs.

Francesca Bray (1994) describes polycultivation, also known as permaculture, as a technique that involves plants that complement each other rather than compete with each other. An example is how the Maya learned that planting corn, beans and squash in the same hole produced more food in a smaller amount of space. The beans fix nitrogen in the soil for the corn, and each root system draws nutrition and moisture from different levels of the soil.

Polyculture uses land intensively with the ability to support high population densities. In a place where labor is not a scarce resource, polyculture relies on the local labor force. "Intensive polyculture…can yield a livelihood for poorer farmers, offer widespread access to land and generate other employment opportunities. Ideally, polyculture should not only support rural diversification but also lessen dependence on industrial inputs. Mayan peasants can grow corn without buying chemicals because beans naturally manufacture nitrates."

-Bray, F. (1994). "Agriculture for Developing Nations." Scientific American **271**(1): 18-25.

Traditional production systems of the tropics are polycultivational. To mimic the forest structure, polycultivation evolved to minimize instability, prevent degradation and integrate both intensive and extensive labor techniques that maximize production. Heterogeneous and biodiverse, the forest gardens constituted the strength of the Maya community in the past, as well as today, by relying on the traditional knowledge of local farming households. Today, villagers are rapidly abandoning time-proven methods in exchange for introduced technologies.

2. How is a forest garden different from a plowed field?

A forest garden consists of many species growing together, as a forest is made up of many different species. The forest garden may look wild, however, it is not. The forest garden is carefully managed; once the forest is managed, it becomes a garden. Debris is moved from a seedling

growing on the forest floor to help ensure its maturation; plants are taken from one part of the forest to another to facilitate growth; unwanted sprouts are removed; trees are shaped to keep branches low to harvest fruits easily or to remove limbs for lumber; trees and shrubs are irregularly spaced, their position is determined by the landscape; plants may not be hand-sown, but driven by natural reproduction strategies (seeds blown in by wind, through animal droppings, etc.) and where desired they will be nurtured and encouraged to grow, creating a scattered, "random" pattern within the garden.

3. **What are the environmental benefits of polycultivation?**
   Polycultivation increases biodiversity. Because a field in polycultivation does not require the harvesting of every plant at one time, the soil stays shaded by canopy trees, retaining moisture. The roots of the plants not being harvested hold the soil in place, preventing erosion from downpours of rain. Polycultivation diverts pests by maintaining herbs that they prefer over the crops. This strategy also encourages species diversity, providing nutrition for insects, birds and animals. In addition, fewer chemicals and fossil fuels are needed for production, therefore reducing pollution.

4. **How does labor and skill, instead of capital (petrochemicals and tractors), support smallholders in emerging economies?**
   Industrial chemicals and heavy machinery not only require money; they require extensive knowledge for use and operation. The expansion of many large companies affects the soil by impaction, the drying up of streams, and converting the land from forest to cropland. Utilizing local labor and knowledge passed down through generations in harvesting, production and marketing techniques relies on local people, is more sustainable, and supports the local economy.

   The forest gardeners use natural fertilizers (compost), natural pesticides (certain plants that defend against pests), and non-intensive harvesting to keep their land, water, and community safe from the harmful effects of petrochemicals and impacts of heavy machinery. And, by using local labor, or better yet having the ability to harvest your family's needs by yourself, money stays within the community instead of going to overseas corporations. Plants are often shared between neighbors and friends, through cuttings, seeds and some grafting. Local families could sustain

themselves by maintaining a forest garden because of the crop diversity from vegetables, herbs, medicinals and other cultivars.

In Belize, Heriberto Cocom, master forest gardener, states that "people could afford to maintain [forest gardens] because each and every one of us here in the villages or, throughout the whole nation, has at least a small parcel of land where we can make our forest garden. So I would encourage every [person] who has land to do so."

5. Why is polycultivation important in the Maya area? In the tropics? For the world?

"When managed appropriately, biodiversity lays the foundation for recovery, sustainable development, and a solid national economy"

-Castillo, G. "Five Hundred Years of Tropical Jungle: Indigenous Heritage for the Benefit of Humanity" in Plotkin, M. and L. Famolare, Eds. (1992). Sustainable Harvest and Marketing of Rain Forest Products. Washington, DC, Island Press.

