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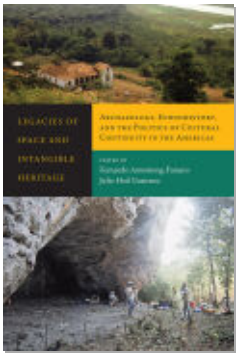

10

Interpreting Long-Term Human-Environment Interaction in Amazonia

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This chapter seeks to combine a retrospective analysis of archaeology in Amazonia with a reflection on how scholarly agendas evolved to dovetail with the interests and perspectives of living Amazonian peoples. In mid-twentieth-century scientific approaches, Amazonia was seen by pioneering social anthropologists and archaeologists as a wilderness that limited human adaptation to a unitary tropical forest culture of camps and villages relying on slash-and-burn cultivation and foraging. Although these scholars did not conceive of the possibility of indigenous impacts on the forest, the cultural geographers of that time did, based on cultural features of soil and topography that they observed. In the later twentieth century, ethnographers also recognized in Amazonia evidence of cultural effects on habitats, in the course of research on surviving indigenous land management systems and the cultural concepts behind them. At the same time, research in the approaches of "New Archaeology" revealed evidence of not just one indigenous tropical forest culture but a wide variety of chronologically and regionally distinctive indigenous human cultures and landscape adaptations through prehistory and history that had significant effects on the habitat even to today. Throughout this whole period, researchers' approaches tended to bifurcate into those who used deductive scientific hypotheses and empirical tests of them on the one hand and those who used description and analysis of native views and knowledge on the other, approaches not always compatible with each other.

Native Amazonians, as informants and as assistants in research studies, have made their own observations about and interpretive insights into both ancient and

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modern human-environment interactions, via traditional cultural approaches that embody deeper and broader memories and understandings of these relationships than do the Western ones. In their more integrative cultural systems of ancient landscapes, acute and fundamental scientific knowledge is interwoven with emotional states and symbolic concepts into a rich tapestry of a widely shared Great Tradition of Amazonian mythic and historical cosmology. These traditions explain the creation of the world, the origins of human societies, and the relationship of human societies with their environments through time and space. With such expansive knowledge and concepts, Amazonians have maintained high levels of sustainability and a high quality of habitat and human health over more than 13,000 years. However, the domination by European populations from the outside has marginalized Amazonian people politically, geographically, and economically and has significantly damaged their physical and mythological environments, as well. In the future, by taking a more sovereign role, Amazonian communities can contribute further to the preservation of their cultures and habitats as both project directors and contractors in research based on more holistic, nuanced, and practical views of Amazonian landscapes through time and space. Their participation as sovereign stakeholders could also help secure their rights to both territories and lifestyles and lead to fairer, more effective, and more productive sociopolitical, judicial, and environmental management there in the future.

A THEORETICAL JOURNEY IN AMAZONIA: ENVIRONMENTAL LIMITATION THEORIES ON HUMAN OCCUPATION OF THE AMAZON RAINFOREST

In the mid-twentieth century, in approaches of the first generation of scientific anthropologists and archaeologists to the question of indigenous land use in Amazonia, the environment was seen as an unalterable given that limited or even forcibly directed human affairs. As such, the character of the environment was assumed and thus not investigated by researchers at the time. The overall environmental determinism theory seemed so logical that it was used more to explain the archaeological record than to be tested by that record. Human adaptation to the Amazon environment was seen as more or less unitary and unchanging through time: an archetypal "tropical forest culture." So, human subsistence and land-management patterns in Amazonia were not treated as archaeological problems but as givens. Similarly, the behavior of indigenous populations through time had expected characteristics for scholars. People were assumed to have adapted to habitat by migrating from one place to another, rather than by developing new ways to use resources in place and cultural methods to maintain connections to communities in other regions. Scholars nevertheless recognized major variations in the

environment over space, and these were incorporated into their statements about regional differences in tropical forest culture and changes through time as populations migrated through Amazonia (Lathrap 1970; Meggers 1972; Steward 1949). Generally, anthropologists contrasted the resource productivity of the major alluvial floodplain regions to the resource poverty of the uplands away from large rivers. Such differences were considered the causes for contrasts in population size and density and in cultural complexity between regions. But this approach—often called cultural ecology after the concept developed by cultural anthropologist Julian Steward—only saw causality from environment to humans, not the other way around. Thus, people in resource-rich areas could develop denser settlement and more complex cultures, and people who moved out of those areas into poorer areas were considered to have been diminished in population and cultural complexity because of the lesser resource availability there.

