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Ancient use and manipulation of landscape in the Yalahau region of the northern Maya lowlands

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Abstract. The tropical lowlands of southern Mexico and Central America are composed of a complex mosaic of landscapes that presented a variety of possibilities and challenges to the subsistence practices of the ancient Maya. The Yalahau Regional Human Ecology Project has been investigating ancient Maya agricultural practices and use of resources in a unique fresh-water wetland zone located in the northeast corner of the Yucatán Peninsula. While containing only a sparse population today, the Yalahau region once supported numerous Maya communities and civic-ceremonial centers, particularly during the Late Preclassic and Early Classic periods, between approximately 100 B.C. and A.D. 450. Our investigations have developed evidence that the ancient Maya manipulated and cultivated the wetland landscape of the region, used soil or algae from the wetlands to enrich upland garden plots, and cultivated trees within their communities. We suggest that the study of ancient Maya agricultural practices can contribute to sustainable development of the area today and in the future.

Key words: Agriculture, Ancient agricultural systems, Cenotes, Homegardens, Maya, Periphyton, Settlement pattern, Tree cultivation, Wetland cultivation

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Introduction

The tropical lowlands of southern Mexico and Central America were home to one of the most complex civilizations of the Americas, the ancient Maya (Figure 1). Mention of the ancient Maya generally brings to mind their many accomplishments in art, architecture, astronomy, arithmetic, and hieroglyphic writing, associated primarily with the Classic period of their civilization, from about A.D. 250–900. While the political and demographic collapse that marks the end of the Classic period is generally regarded as the principal "mystery" of Maya civilization, the manner in which they managed to thrive in a seemingly hostile jungle has long baffled researchers. In scholarly tradition, it was long assumed that the Maya Lowlands were a harsh and fragile environment, capable of supporting only a sparse population dependent on slash-and-burn (swidden) cultivation of maize (see Meggers, 1954 as an extreme example). Typifying the negative attitude toward the tropical lowland environment was J. Eric S. Thompson, one of the most influential twentieth-century Maya scholars, who wrote in 1954:

> To me, one of the greatest mysteries is why Maya culture should have reached its peak in this region so singularly lacking in natural wealth, where man, armed only with stone tools and fire, had everlastingly to struggle with the unrelenting forest for land to sow his crops. Moreover, when he had wrestled the necessary area momentarily from the forest's grasp, he usually found a soil so thin and quickly

Figure 1. The Maya region of southern Mexico and Central America.

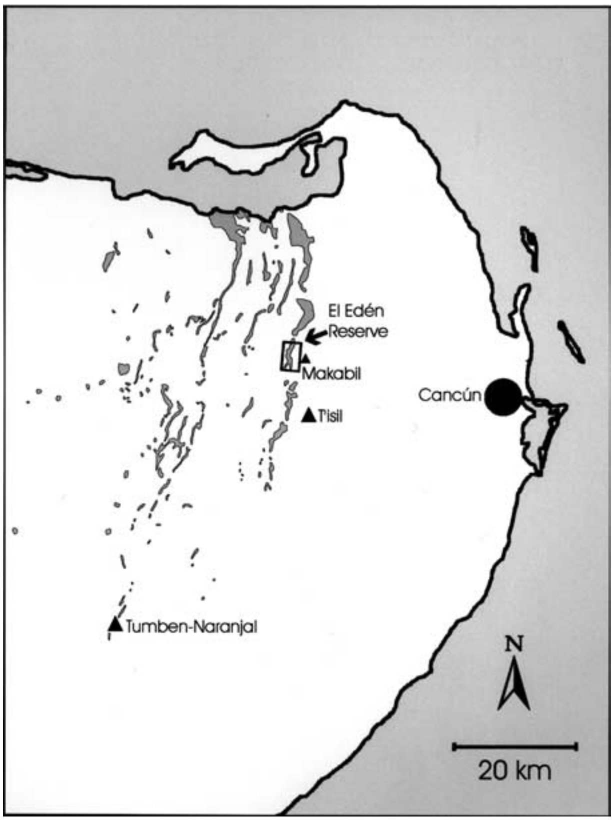

Figure 2. The Yalahau region of northern Quintana Roo, Mexico, with locations mentioned in the text. The shaded area of the interior represent wetlands.

