Living on the Edge:
Fifty Years of Belize Wetland Archaeology

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Abstract

In the early years of Maya archaeology, Belize was considered a "periphery" and the wetlands were at the far edge of this pseudo-backwater. It was not until the 1970s with Turner and Harrison's seminal study of Pulltrouser Swamp that Belize and its wetlands moved from the periphery to center stage in Maya archaeology. Northern Belize contains some of the largest tracts of wetlands throughout the Maya Lowlands, providing rich repositories of well-preserved pollen, phytoliths, and macrobotanical remains, which have yielded some of the earliest evidence of Maya cultivation. Geomorphological studies have greatly advanced our understanding of the construction, use, and abandonment of Maya ditched and drained fields in Belize. And in more recent years, LiDAR and other geospatial technologies used as mapping tools have shown that wetland modifications in Belize were much more expansive than previously thought. Our own work in Belize's Crooked Tree Wildlife Sanctuary reveals wetland enhancements were vast but also more varied, with some being used primarily as large-scale fish-trapping facilities, rather than as agricultural fields. In tracing the last fifty years of archaeological investigations, we show how Belize has moved the field forward and remains at the cutting edge of wetland research across the Maya Lowlands.

[**Intro Slide**] My co-authors and I would like to thank the organizers Jaime and Arlen. We are honored to be a part of this incredible double session where we have been tasked with reviewing the last 50 years of wetland archaeology in Belize. Admittedly, this is a little daunting, especially with the Beachs (Mr. and Mrs. Wetlands) sitting right over there - if you've got any questions after the talk just go ask them!

The title of our talk "Life on the Edge" plays on the theme of this session, which builds on David Pendergast's 1993 article ("The Center and the Edge"). Our collective aim is to move Belize archaeology (in our case wetland archaeology) from the edge to center stage. In our talk, we briefly trace the historical trajectory of wetland research [**SLIDE 2**] (fortunately for us, these two new articles just came out that offer up-to-date reviews of agriculture, including wetland studies; [**SLIDE 3**] I think their map of the Maya lowlands says it all…check out the overwhelming number of studies that have been carried out in Belize). [**SLIDE 4**] In the low-lying coastal zone of northern Belize, at elevations below 80-100 m there are vast tracts of modified perennial wetlands (the light green squares) that form in karstic depressions, like Pulltrouser Swamp and in slower-moving rivers like the New River and the Rio Hondo. Moving west into the interior in the uplands of northern Peten where the elevation is above 80-100 m, there are also vast tracts of seasonal wetlands or *bajos* found in karstic depressions (the dark green squares in this map); these wetlands are not connected to rivers and the evidence for artificial features is less prominent; when present they are usually restricted to the margins of the bajos.

[**SLIDE 5**] Belize is where we find the bulk of the "classic" patterned, lattice-like ditched and drained wetland fields, although similar examples have also been identified

in Mexico in the low-lying wetlands of the [**slide**] Candelaria in Campeche and areas of southern Quintana Roo. However, Belize is where the bulk of wetland studies have been carried out to date. In this presentation, we discuss how current research in Belize has moved the field of wetland archaeology forward over the last fifty years, expanding our understanding of: **(1) the types of cultigens (**other than maize) grown in wetland fields; **(2) the overall chronology** of wetland use and modification (that is, wetland are used much earlier and much later than we initially thought); **(3) the aerial extent** of wetland modifications through more advanced remote sensing technology (much more vast than previously thought); and **(4) early intensification of food production** in wetlands (we are now realizing that wetlands supported not only early agriculture but also large-scale aquaculture with the mass harvesting of fish and other aquatic resources – that was a teaser - I will come back to our exciting new fisheries data at the end of my talk!).

[**SLIDE 6**] In Pendergast's 1993 article, he noted that some of the earliest wetland investigations occurred in Belize but that it wasn't until the late 70s and early 80s that wetland archaeology really took off, starting with Turner and Harrison's seminal study of Pulltrouser Swamp in northern Belize. Their work highlighted some of the first real compelling evidence of Maya agricultural intensification beyond a simple slash-and-burn milpa strategy. The results of their work moved Belize and the wetlands from the periphery to center stage in Maya archaeology.