THE GAIA HYPOTHESIS

In the natural sciences, however, field researchers had recognized for a long time that both animals and plants could have strong effects on their habitats and each other. Different levels of population density of deer, for example, were known to have very different effects on forest vegetation and thus on other animals, and even plant species distributions were recognized to have influenced other plants in the community, as when certain tree species, such as Black walnut, change soil chemistry around them in ways inimical to other plant species. In the late twentieth century, the Gaia Hypothesis built such insights into a comprehensive scheme that has gained popularity and even general scientific acceptance. First articulated in the mid-twentieth century, it contributed the insight that the larger community of biota has a strong effect on the global characteristics of the earth and its atmosphere, over and above the effects of particular chemical and physical processes (Lovelock 2000).

After a period of criticism, refinement, and testing, the tenets of the Gaia Hypothesis have been integrated into many disciplines. Its practical implications for human ecology are that the entire community of life-forms are essential in the development and maintenance of physical and chemical systems on earth and in the atmosphere. Thus, disrupting life-forms on a massive scale through uncontrolled industrial impacts could lead to significant deterioration of the earth's ability to sustain life. In its early application in Amazonia, particularly, scientists studying environmental water budgets showed that more than half of the tropical forest region's moisture at any particular time was tied up in the vegetation of the forest mass (figure 10.1) (Salati and Marques 1984; Salati and Vose 1986). When the forest was removed, these scientists showed, much of the original moisture became

Figure 10.1. Tropical forest at Taperinha.

unavailable, and the sudden direct exposure of the ground to sun and wind led to further losses. Thus, not only was the forest an important factor in stability and recycling of moisture in Amazonian climate, but its removal could threaten the integrity of the entire biophysical system.

Perhaps such research eventually made anthropologists more aware of the possibility that the Amazon rainforest might not have been a purely natural unilinear causative force upon indigenous human cultures as much as a complex natural community that had long interacted with human communities, resulting in continuing change, mutual influence, and adaptation in both communities. In any case, scientists' first conscious awareness of the possibility that there had been a more complex, multilinear, and mutualistic relationship between humans and Amazonian habitats during prehistory came not so much directly from theoretical insights but from problem-oriented empirical findings that they made as a result of applying methodological innovations from North America to the region.

THE "NEW ARCHAEOLOGY" IN AMAZONIA

A new generation of archaeologists began looking at Amazonian sites, sequences, and regions in the 1970s and 1980s, many of them influenced by contacts with founders of the "New Archaeology" (Binford and Binford 1969), such as Stuart

Struever, Jane Buikstra, and Howard Winters, in my case. Developments in North American archaeological theory and method motivated its practitioners to pursue problem-oriented research in interdisciplinary paleodietary, paleoenvironmental, and bioarchaeological fields, as well as settlement analysis, among other directions. The "New" approach by American archaeologists continued and developed Steward's environmental determinism/cultural ecology. But in doing so, it also brought more recognition of the fact of systematic cultural change through time, especially in response to change in demographic parameters. By implication, if there had been a series of different cultural solutions to humans' need to engage with their environments, then the characteristics of a particular environment could not have been as limiting to demographic and cultural development as originally thought by Steward.