> weed infested that after one or two crops, it had to be surrendered to his enemy, who lost no time in covering it once more with dense vegetation. (Thompson, 1954: 26)

Since Thompson's time, our knowledge of ancient Maya demography and agricultural practices has changed dramatically. We now know that the Maya Lowlands were densely populated, that those high population levels were maintained for many centuries, and that an impressive variety of crops and cultivation methods were used to support the millions of people who lived in the region during the Classic period (Culbert and Rice, 1990; Fedick, 1996a; Flannery, 1982; Harrison and Turner, 1978; Pohl, 1985; White, 1999). Our perceptions about the lowland environment have changed as well. Instead of being a uniform blanket of green forest, broken only rarely by swamps or an occasional savanna, the lowlands are beginning to be viewed as a mosaic of highly diverse land resources, combined in varying ways and at different scales to form a great number of distinct physiographic zones or sub-regional landscapes (Dunning et al., 1998; Fedick, 1996b; Gómez-Pompa et al., 2003; Turner, 1978). This mosaic landscape is also recognized as being dynamic; shifts in climate and hydrology, as well as human impact on the environment over many millennia of occupation, have changed patterns of resource endowment (e.g., Curtis et al., 1996; Dunning et al., 2002; Gill, 2000; Gómez-Pompa et al., 2003; Haug et al., 2003; Pohl et al., 1996).

Nicholas Dunning and his colleagues (Dunning et al., 1998) have recently defined 27 distinct physiographic "adaptive regions" in the Maya Lowlands, each of which have environmental characteristics that imply a different mix of agricultural strategies and potentially unique trajectories of environmental change. The Yalahau region, an area of wetlands and forest in the northeastern Yucatán Peninsula, is one of the least known regions of the Maya Lowlands (Figures 1 and 2). Virtually unoccupied from the time of European contact until only recently, this region is today being settled by immigrants from many parts of Mexico and tapped for groundwater to supply the needs of the growing resort development area of Cancún. Since 1993, the Yalahau Regional Human Ecology Project has been studying ancient Maya land use and settlement history in this unique environment of the northern Maya Lowlands (Bell, 1998; Fedick and Taube, 1995; Fedick, 1998; Fedick et al., 2000; Lorenzen, 1999; Mathews, 1998; Morrison, 2000). Most recently, we have documented a previously unreported form of

Figure 3. A wetland of the Yalahau region.

wetland management, and have found evidence for tree cropping and use of fertilizers in home gardens of ancient Maya communities dating to about 100 B.C. to A.D. 350/450.

Rather than being a "... region so singularly lacking in natural wealth" (Thompson, 1954: 26), the mosaic landscape of the Maya Lowlands offered a great variety of resources that the Maya learned to recognize and use. Our studies in the Yalahau region provide another example of how the Maya could convert what might seem to be a forbidding wasteland into a productive landscape.

Defining the Yalahau region

The Maya Lowlands consist primarily of the vast limestone platform that makes up the Yucatán Peninsula (Figure 1). Tracing the peninsula from south to north, one finds a general decrease in elevation, topographic relief, forest canopy height, and annual rainfall (Wilson, 1980). The relatively flat, low-lying, northern lowlands present a seemingly stark environment for human occupation. Soils are rich, yet very thin, with vast areas of exposed bedrock mantled with only a skeletal covering of earth. Vegetation of the northern lowlands is medium to low semi-deciduous forest, decreasing to nearly desert-like low scrub-forest in the extreme northwest.

The porous karst geology results in vertical drainage of rainfall into subsurface rivers and caves (Wilson, 1980). There are virtually no surface rivers north of approximately 19 N. Latitude. Access to fresh water is generally restricted to natural wells or *cenotes* (karstic sink holes) and occasional small lakes associated with fault systems. In much of the northern lowlands, the water table can also be accessed by excavating hand-dug wells through the relatively soft limestone bedrock (see Matheny, 1978; Winzler and Fedick, 1995).