Although world food production can potentially feed every person on the planet, millions are starving due to the fact that development often worsens the inequities of distribution.

"The 'modernization' of agriculture, as generally understood, entails the application of science, technology and capital to increase the output of just a few crops that have world markets-among them wheat and rice for human consumption, corn and soybeans for animal feed, and cotton for industry….The system favors rich farmers…specialization and economies of scale reduce economic diversity and employment opportunities in rural areas."

-Bray, F. (1994). "Agriculture for Developing Nations." Scientific American **271**(1): 18-25.

Polycultivation allows farmers to harvest plants throughout the year so that they are guaranteed food and income. For example, in the Maya forest, Alfonso Tzul tells us there are different varieties of plums that ripen in different months-April, May, July, August and October. If the farmer has all of these varieties, s/he can harvest throughout the year, in addition to harvesting other fruits and vegetables that mature in other months.

Polycultivation techniques allow for a diversity of crops in a small area. This concept therefore allows the nutritional needs of a community to be grown within that community. Each family then has the capacity to feed itself and rely less on the world market. If smallholders (rural farmers) in developing countries embrace the concept of polycultivation, their dependence on more developed countries for food may decrease.

6. **How does a Forest Garden complement a field of Corn? (AT)**
   Corn is a staple and although the forest garden provides many different sources of food, people still need the sustenance provided by corn in order to maintain a healthy diet. A forest garden allocates space to fruits and vegetables that cannot be planted with corn, but the cornfield also provides required nutrition.

More questions about polycultivation (also known as permaculture)?
Link to Bill Mollison, who is sort of the father of the modern permaculture movement.
www.tagari.com

Name of Page: Mesoamerican Facts
Description: Key facts: economic, social, linguistic etc: of Belize (esp. western Belize and Guatemala (Gives a context for the project)

Still need something about how this project could help with bi-national cooperation

Content
Map of the Maya Forest-including political boundaries

Mesoamerican Tropics Facts:
DEFORESTATION: Mesoamerica is one of the most diverse regions on the planet with 24,000 plant species, 5,000 of which are endemic. However, the forest is being depleted at an alarming rate. The extraction of such economically valuable species as mahogany and cedar has degraded the forest. Annually 2% of the forest is lost, 10 times that of the world average. The IUCN Red List (www.redlist.org) notes that over 1,300 species are threatened here; over half are plants. There may be hundreds more species of plants not yet discovered. The forest is also home to threatened fauna like the jaguar and howler monkey which are inherently affected by the loss of forest habitat.

POPULATION: Over half of the population of Mesoamerica is made up of rural farmers who depend on family labor. Also, half the population are children under 15 years old, representing a potentially dangerous rapid growth rate, doubling within the next 20 years. The majority of the population suffers from malnutrition and poverty, a common and increasingly devastating problem in the tropics.

For more information on threatened plants and areas of Mesoamerica:
IUCN Red List (www.redlist.org)
Parks Management, World Heritage Sites (www.unesco.org/whc/heritage)

BELIZE

Located at 17 degrees 15 minutes N, 88 degrees 45 minutes W, Belize shares its border with Mexico, Guatemala and the Caribbean Sea and is the second smallest Central American country with 22,966 sq km.

Formerly known as British Honduras, Belize's climate is tropical, very hot and humid; the terrain is flat, swampy coastal plain with low mountains in the south. The rainy season lasts from May to November and the dry season from February to May. Hurricanes and coastal flooding are natural dangers in Belize. Current environmental issues are deforestation, water pollution from sewage, industrial effluents, agricultural runoff, and solid and sewage waste disposal.

There are approximately 273,000 people in Belize, with a growth rate of 2.39%. Ethnic groups include Mestizo (48.7%), Creole (24.9%), Maya (10.6%) and Garifuna (6.1%). English is the official language but Belizeans speak Spanish, Mayan, Garifuna (Carib), and Creole as well.

The **capital** is Belmopan, located in the central part of the country.

The **economy** is small and essentially private enterprise dominated by tourism, followed by cane sugar, citrus, marine products, bananas, and garments. 33% of the population is below the poverty line-the GDP per capita is $4,900. The labor force is divided into services (55%), agriculture (27%), and industry (18%). Agricultural products include bananas, coca, citrus, sugar, fish, cultured shrimp, lumber and garments; industries include garment production, food processing, tourism and construction. Exports include sugar, bananas, citrus, clothing, fish products, molasses and wood which are shipped to the US (39.3%), UK (25.1%) and France (4%). The Belizean Dollar (BZD) is equal to $0.5 USD.