Applied to Amazonia, such research soon furnished evidence that there had been—not just one but—many chronologically and regionally distinct prehistoric human cultures and settlement arrangements and that their sequence of development was unexpectedly long and complex, going back at least 13,000 calendar years (e.g., Roosevelt 2000, 2014). So, whereas the early Paleo-Indians chose to move about seasonally, collecting a broad spectrum of natural plant and animal species as they moved, early Holocene foragers chose to settle down along rivers and wetlands and subsist by intensifying use of certain local fish and shellfish (figure 10.2). Subsequently, so-called Formative Amazonians added various domestic crops to their subsistence mix and spread out widely but thinly in most regions. In only a few places did the early agriculturalists group into large dense concentrations of population. Populous later prehistoric complex cultures narrowed and intensified resource use, specializing in mass collection of aquatic resources and cultivation of plant staples, while their country cousins in the hinterlands maintained a broader spectrum of resources for their support. Thus, by implication a current people's relationship with their habitat was not necessarily the same as that of their predecessors nor even of their neighbors (Roosevelt 1989, 2014). Since there had been changes through time, one could not necessarily "project" today's ethnographic patterns into the deep past. One had to investigate specifically the patterns of different periods as well as different places to reveal the patterns of similarity and difference.

NATIVE AMAZONIANS' AGENCY IN THE RELATIONSHIP WITH THEIR HABITATS

More or less at the same time as these developments in archaeological method and theory in Amazonia, several ethnobotanists and ecological anthropologists

Figure 10.2. Floodplain and floodplain forest, Monte Alegre.

began to look more closely at the details of landscape management by living Native Amazonians through ethnographic research (Anderson et al. 1991; Balee 1999; Posey and Balee 1989; Posey 2002; Smith 1999). Insightful early research by cultural geographers in Amazonia already had revealed instances of widespread purposeful alterations of the habitat by certain prehistoric communities. These alterations involved such things as large raised field systems in wetlands and large anthropic earth deposits on uplands (Denevan 1966; Smith 1980; Sternberg 1975). The abovementioned ethnographic and economic botany studies of the 1970s and 1980s found further evidence of significant, purposeful human effects on the botany and soils of their habitats and recovered important new information on indigenous savants' interpretation of habitat in terms of regional ritual systems and cosmologies. Not only were living Amazonian Indians visibly impacting their environments, but they were doing so in both purposeful and in unconscious ways, leaving their virtual "footprints" in the forests. For example, some people had created vast cultural forests dominated by certain useful palms. Others had made a series of clearings in order to encourage the proliferation of plants useful in their medicine or technology systems. Recognition of these dynamic processes enriched understanding of the relationship of people to their habitats, but attention to the role of cosmology and myth in the relationship was rare (Balee 1999).

ARCHAEOLOGISTS COME TO RECOGNIZE THE DYNAMISM OF THE HUMAN-ENVIRONMENT RELATIONSHIP

Continuing archaeological research in Amazonia in the 1990s and first decade of the twenty-first century also encountered evidence of prehistoric indigenous landscape management strategies that altered habitats, in some cases with far-reaching effects that still today influence the nature and quality of environmental resources and condition people's attitudes and approaches to them. Evident from this continuing research were interesting contrasts among contemporary but different patterns of prehistoric settlements within a community in terms of people's choices of resources to use and management of their landscape as a whole. Archaeologists interested in issues of environment and subsistence had to develop collaborations with local savants as well as with academic natural scientists, in order to identify species and explore their properties and significance. These collaborations exposed further contrasts in different prehistoric groups' approaches to and interpretations of landscape, in addition to the continuities (e.g., Heckenberger 2004; Piperno and Pearsall 1998; Roosevelt 1991, 2000, 1994).

In the background behind this research, general archaeological theory continued to develop in new directions, some of them inspired by early debates between "New Archaeologists" influenced by environmental determinism and other archaeologists influenced by "Postmodern" thinking that privileged a view of the human past where human agency was unfettered by any systematic influence from environments. Many of the archaeologists practicing in Amazonia subsequently adopted elements from both paradigms in their approaches and also maintained relationships of communication and collaboration across anthropological subfields and national boundaries. Both the American Anthropological Association and the Society for American Archaeology welcomed these kinds of cross-paradigm relationships by providing places and times for discussion and publication about them. Archeologists themselves organized formal interdisciplinary discussions of these issues with the help of sponsorship of natural history museums, universities, and foundations (Neves et al. 2010; Roosevelt 1994; Visigalli and Roosevelt 2010). One result of these interactions was the integration of the new archaeological evidence of prehistoric cultural complexity and change into social anthropologists' interpretations of the ethnographic present. Another of the results of these processes of interaction was the further development of archaeologists' analysis of archaeological iconography and style in the context of their growing familiarity with the conceptual iconography and interpretive art styles of living Amazonians (e.g., Roosevelt 1991). Thus, Amazonian archaeology benefited from the addition of conceptual studies of aesthetic and ideological patterns to the more utilitarian materialistic study of empirical food and demographic patterns.