The northeastern corner of the Yucatán Peninsula contrasts dramatically with the general environmental characteristics of the northern Maya Lowlands (Figure 2). The extreme north of Quintana Roo receives much more rain than the rest of the northern lowlands, averaging up to 1500–2000 millimeters per year, an amount comparable to much of the southern lowlands. The abundant rainfall of northern Quintana Roo has contributed to the formation of a series of elongated depressions in the limestone bedrock that apparently formed as limestone dissolved along an underlying north-south oriented fault system (Tulaczyk, 1993). The dissolving of limestone within the depressions gradually lowered the land surface to the point where it met the water table, creating a series of fresh-water wetlands (Figure 3); consequently, the depth of water and seasonal duration of flooding in the wetlands are closely related to seasonal changes in groundwater levels (Tulaczyk, 1993: 112–131). The wetland zone extends from the north coast to about 50 kilometers south, with a width of about 40 kilometers. We refer to this wetland zone and associated upland terrain as the Yalahau region (Fedick and Taube, 1995).

An overview of settlement in the Yalahau region

Archaeological investigations in the Yalahau region have begun to develop an initial approximation of settlement history and settlement distribution in relation to natural resources of the area. While the project is about to embark on a major regional program of resource classification, settlement survey, and test excavation, some initial patterns can be discerned.

Settlement history

The history of human occupation in the Yalahau region is not yet well understood, but appears to be quite sporadic and out of synchronization with surrounding areas. Test excavations and surface collections at three sites of widely differing sizes suggest that the region was first occupied during the Late Preclassic period (400 B.C. to A.D. 250/350), most likely around 100 B.C.. This evidence is in the form of ceramics recovered from the large civic-ceremonial center of Tumben-Naranjal, the medium-sized residential community of T'isil, and the small hamlet of Makabil (Figure 2). Interestingly, Nabanche phase ceramics recovered by Dominique Rissolo from caves in the southern Yalahau region date back to much earlier times of the Middle Preclassic period, probably around 500 B.C. (Rissolo, 2003). However, the nature of early human presence in the region as represented in the caves is uncertain and may represent either an extremely sparse occupation that has not yet been identified at surface sites, or pilgrimages to caves as sacred sites by travelers passing through the region on the way to the coast (Rissolo, personal communication, 2001). As of 2001, no Middle Preclassic ceramics have been recovered from any contexts at surface sites investigated by the Yalahau project.

Initial occupation of the region during the Late Preclassic period appears to be widespread, with many sites containing dense concentrations of ruined residential structures and ample ceramics diagnostic of this period. This strong surge of occupation seems to have been relatively short-lived, as settlements throughout the region appear to have been abandoned by the early part of the Early Classic period, around A.D. 350. Occupation at Tumben-Naranjal lasted perhaps another century, until about A.D. 450 (Mathews, 1998). After that time, only a few ceramic sherds from Tumben-Naranjal and T'isil suggest any presence in the Yalahau region for nearly 800 years, until a limited reoccupation during the Late Postclassic period, beginning about A.D. 1250 when Tumben-Naranjal, and to a lesser extent T'isil, were reoccupied (Hoover, 2003; Lorenzen, 1999). Other sites in the Yalahau region are also known to have been occupied during the Late Postclassic (Taube and Gallareta Negrón, 1989).

The apparent wide-spread abandonment of the Yalahau region during most of the Classic period and the Early Postclassic period, especially after such a pronounced initial occupation, is anomalous. To the west in the Chikinchel region, the Classic period is a time of growth, with clear continuity through the Postclassic (Kepecs, 1997, 1998). To the south of the Yalahau region, the site of Cobá developed as a major population center by the end of the Early Classic period and dominates that region through the Terminal Classic, with occupation continuing throughout the Postclassic although in a reduced density and with significantly less political clout (Folan et al., 1983). On the east coast, there is minimal evidence for occupation until the Postclassic, when the expansion of coastal trade routes apparently draws massive populations near the shore (Robles Castellanos and Andrews, 1986; Silva Rhodes and María del Carmen Hernández, 1991).