Territorial disputes between the UK and Guatemala delayed the independence of Belize until 1981. Guatemala did not recognize the new nation until 1992. Tourism has become the mainstay of the economy.

Source: The US CIA Factbook Belize 2004

For more information, refer to the US CIA Factbook Belize at
http://www.cia.gov/cia/publications/factbook/geos/bh.html
Or the Belize Government at http://www.belize.gov.bz/belize/economy.html

GUATEMALA

Located at 15 degrees 30 minutes N, 90 degrees 15 minutes W, Guatemala shares its border with the North Pacific Ocean, El Salvador, Mexico, the Gulf of Honduras, Honduras and Belize and with a total of 108,890 sq km is the largest and most populous country in Central America.

Guatemala's climate is tropical-hot and humid in the lowlands and cooler in the highlands. Its terrain is mostly mountains with narrow coastal plains and rolling limestone plateaus (in the Peten). Numerous volcanoes pose a threat to the population, as well as occasional violent earthquakes, hurricanes and other tropical storms. Current environmental issues include deforestation in the Peten rainforest, soil erosion and water pollution.

There are approximately 14 million people living in Guatemala with a growth rate of 2.61%. Ethnic groups include Mestizo (55%), Amerindian or predominantly Amerindian (43%), whites and others (2%). The population speaks Spanish (60%) and Amerindian languages (40%) (23 officially recognized Amerindian languages, including Quiche, Cakchiquel, Kekchi, Mam, Garifuna, and Xinca)

The **capital** is Guatemala City, located in the south-central part of the country.

With 75% of the population below the poverty line, agriculture accounts for about half of the labor force, services, 35% and industry, 15%. The GDP per capita is $4,100. Agricultural products include sugarcane, corn, bananas, coffee, beans, cardamom, cattle, sheep, pigs and chickens and industries include sugar, textiles and clothing, furniture, chemicals, petroleum, metals, rubber and tourism. Guatemala exports coffee, sugar, bananas, fruits and vegetables, cardamom, meat, apparel, petroleum and electricity to the US (55.5%), El Salvador (10.5%) and Nicaragua (3.5%). Guatemala uses two forms of currency, the quetzal (GTQ) and the US Dollar (USD). There are approximately 8 quetzals per USD.

The Maya civilization flourished in Guatemala and surrounding regions during the first millennium A.D. After almost three centuries as a Spanish colony, Guatemala won its independence in 1821. During the second half of the 20th century, it experienced a variety of military and civilian governments as well as a 36-year guerrilla war. In 1996, the government signed a peace agreement formally ending the conflict.

Source: The US CIA Factbook Guatemala 2004

For more information, refer to the US CIA Factbook Guatemala at
http://www.cia.gov/cia/publications/factbook/geos/gt.html
Or the Guatemalan Government at www.**guatemala**.gob.gt

Please also see The Inter-American Development Bank (www.iadb.org), The World Bank (www.worldbank.org), The United States Agency for International Development (www.usaid.gov), International Council On Monuments and Sites (www.icomos.org), Organization of American States (www.oas.org)

Name of Page: Forest Garden Map

Description: Map of Selected Forest Gardeners (click on dot to take you to the Gardener)

Content

Updated forest garden map with Enlaces' data

Name of Page: Get Involved

Description: How to get involved with helping EPFGN

Content

1. Get on the mailing list
    a. Set up a mailing list where they can fill out their email, snail mail, phone number to receive info on…? or to become part of the network…?
2. Contribute
    a. Make a way for them to donate electronically (through PayPal?)
    b. Send check or money order to: Help for Progress? ESP: Maya?
3. Come visit and see for yourself!
    a. How to get there-directions, links to airlines, Martha's kitchen, maps, etc.
4. Tell your friends

Name of Page: Links
Description: Links to MARC, ESP Maya, HfP, etc and recommended readings