EXAMPLES FROM THE LOWER AMAZON

Once archaeologists working in Amazonia became interested in recovering biological objects from sites, such a wealth of specimens turned up that they have only just begun to be identified and interpreted. Nearly all sites that have been explored with directed recovery techniques have produced an abundance of ecofactual as well as cultural materials. These materials in the discrete components of archaeological sites furnish a partial picture of an ancient human landscape at different points in time because during each phase of occupation people brought to the sites many kinds of environmental materials from the wider areas of their catchments, and ecofacts also entered site-deposits through natural processes. People presumably did not utilize and bring back specimens of all the possible species available to them, but archaeological sites nonetheless usually yield large numbers of diverse specimens of bone, shell, macroplant parts, pollen, phytolith, leaf scale, or other microscopic components, often identifiable at least to genus and often to species (with the exception of pollen, which may be only identifiable to family or subfamily). Some items are adventitious inclusions in sites, such as parts of insects from the soil fauna or weeds, but these, too, can reflect features of human activities and their habitats. The available species at any point in time and people's choices from the available species are illuminating both for understanding the nature of the environments in their catchment areas and of their sense of the importance and utility of different plants, animals, and materials, whether from practical considerations or from considerations deriving from their ideas about human ecology, society, and the supernatural.

CONTRASTING HUMAN APPROACHES TO BIOTA AND CATCHMENTS IN A REGION OVER TIME AND SPACE

The differences and similarities between the biological remains in different time components of ancient human sites and in archaeological sites of the same time period in different parts of a region were revealing (Roosevelt 2000).

The prehistoric community at Santarem on the south bank of the Lower Amazon in Brazil had maintained a dense, diverse, high canopy forest and broad faunal diversity in its environs in the Formative period around the beginning of the first millennium BCE. In the local region Formative pottery is decorated with simple incised geometric designs. In the gray-brown-stained, charcoal-flecked soil layers of that site, we found the remains of a diverse group of large and medium fleshy fish and a few smaller mammals, such as large rodents. There also were specimens of tasty, succulent fruits and berries along with the faunal remains. The structure of the wood charcoal and isotopic chemistry of the dated carbonized plant remains fell in ranges of reference studies in closed-canopy tropical forests. According to our

excavations, the soils in the perimeter of the living areas of the early period lacked the artifacts and earth structures we found in intensively occupied areas but were also magnetized by burning and stained and mottled a light gray-brown from soot and charcoal. We've interpreted these latter areas as the agroforestry sites where people maintained or planted desirable trees in open patches that they created for planting of cultigens, through selective clearing and burning of vegetation.

Later on, between about AD 1200 and 1500 in late prehistory, the human occupation of the Santarem site became much larger and more crowded. Our analysis of the charcoal showed that the effects of this later occupation turned the closed-canopy hardwood tropical forest habitat that existed in the Formative cultural period into a more simplified one dominated by more open-grain, fast-growing trees and shrubs and more open areas of crops and orchards. The community's faunal-collection activities and plant-cultivation systems also had been simplified by this time. The great majority of fish eaten daily were now very small: between anchovy-sardine-size to trout-size catfishes and characins, and among the carbonized plants were more remains of the common, coarse but productive cultivated Cocosoid palm fruit genera such as *Astrocaryum* and *Attalea*. Larger fish such as the Formative people dined on now only occurred in the deposits of the remains of ceremonial feasts, adjacent to people's house mounds. The foods consumed at feasts include remains from more succulent and delicate fruits, such as the cultivated water palm *Euterpe* (acai) and the domesticate *Bactris gasipaes* (pupunha), and the large fleshy fish the Formatives appreciated, though no longer the small mammals. Thus, in this later time people's resource base seems to have been partitioned, with high-volume everyday food production focused on smaller and bonier but more abundant and resilient populations of food fishes and common palms, and the rarer, more difficult to catch or produce species and succulent, delicate fruits used only for food in ceremonial occasions, identified by funerary remains and the making and use of fine ritual art objects.