Settlement pattern

A critical factor in settlement location within the wetland environment of the Yalahau region is the use of upland areas. Within the relatively high topographic relief of the southern and western areas of the Yalahau region, sites such as Tumben-Naranjal are located directly adjacent to steep-sided and well-contained wetlands (Figure 2). In the eastern portion of the Yalahau region, where relief is much lower, seasonal flooding can expand wetland margins dramatically, prohibiting permanent settlement within a large flood zone (Fedick, 1998: 120). Topographic studies in the vicinity of the El Edén Ecological Reserve and associated wetland revealed a protective ridge located 1.4 kilometers east of the wetland's dry-season margin and rising 2.2 meters above its dry-season water level (Morrison, 2000: 148). All settlement identified to date in the area of the El Edén wetland and those immediately north and south of it is located beyond this natural barrier.

Each ancient settlement identified to date within the Yalahau region is located adjacent to one or more *cenotes*. After selection of non-flooding areas, access to the water table through these natural sinkholes appears to have been a primary determinant of settlement location. A survey of *cenotes* in the vicinity of the El Edén Ecological Reserve by Julie Bell (1998) concluded that all settlements in the area are associated with *cenotes*, although not all *cenotes* have associated settlements. It was also noted that settlements with elite residential and/or monumental architecture were associated with large sinkholes: either classic open-water *cenotes* or soil-filled, seasonally-flooded varieties of *cenotes* referred to locally as *dzadzes* or *nauahuelas*. Non-elite sites in the area are associated with smaller, well-like *cenotes* with permanent water, but with surface openings often less than about 4 meters in diameter.

Because some *cenotes* in upland areas surrounding the El Edén wetland are found not to have any associated settlement, it is clear that the criteria of avoiding areas of potential flooding, and selection of locations with *cenotes*, are not the only environmental factors that were involved in selecting a location for a settlement. Large settlements in the area, such as T'isil, are associated with *cenotes* in area of deep soils, whereas upland *cenotes* with shallow or skeletal soils remained unoccupied. Interestingly, the small, non-elite site of Makabil is located in an area of extremely sparse soils. Residents of this community likely relied on the agricultural potential of the nearby El Edén wetland and may, as discussed below, have augmented the local soils to increase the productivity of their homegardens.

Use of wetlands in the Yalahau region

Evidence for ancient use of wetlands for subsistence production in the Maya Lowlands has previously been restricted to the southern lowlands, where various forms of wetlands cover a large amount of the terrain (e.g., Culbert et al., 1990, 1997; Gliessman et al., 1983; Pohl, 1990; Siemens and Puleston, 1972; Turner and Harrison, 1983). Wetlands are rare in the northern lowlands, being primarily restricted to coastal zones. The few reports of features within these northern coastal wetlands describe linear depressions that have been viewed from aerial surveillance, and are generally interpreted as transportation canals of either prehistoric or historic origin (López Ornat, 1983; Matheny, 1976, 1978; Millet, 1984). Other features recorded in the salt-water or brackish-water coastal wetlands are the remains of salt production facilities, some of which do apparently date to Prehispanic times (Andrews, 1983, 1985; Kepecs, 1998; Kepecs and Boucher, 1996: 81–82; Sierra Sosa, 1999).

Reconnaissance level survey in the Yalahau region during 1993 provided evidence for clustering of ancient settlement around the margins of wetlands, and identified a single rock-alignment feature within a wetland adjacent to the large site of Tumben-Naranjal (Fedick, 1998: 115; Fedick and Hovey, 1995: 92). Further reconnaissance in 1994 and 1995 focused on a major wetland located within the El Edén Ecological Reserve where an extensive system of rock-alignment features was identified (Fedick, 1995a). Prompted by these discoveries, a full-scale survey of the El Edén wetland was conducted in 1996–1997, followed by test excavations at a small sample of these features in 1997.