When Pendergast (1993:9) was writing his article in 1992, he described this period of time as the "blossoming of Belize" [**SLIDE 7**] (Coincidentally, it just so happens that 1992 was the first year I came to Belize…And I worked at Wildcane Caye with none other than [**slide**] Dr. Heather McKillop (that was a blossoming experience). [**SLIDE 8**]

And a few years late in the mid-90s I myself had the distinct pleasure of working in Pulltrouser Swamp (Berry and McAnany 2007), as part of the K'axob project directed by Patricia McAnany. (Not sure if you can make out which one is me or not in these photos)…Yes, Belize was blossoming in the 90s and as Pendergast noted wetland archaeology at that time was really taking off.

Advancing our Understanding of Agricultural Production

[**SLIDE 9**] In addition to Pulltrouser Swamp, other surveys and excavations of ditched and drained wetland fields were being carried out in northern Belize in the late 1900s (as my kids like to say). [**slide**] This includes Mary Pohl's study of the wetlands in and around Albion Island (Bloom et al. 1983; Pohl 1990, ed.; Pohl et al. 1996; Pope and Dahlin 1989). Excavations and coring occurred there and at Douglas and Cob Swamps along the Rio Hondo (Jones 1994; Pohl et al. 1996) as well as at Cobweb Swamp near Colha (Jacob 1995). These studies revealed rich repositories of archaeobotanical remains, including domesticates of manioc, maize, and other cultigens and again put Belize on the map for providing at that time the earliest evidence of wetland agriculture. These scholars demonstrated that intensification of wetland use began as early as the Late Archaic period around 2500 BC. Pollen and wetland sediments showed that the introduction of cultigens was accompanied by mass forest clearing evident in a decrease in arboreal pollen, higher erosion rates, and an abundance of microscopic charcoal -- all indicative of increased burning and forest clearing for agriculture (Pohl et al. 1996).

[**SLIDE 10**] By the beginning of the 21st century, Tom Guderjan, Tim and Sheryl Beach, and their graduate students (which includes my co-author Dr. Sam Krause) had

begun their wetlands investigations in northwest Belize around the site of Blue Creek. [**SLIDE 11**] Their excavations and coring at sites like Chan Cahal wetlands provided valuable geomorphological and geochemical studies of soils that have shaped the current understanding of how Belize's wetlands formed over the Holocene period. They determined that sea level rise during the Preclassic period occurred and that the Maya responded by building extensive canal and field systems to drain the water and create planting platforms.

[SLIDE 12] Revising Wetland Chronology

For the Maya, it has been assumed that these fields were developed during the apex of Maya society in the Late Classic period (ca. AD 600-800) to support the burgeoning populations, similar to the Aztec chinampas. The Albion Island wetlands in Belize excavated by Mary Pohl and others refuted this idea, recovering radiocarbon dates suggesting that they were built earlier during the Formative period (Bloom et al. 1983; Pohl 1990; Pohl et al. 1996). [**SLIDE 13**] And in northwest Belize, radiocarbon dates from excavations of canals and fields in the Birds of Paradise and Chan Cahal wetlands have brought this entrenched model into further question. Their results show that many of these enhancements date to the Terminal Classic period, suggesting that the wetlands and their adjacent centers persisted while nearby urban centers declined and were abandoned during the so-called Maya "collapse" period.

[**SLIDE 14**] **Advances in Remote Sensing and Mapping of Wetland Modifications**

What first put the wetlands of Belize on the map was aerial imagery of ditched and drained wetland fields in northern Belize captured by Dennis Puleston (1977) and Alfred Siemens (1982) in the 1970s. Because wetlands are partially or fully inundated environments, they are easiest to identify and map from the air, as these images attest. Over the last decade or so, the development of a range of more powerful remote sensing technologies has dramatically improved our ability to map landscape-scale wetland features from a birds-eye-view. **[SLIDE 15]** This includes the use of airborne and drone-mounted LiDAR. Again, Belize has led the way in applying this technology to a range of environments, including wetlands. The most notable in this regard have been the Blue Creek project. They report their astounding results in Beach et al. 2019 article among several other prominent publications. **[SLIDE 16]** Other LiDAR conducted as part of a consortium of projects in the western upper Belize Valley has revealed evidence of ditched and drained wetland fields along the floodplains around the site of Baking Pot (Ebert et al. 2016a, 2016b).