Late prehistoric Santarem residential neighborhoods were composed of regular rows of small house mounds next to ceremonial facilities and large, low platforms, where cremations and ritual caches of fine art objects were placed in formal ceremonies. The density and size of the human population in these neighborhoods were so great that people's meter-thick, charcoal-black refuse deposits literally blanket the entire four square kilometers of the late prehistoric site. In Brazil these black cultural soil deposits are called black Indian soils. We know from contact period accounts that these deep dark deposits rich in artifacts and ecofacts were used by Indians for intensive infield cultivation of field crops and orchards, and most are still used this way by Brazilian country people (figure 10.3). In this way the Amazonians developed a way to efficiently reap further harvests from the refuse produced by the

Figure 10.3. Santarem period cultural black soil site, Alter do Chao.

consumption of prior harvests and foraging in the past. Such anthropic soil deposits have been widely found throughout the Lower and Middle Amazon, both along floodplains and away from them, and are a testament to indigenous Amazonians' ability to make a good living in the forest without using it up. That the Amazonian forests were never cleared on a wide scale by indigenous people seems quite firmly established by the results of paleoecological research, which give overwhelming evidence of prehistoric biological assemblages whose characteristics fall well within the range of current forests, not of savannas.

The approach of the Santarem community to its habitat and subsistence would presumably have been responsive to changes in the cultural role of the site as it evolved from a large, independent Formative village to a large and wealthy cultural center in its region toward the end of the prehistoric period. The choices probably also reflected the large size and density of population of the later settlement, which stood along major transportation routes between different cultural and ecological regions. Its location was the junction of several large, productive resource biomes at the intersection of the mainstream Amazon and the Tapajos River, a large tributary coming from the Brazilian shield and limestone areas: the upland forests, extensive cultivable floodplains, and major fisheries.

This late prehistoric Santarem site was the center for the classic style of the Incised and Punctate Horizon, which extended for hundreds of kilometers along the Amazon banks east and west of the Tapajos river mouth (Stenborg 2004). This style's iconography emphasized raptorial birds and carnivores and well-ornamented

men and women. Females are most common in the art by far, but the males hold special objects, such as rattles and bags, seemingly related to shamans' roles. The relationship of communities in the larger region seems to have been partly conditioned by the threat of raiding, in addition to intense cultural and ecological exchange, for many of the closely culturally related communities near Santarem felt the need to take defensive locations along the high riverbanks, despite the inconveniences these must have entailed, such as distance to water, fisheries, and floodplain planting fields. People in many regions of Amazonia developed their own versions of the Incised and Punctate Horizon and other cultural horizons, and it seems, based on the evidence for defensive works, that these entities may have competed as well as participated in shared cultural styles with each other.

CONTRASTING APPROACHES TO HABITAT BETWEEN DIFFERENT SITES OF PREHISTORIC CULTURES AND DIFFERENT PERIODS OF OCCUPATION AT SITES: MONTE ALEGRE