Investigations at the El Edén wetland

The El Edén wetland consists of a large, shallow depression measuring approximately 5.5 kilometers north-south by 0.8 kilometers east-west. The wetland is situated within the El Edén Ecological Reserve (Figure 2), a 1495 hectare tract of privately owned land established in 1991 as a reserve dedicated to both conservation and experimental approaches to sustainable land use (Gómez-Pompa and Dirzo, 1995). The El Edén wetland floods during the rainy season (approximately June through November), while standing water is present only in depressions during the dry season. The terrain surrounding the wetland is of very low relief, and a wide margin around the wetland is subject to occasional flooding associated with hurricanes.

A full-coverage pedestrian survey of the El Edén wetland was conducted under the direction of Fedick, using aerial photographs and a Global Positioning System (GPS) to locate and map features (Figure 4). A total of 78 rock-alignment features was recorded, varying in length from a few meters to about 700 meters (Figures 5 and 6). Test excavations at rock-alignment features were conducted under the direction of Bente Andersen and Fedick. The four features selected for excavation (Alignments 11, 41, 42, and 57) represent a range of alignment forms and physiographic settings within the wetland. The excavations revealed a concentration of water-worn limestone gravel along either side of the alignments, suggesting that that the alignments may once have functioned as foundations for earthen berms that have since eroded away (Andersen, 2001; Fedick, 2003; Fedick et al., 2000). Recent reconnaissance in two large wetlands located south of El Edén has identified extensive rock alignment systems similar to those in the El Edén wetland.

Climate change and the interpretation of wetland use

The interpretation of ancient use of wetlands in the Yalahau region must take into account evidence that the hydrology of the area has not remained constant over time. Recent studies suggest that climate (and by extension, seasonal variability in the water table) in the northern Maya Lowlands has fluctuated through the last three thousand years (Curtis et al., 1996; Leyden et al., 1998). Other studies have documented evidence for a gradual rise in sea-level that continued after the Pleistocene, in turn raising the water table of the karstic Yucatán Peninsula (Alcala-Herrera et al., 1994; Dunn and Mazzullo, 1993; Folan et al., 1983: 43–48; McKillop, 1995). More recent studies on Key Biscayne, Florida, and the Gulf Coast of Texas suggest that the Holocene record of sea-level change is much

Figure 4. Mapping rock alignment 42 during survey of the El Edén wetland.

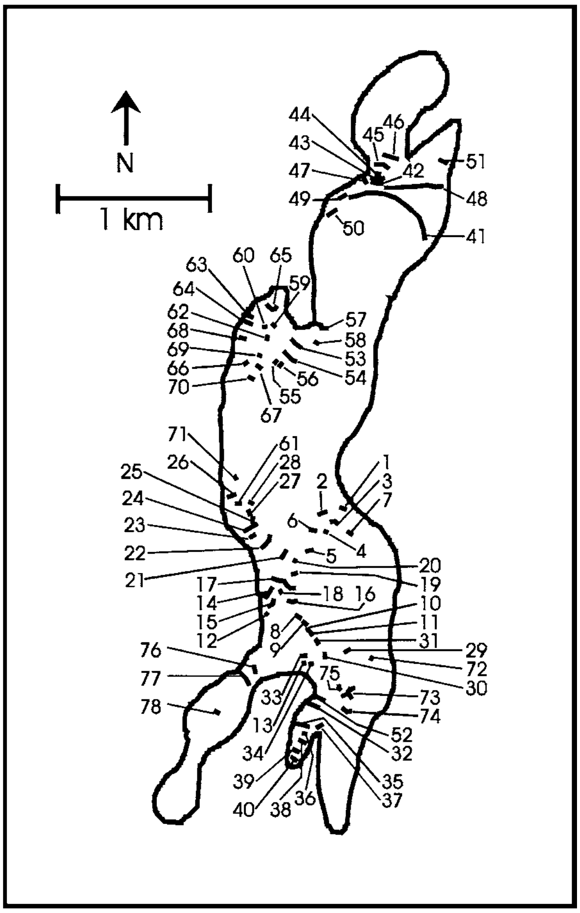

Figure 5. Outline of the El Edén wetland with the locations of the 78 recorded rock-alignment features.