Content

MesoAmerican Research Center www.marc.ucsb.edu
Exploring Solutions Past: The Maya Forest Alliance www.espmaya.org
Help for Progress www.helpforprogress.org
Amigos de El Pilar http://www.interconnection.org/elpilar
Sacred Heart Junior College http://www.shc.edu.bz/shjc/welcome
New York Botanical Garden www.nybg.org
Society for Economic Botany http://www.econbot.org
Arturo Gomez-Pompa's Q'TAXA: An interactive system for education and information on the diversity of life on earth http://maya.ucr.edu/pril/PRIL.html
Jan Meerman's Biodiversity in Belize http://biological-diversity.info/
Bill Mollison's Permaculture www.tagari.com
TRAMIL http://funredes.org/endacaribe/Tramil
Mayan Mojo www.mayancafedemojo.com
Consejo Nacional de Areas Protegidas (CONAP) http://conap.online.fr/
Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)
http://www.catie.ac.cr/Magazin.asp

Recommended Readings:

Arvigo, Rosita. (1994). Sastun: My Apprenticeship with a Maya Healer. San Francisco, CA. HarperSanFrancisco

Balick, M. J., M. H. Nee, et al. (2000). Checklist of the Vascular Plants of Belize With Common Names & Uses. Bronx, NY, The New York Botanical Garden Press.

Hernández Xolocotzi, E. (1985). *Xolocotzia,* Tomo I, Rev. de Geografia Agrícola. Universidad de Chapingo, México.

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Mollison, Bill. (1988). PERMACULTURE: A Designer's Manual. Tasmania, Australia, Tagari Publications.

Morton, Julia F. (1981). Atlas of Medicinal Plants of Middle America. Springfield, IL. Charles C Thomas Publisher.

Plotkin, Mark and Lisa Famolare (Eds.) (1992). Sustainable Harvest and Marketing of Rain Forest Products. Washington, D.C. Island Press.

Roys, Ralph L. (1931). Ethno-botany of the Maya. New Orleans, LA. The Tulane University of Louisiana.

Tzul, Alfonso. (n.d.). *An Agro-Forestry Farm Model: El Pilar for the Maya Forest*. NEED TO LINK TO THIS

Cocom, Heriberto. *Three Sisters-Masewal Forest Garden Trail*. NEED TO LINK TO THIS

Name of Page: Contact
Description: Provides general contact information for EPFGN

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Name of Page: Interesting Fact Ticker (name not visible to the viewer)
Description: 10-20 interesting facts that serve to stimulate people's curiosity (it would refresh itself every time the page is refreshed)

Content

1. Oranges in the Maya forest aren't orange, they're green. In temperate zones, oranges turn orange when they are exposed to cold air which breaks down chlorophyll and releases an orange pigment called carotene

2. Vanilla, native to the Maya forest, is used in perfumes, as a spice, and is part of the secret recipe for Coca-Cola

3. Cassava, one of the most widely used plants of the tropics, contains fatal toxic compounds. Almost all native peoples have developed a method to rid the plant of its poison

4. The native cashew, in the same family as poison oak, poison ivy and poison sumac, must be cleaned thoroughly and roasted before it is consumed to eliminate its toxic oil

5. Copal resin, used in ancient Maya rituals, is used in modern dentistry as part of cavity fillings

6. Did you know that the Corozo nut produces a multi-use oil that can be refined enough to make a high-grade machine oil?

7. Did you know that beans, planted next to corn, actually grow up onto the corn stalk?

8. Sown together among corn and beans, the leaves of the squash plant work to shade and conserve moisture in the ground

9. Vanilla and chocolate are both Maya forest garden crops, yet these crops are indistinguishable from those growing in the wild

10. The perennial bush, chaya, cooked as a green vegetable, propagate only by cuttings and are clones with the same DNA from Palenque to Pilar

11. The ramon nut is considered a famine food but continues to produce nutritious fodder that was the mainstay of the chicle industry

12. Did you know chocolate was the money that grew on trees for ancient Mesoamericans?

13. Allspice is a native Mesoamerican spice tree used by the ancient Maya as medicine as well as a condiment

14. Avocado, a native to the Maya forest, has more potassium than banana, exotic to the Maya forest

15. One-quarter of all pharmaceutical medications have an active plant-derived ingredient

16. *Theobroma,* the scientific genus of chocolate, literally means “food of the gods”

17. Guatemala means “land of the trees” in the Maya-Toltec language

18. The seeds of amaranth species were used in Maya ritual ceremonies for the Feasts of the Dead