Different kinds of ancient communities within the same cultural sphere also sometimes had different approaches to the development and exploitation of their habitats in the Amazon. In contrast to the Santarem center site and the many other large, complex, concentrated occupations along the Amazon banks both upstream and down, during this entire period of later prehistory a small settlement at Cavern of the Painted Rock—a large cave-rock-shelter in the wooded, rocky hinterland hills of Monte Alegre on the other side of the Amazon river (figure 10.4)—maintained a very diverse habitat around it, with deep, tall forest on both hills and adjacent lakes and wetlands and some clearings for orchards and field crops. In addition, its take of collected-managed plants and collected or hunted animals was dominated by much larger species and larger individuals of species than those at Santarem at the time, and the species representation in their take was much more diverse than at Santarem. It included larger faunal species, such as crocodilians and deer, which have not yet been identified among the many remains of fauna at the Santarem site. Plants used at the cave site included many species of fruits, such as wild cashews, that seem to have been absent in the environs of the large settlement at Santarem, as well as cultivated plants, such as maize, palms, and tree fruits also enjoyed at Santarem. Like the contemporary cliff villages near Santarem, however, this hinterland community seems to have sensed a threat of raiding, for it maintained a sturdy post-and-thatch wall across the entrance of the cave at this time.

This cave is also the site of one of the first documented human occupations in the Amazon (figure 10.5). In the millennium between about 13,000 and 10,000 years ago (calendar years), we find Paleo-Indians living both in the floodplains and interior

Figure 10.4. Cavern of the Painted Rock, Monte Alegre.

forests in the Lower Amazon (Roosevelt et al. 1996; Roosevelt et al. 2009). They seem to move around a lot but return repeatedly to the same campsites for hundreds of years, sometimes staying for many months. The Paleo-Indians created large polychrome painting compositions on the rocks and caves of Monte Alegre, opposite Santarem, representing both people and animals and important heavenly bodies such as the sun, which they aligned to mark seasonal events like winter solstice sunset (Davis 2014). The paintings also include geometric designs, some of which may have served as notational devices. Monte Alegre is not the only region with extensive rock art; other site complexes occur in many parts of the Amazon and in eastern and southern Brazil outside the basin. The large numerous paintings constitute a lasting imprint of the cultures of the first colonists on the Amazon landscape.

Only a few living sites of the period have been identified as yet, so we only know about their resource use at certain times of year. In the late rainy season and early dry season, Monte Alegre Paleo-Indians living at the cave focused their attention on groves of rugged, fertile upland palm trees (genera *Attalea* and *Astrocaryum*), whose fruits and seeds are rich in fat, vitamins, and carbohydrates, and also certain common and prolific tree beans (*Hymenaea* genus of the Fabaceae family) in the hill forests, whose fruits are rich in fat, vitamins, starch, and protein. They also spent a lot of time in the floodplain lakes below the rocky hills to get fish, turtles,

Figure 10.5. Cavern of the Painted Rock strata with Paleo-Indian camp layer at the bottom and late prehistoric Santarem period house at the top.

and shellfish, which they laboriously lugged up to the cave, a half hour walk uphill. Our fine-screening of the archaeological cave's stratified sediments revealed that most of the fish bones are from small species of characins and catfishes (just like the ones that were prominent in the late prehistoric domestic food at Santarem center thousands of years later on), with a few exceptions of large fishes more than a meter long. There are few mammals in their food remains, though, other than a small number of medium-size rodents. Perhaps because of their more mobile lifestyle, the Paleo-Indians were not there long enough each year to exploit the great breadth of resources that the later Santarem culture inhabitants of the cave sampled. To judge from the distribution of their distinctive projectile point types, Paleo-Indians roamed in much larger catchments than the late prehistoric people, reaching deep into the fast rivers of upland interfluvial areas south of the Santarem municipality in the middle Xingu River drainage. In contrast, the late Santarem period people's culture never extended far inland from the main Amazonian floodplains, though it reached long distances along it. In the southern interfluves that they penetrated, the Paleo-Indians would have found both diverse lithic raw materials and the huge fishes that migrate between the fast tributary streams and the Amazon main floodplains.

Already during this earliest-known human occupation period, Paleo-Indians seem to be actively managing their habitat. My and other's results suggest that some cutting and burning were being done in the forest to encourage concentrations of the Cocosoid palms, which proliferate under human disturbance, often sprouting more vigorously when cut to the ground or burnt, outcompeting less aggressive reproducers among the trees. The fruits of such palms were the single most abundant plant remains in the Paleo-Indian deposits at the site, and their stable carbon isotope ratios indicate that they had grown not in the shade of the understory but in clearings cut in the tall forest that still clothed the hills at the time. The Paleo-Indians cached large heavy cutting and chopping tools flaked from tough, resilient stone in the cave, presumably for that purpose. It is also evident that these Paleo-Indians were thrifty with their food resources. Not a single example of the carbonized palm fruits that we excavated in the cave had escaped being laboriously cracked open to get out its fatty inner kernel.