Figure 6. Rock-alignment feature 41, facing west. The western terminus of the 700 m alignment is at higher ground marked by the tree line visible in the background.

more complex and varied than previously known, with multiple highstands having brought the sea to higher levels than today (Froede, 2002; Morton et al., 2000). Fluctuations in sea-level may have strongly influenced the timing and nature of ancient wetland manipulation in the Yalahau region.

Further studies will be necessary in order to determine the exact nature of ancient wetland management in the El Edén Ecological Reserve and elsewhere in the Yalahau region, but some preliminary hypotheses have been developed and are currently being investigated (Fedick et al., 2000). Most of the rock alignments identified so far are situated within the shallow channels that flow into two large depressions in the north and south ends of the wetland that represent the most extensive tracts of relatively deep soil, currently dominated by sawgrass (*Cladium jamaisense*) and cattail (*Typha dominguensis*). Assuming a lower water table than today, the large depressions may have been used for cultivation, with the cross-channel alignments functioning to slow the rush of rainwater runoff into the depressions, while also serving to build up sediments behind their walls, which then could also have also been used for cultivation. The long alignments closing off the north end of the wetland may have served as breakwaters or dikes to protect cultivated areas from runoff. The hydrological regime active at the time of wetland use would have strongly influenced the seasonality of cultivation, but it is likely that planting would have been scheduled either as a flood-recessional system at the close of the rainy season, or as a late dry-season crop, referred to today as a *marceño* (March) planting of maize varieties that are tolerant of flooding (see Culbert et al., 1978; Gliessman, 1991; Wilk, 1985).

The project is also exploring the possibilities that ancient management of the wetlands may have functioned to increase the productivity of wetland resources as an alternative or supplement to cultivation of domestic crops. The abundance of edible wetland resources such as cattail, tasiste palm (*Acoelorraphe wrightii*), apple snails (*Pomacea flagellata*), and numerous species of fish and turtle, is determined in large part by hydrological conditions that could have been manipulated by the ancient Maya to increase productivity of these resources. Ongoing analysis of faunal remains recovered during excavation of household trash deposits at the site of T'isil have identified an abundance of fish bone, turtle carapace, and the presence of shell from apple snails. Another intriguing possibility is that the abundant periphyton that grows within the El Edén wetland may have had a significant role in the agricultural ecology of the region. Periphyton is a colony of algae, fungus, bacteria and other living organisms, and detritus, that forms a mat several centimeters thick over most flooded areas of the El Edén wetland. We are exploring the possibility, along with our colleagues, that periphyton could function as a natural, renewable, and manageable source of agricultural fertilizer (Fedick, 2003; Morrison and Cózatl, 2003; Novelo and Tavera, 2003; Palacios-Mayorga et al., 2003). Dried periphyton, or the associated enriched organic soils of the wetlands, could have been transported and applied as fertilizer in upland agricultural fields or homegardens.

Intensive gardening and tree cultivation in the Yalahau region

Preliminary evidence from the sites of Makabil and T'isil suggest that homegarden cultivation and tree cropping may have been major forms of land use in the region. The cultivation of homegardens is an important part of modern Maya subsistence practice, incorporating a great variety of economically important tree species as principal crops (Anderson, 1993, 1995; Fletcher and Kintz, 1983; Herrera Castro, 1994; Ortega et al., 1993). Archaeological evidence from various areas of the Maya Lowlands suggests that this form of intensive gardening has been conducted since Prehispanic times. This archaeological evidence takes the form of regular spacing between household residential groups, thereby leaving space for potential gardening activities (Drennan, 1988), the enclosure of land surrounding ancient individual household sites by wall systems in the same way that the boundaries of Maya houselots and homegardens are defined today (e.g., Fletcher and Kintz, 1983; Goñi Motilla, 1993; Sierra Sosa, 1994; Silva Rhoads and María del Carmen, 1991), the location of residential sites within prime agricultural lands (Fedick, 1995b), the addition of soil amendments within house lots as indicated by nutrient enrichment and artifact distributions (e.g., Killion et al., 1989), the distribution of cultivation tools in the vicinity of residences (McAnany, 1992), and, in the rare case of Cerén, in El Salvador, actual garden plots preserved beneath volcanic ash (Wiseman, 1998).