Just to the east of Barton Ramie farther down river, [**SLIDE 17**] our Belize River East Archaeology (BREA) project has used a combination of remote sensing technologies, including drones and Google Earth imagery to map vast tracts of ditched and drained wetland fields in the hinterlands surrounding the large center of Saturday Creek. Volatile flooding regimes like the Belize River Valley are found in many river valleys in the Maya Lowlands and it is likely that many more wetland fields exist but, as Fed-dick and others (2024:133) have observed, they have likely "been buried over the years by alluvial deposits."

[**SLIDE 18**] Through aerial survey we have also identified a distinctive configuration of linear wetland features [**slide**] in the BREA study area in the Western Lagoon wetlands of the Crooked Tree Wildlife Sanctuary (CTWS). Eleven of these linear channels were initially documented by Anne Pyburn in the vicinity of Chau Hiix when she worked at this Maya site over 20 years. [**SLIDE 19**] Since then, a much more powerful range of remote sensing technologies have been developed. Using Google Earth and drone imagery, we have been able to identify a total of 167 linear features that extend over 30 km in length, a vast area that measures over 40 km^2. Throughout most of the Western Lagoon, these linear zigzag canal features are paired with a series of ponds. [**SLIDE 20**] These wetland modifications resemble ethnographically-documented fish-trapping facilities found in Zambia, Africa, and closely parallel other Pre-Colombian fisheries recorded in the Bolivian Amazon, which were designed to channel annual flood waters into source ponds for fish-trapping. [**slide**] We suggest this was the function of the Western Lagoon wetland features.

[**SLIDE 21**] We carried out three test excavations and presented our preliminary findings at the 2022 SAA meetings. Since then, we have run a total of 26 calibrated radiocarbon dates from our excavations. The findings surprised us, but the stratified sequence of dates indicates that the channels themselves were initially built by Late Archaic hunter-gatherer-fisher groups as early as 2000 BCE and continued to be used by their Formative Maya descendants.

[**Figure 22**] Based on ethnographic comparisons, we estimate that this this fish-trapping facility could have easily provided over one million kg of fish per year, which

could feasibly feed upwards of 25,00 people. This certainly have satisfied the needs of a growing demographic and sedentary population by Middle to Late Formative times. [**Figure 23**] Agricultural intensification after 2000 BCE has been credited for supporting the development of complex society in Formative Mesoamerica, but we suggest some groups in the wetlands relied more heavily on the mass harvesting of aquatic resources and was a staple food source capable of supporting the rise of Pre-Columbian civilizations like the Maya.

Prehistoric fish weirs have been documented in native North and South America, but this is the first large-scale Archaic fish-trapping facility recorded in Central America. That said, we don't think it's the only one. [**Figure 24**] Through remote sensing, we have identified similar examples elsewhere in the Maya Lowlands, including the New River, Rio Hondo, Candelaria, and elsewhere as shown in this map. If coeval with those in the Western Lagoon, we would expect these areas to yield similar evidence of Late Archaic to Formative Maya occupation. Notably, in the locations with probable fish-trapping facilities we find evidence of monumental Maya centers shown on this map that have Early-Middle Formative occupation.

[**SLIDE 25**] Paleoclimate data from our excavations indicate that around the time these were constructed, there was a dry period that may correspond with a long-term drought recorded across Mesoamerica at the end of the Late Archaic (cal. 2200-1900 BCE). Rob Rosenswig (2015) has suggested this climatic disturbance was what led to the intensification of food production and a shift toward primarily maize cultivation. However, pollen and carbon isotope data from our excavations, shown here, do not show

any signs of cultigens; instead, we argue that the data suggest groups were responding by intensifying fish-trapping in the wetlands as their primary food source.

[**SLIDE 26 - acknowledgements**] In conclusion, wetland research in Belize continues to lead the way, revealing valuable information on early food production in terms of both agriculture and, now with our study, evidence of intensified aquatic food production. We have no doubt that Belize wetland investigations will continue to lead the way in transforming our understanding of the ancient Maya and their ancestors for years to come.

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