TAPERINHA

Amazonian people don't seem to have settled down in year-round settlements until after most regions had been reached by the Paleo-Indians' descendants: the Archaic people. Permanent settlements occur only in a few regions at first, starting around 6,000 to 7,000 years ago in the middle Archaic period. We found one of their sites at Taperinha, nor far downriver from Santarem, where richly wooded uplands abut extensive creeks, rivers, and wetlands (figure 10.6.) (Roosevelt 1995). Paleo-Indians had roamed there periodically, leaving behind a few projectile points, but to maintain themselves longer in one place, the people of the subsequent pottery Archaic culture focused on a more monotonous diet of shellfish and those small fish that can be harvested intensively locally and won't quickly run out or migrate away for good. The early people's garbage heaps are really full of their remains and not much else. In only a few Amazonian regions that we know of did people settle down in this way, usually where wooded upland creeks and rivers debouched into especially productive muddy river backwaters or estuaries. It's easy to dig shellfish in the soft mud there and, though Amazonian people mostly gave up the shellfish for horticultural plants in the Formative period, mentioned above, almost all riverside communities have kept their focus on small fish for their everyday protein food. The best way to get these tiny fishes nowadays is to net them in small streams or capture them in baskets behind dams in the dry season when the main rivers are low.

The people of the Taperinha culture were the first to create pottery vessels, which they used for cooking, presumably, the fish and shellfish that predominate in their middens. Only a few of the sherds are decorated, with simple geometric incised and

Figure 10.6. Cultural and natural palimpsest: Taperinha Plantation.

punctate designs. Their imagery is poorly understood because of the small sample and small pieces, but the patterns continue to be used in later Amazonian pottery, and in it they represent hair, weavings, and basketry. The Archaic people also built mounds, as did later Amazonians, by heaping up empty shells and other garbage, and they ate different food during ceremonies. For example, small turtles are common in sandy areas around the mound where burials were placed but they are not common in the shell-midden remains.

During the Santarem period in late prehistory, when the paramount chiefdoms warred for cultural and natural resources, people clustered their houses densely all along the high cliffs that loom above Taperinha, apparently for defensive purposes, as mentioned above. The thick black cultural soils and orchards that accrued around houses remain among the most important agricultural resources in the area still today.

MARAJÓ

The low-lying major estuarine regions at the mouth of the Amazon, almost a thousand kilometers downstream from Santarem, was the birthplace of the magnificent Amazonian Polychrome Ceramic Horizon more than a thousand years ago. Large

Figure 10.7. Cultural forest on Monte Carmelo mound group, Marajó Island.

villages of the Polychrome culture on Marajó Island were built atop large mounds in the middle of the seasonally flooding plains. The ancient villages had groups of large thatched dwellings built on top of wide, flat artificial mounds, with anthropic black soil deposits, orchards, and urn cemeteries between individual house mounds (figure 10.7). Village mound platforms vary in height from less than a meter to ten meters or more, which is much higher than necessary to avoid the seasonal floodwaters. Thus, either or both defense and status may have motivated the creation of these monumental constructions

Here on Marajó, people continued the ancient reliance on small fish as a staple protein source, complemented with pods of the legume tree *Inga*, the common Cocosoid palm fruits, and various herbaceous plants, probably planted and cultivated on the black soil areas. Large, succulent fishes, some of them from one to three meters long, and special cultivated water-palm fruits, such as acai, were used only for ceremonial feasts, held in the open areas of the mound sites (Roosevelt 1991). Around the mounds today acai will only grow if you water it, so it seems likely that the Marajoarans indeed were planting and tending palms of this species.