Use of periphyton or wetland soil in homegardens of Makabil

The use of household refuse, and possibly night soil, as fertilizer within ancient homegarden plots has been documented at several ancient residential sites in the Maya Lowlands (e.g., Ball and Kelsay, 1992; Dunning, 1992; Killion, 1992; Killion et al., 1989). Recent research by Bethany Morrison at the site of Makabil has produced evidence that periphyton or wetland soils were transported to this small residential hamlet and incorporated into soils surrounding ancient residences (Morrison, 2000; Morrison and Cózatl, 2003; see also Fedick, 1998: 123).

The wetlands of the Yalahau region host numerous species of mollusks that feed primarily on the abundant periphyton growth. Most of these mollusks are gill-breathers that live exclusively within the aqueous environment of the wetland. Wetland species identified to date include four gastropods (*Pomacea flagellata*, *Pygophorus coronatus*, a species of *Physella*, and a species of *Biomphalaria*), a bivalve (*Sphaerium transversum*), and a limpet (*Hebetancylus excentricus*) (Morrison and Cózatl, 2003). Terrestrial species of gastropods are also common in the upland environments of the region (see Morrison, 2000; Morrison and Cózatl, 2003). Soil samples taken at regular intervals along a transect that runs from the El Edén wetland through the site of Makabil revealed a distribution of mollusks that suggests periphyton or soil was transported from the wetland and deposited within the site area. Moving east along the transect, and away from the wetland, the abundance of wetland mollusks decreases sharply with distance from the wetland, probably corresponding with the maximum extent of flooding. After a gap of about one kilometer where wetland species were absent, wetland species of mollusks again appear, but only in association with the settlement at Makabil (Morrison, 2000: 150–163). All wetland species, except *Pomacea flagellata* and *Sphaerium transversum* were identified with the settlement area. This pattern of mollusk distribution is interpreted as being the result of human transport of periphyton or wetland soil for use as fertilizer in homegardens at Makabil (Morrison, 2000: 170, 174–175, 179–180; Morrison and Cózatl, 2003). The project is currently investigating the possible use of periphyton or wetland soils as agricultural fertilizer at T'isil.

Tree cultivation at T'isil

The importance of tree cultivation in ancient Maya subsistence has received increasing attention in recent years (e.g., Lentz, 1990, 1991, 1999; McKillop, 1996). Besides the recovery of carbonized tree remains from archaeological sites, an additional form of evidence for tree cultivation is the many examples of small gravel piles, often referred to as *chich* mounds, reported for the northern Maya Lowlands (e.g., Ringle and Andrews, 1988). Kepecs and Boucher (1996) have suggested that *chich* mounds functioned to conserve moisture and to provide support for trees cultivated in the shallow soils of the northern lowlands. Kepecs and Boucher (1996: 76) report that *chich* mounds are used in tree cultivation in Yucatán villages of today, and we have also seen many examples of them in homegardens in both Quintana Roo and Yucatán (Figure 7).

Figure 7. A modern *chich* mound at the base of a tree.

Ongoing mapping at the site of T'isil has documented 178 *chich* mounds within the approximately one-third of the site that has been surveyed as of 2000. The mapped portion of the site (about 38 hectares) had been cleared of vegetation and burned, allowing detailed mapping of features, such as *chich* mounds, that would otherwise be difficult to distinguish. *Chich* mounds are common throughout much of the mapped settlement area, with an average density of 4.7 *chich* mounds per hectare, and with many portions of the site containing densities as high as 28 mounds per hectare (Figure 8). Tree cropping within homegardens at T'isil appears to have been a major form of agricultural land use in this ancient community.

Conclusions

The Yalahau region represents a unique wetland environmental zone of the northern Maya Lowlands

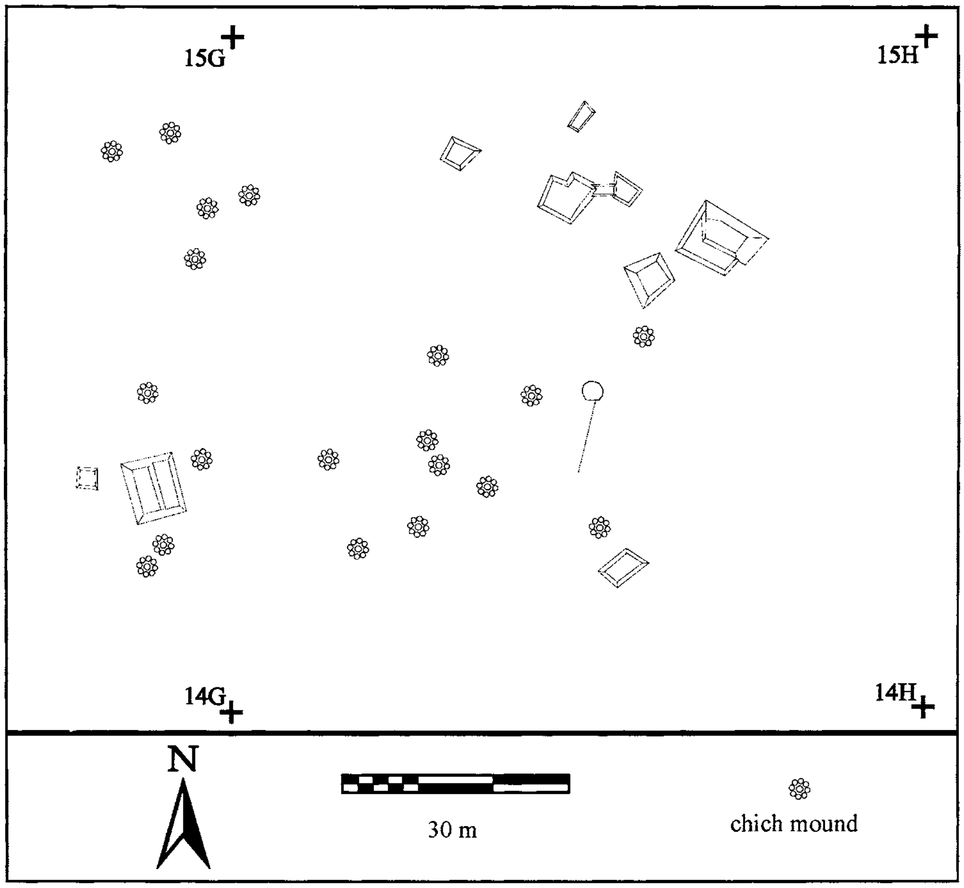

Figure 8. *Chich* mounds associated with residential structures within the ancient Maya community of T'isil. Labeled crosses represent 100 m grid corners of the T'isil site map.

that has a correspondingly unique, and anomalous, settlement history. We recognize that political dynamics likely played an important role in the settlement history of the Yalahau region, but we also suspect that the development and decline of the region is probably linked to the dynamic nature of the landscape; that is, the changing suitability of the wetlands for cultivation in response to changes in climate and hydrology. The system of management employed in the El Edén wetland is quite different than the channelized wetland margins and raised planting platforms that have been described and studied in the southern Maya Lowlands. The rock alignments within the El Edén wetland probably represent a form of surface manipulation intended to control the movement of water and soils through seasonal cycles of flooding. We hope that planned studies of pollen cores from the wetlands will identify the crops that were cultivated, as well as clarifying how changes in hydrology and climate may have altered the suitability of the wetlands for cultivation. Outside of the wetlands, it seems that ancient farmers of the Yalahau region used innovative techniques to cultivate infield areas; transporting periphyton or wetland soils for incorporation into homegardens, and the cultivation of trees within those gardens, as indicated by *chich* mounds.

Recent and ongoing research in the Maya Lowlands has dramatically changed our perceptions of the environment. Rather than being a uniform blanket of green with redundant resources and a limited number of potential cultivation methods, we now perceive a mosaic landscape of varying resource capabilities and limitations to which the ancient Maya adapted in innovative and highly productive ways. Recognizing the diversity of landscapes and the dynamics of landscape change through time, is a necessary step in breaking academic myths about the Maya and developing an appreciation for their skills as managers of their environment.

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