The large ceremonial dishes and funerary urns and ritual items from the feasts are absolutely covered in the sinuous polychrome designs for which the cultural horizon is named. This, perhaps the most important of the Amazon-wide ancient art styles, was still spreading upstream across the region when Europeans arrived, so missionaries were able to learn from the Omagua elite female artists that their

polychrome style represented the skin patterns of the Great Anaconda, creator and ruler of the universe and shaman leader of the fearsome Amazon women who invented sorcery and the ritual arts (Roosevelt 2013). This mythic iconography is one of the strongest links between Amazonians over space and time.

THE SUPRAREGIONAL AMAZONIAN COSMOLOGY

Today, the heritage of the Polychrome Ceramic Horizon is an important nexus from which archaeologists can bring the findings of generations of research on interactions between humans and the environment into a dialog with the cultures and identities of living Amazonian peoples. Among the many modern Amazonian cultures descended from the Polychrome Horizon culture, worship of the great supernatural anaconda female shaman continues, serving to integrate the body of indigenous scientific knowledge of the environment with people's ideas about proper social organization, cosmological origins, and the nature of the supernatural powers (Roosevelt 2013).

The modern supraregional cosmology is centered upon a creation myth in which Anaconda Woman is carved from the trunk of a fruit tree by her father, the Old Shaman, and the Sun wins her for his wife in challenges of his skill and resourcefulness. In the course of a series of confusing events, the Sun creates fish and manioc, and Woman Shaman creates magic and the arts and fashions the Milky Way galaxy, which is the supernatural Amazon. She fills this part of the Amazon with the life-giving and protecting milk from her breasts. By following the shamanic rituals that she invented, including the taking of the hallucinogenic drugs that flow from the supernatural river as milky sap through certain plants, humans can learn from and appeal to the supernaturals in support of human interests. The anthropomorphic spirit twin animals that each person is thought to have are enlisted by ritualists to intercede with the supernatural "masters" or "mistresses" of the animals on behalf of human souls and their access to life-giving knowledge and resources. The spirit people's bodies, as seen in trances, are said to be covered with the bright designs of the anaconda's skin patterns. Modern women shaman paint these patterns on people's bodies and on artifacts as prayers to the spirits for help and protection. The spiritually potent beings and things described in the creation myths also bear significant scientific information about the structure and function of human societies and the natural environment. For example, the stories of the interaction of Woman Shaman and the Sun actually follows the interaction of the heavenly bodies, as Amazonians understand them (Davis 2014). Similarly, beliefs about the relationships of spirit animals and plants express knowledge of not only the appearance but also the social behavior, reproduction, and ecology of the biota (Roosevelt 2013). So, the mythic

Great Anaconda is represented as female, following knowledge of the larger size and social dominance of female anacondas. She also is cast as a dangerous cannibal, for female anacondas do eat other anacondas, including the smaller males, who cluster about females during mating. In relation to human society, she is the spirit animal espoused by leading women in the matrilineal/matrilocal communities of the Shipibo, where women are considered to own the family house, where they were born, and where mature women lead the society's only initiation ceremonies, which are for girls, not boys.

Important elements of this immaterial cosmology can be traced back into Amazonian prehistory, through the material remains of ancient cultures, mentioned above. With their rock art, the Paleo-Indians had created solar observatories to watch the movements of the sun and constellations (Davis 2014). Men, women, and children were all involved in rituals at the sites, for we find their handprints marked within some designs. Some constellations and comets are personified as humans or animals, and sometimes their reproductive status is marked, as in the images of breeding plumes shown on a heron icon. Later on, some Formative art styles depict animals with human stance, limbs, and accoutrements; these appear to represent beings such as the ethnographic supernatural "masters" and "mistresses" of the animals. Santarem art also depicts men and women with their spirit animals mounted on their heads and shoulders, as well as the images of male shaman shaking rattles, mentioned above. These dynamic images represent people going through the process of communicating and traveling to be with supernaturals in the other world.

In Polychrome art, both ancient and modern, the patterns of the anaconda's skin dominate the style just as Woman Shaman, the Great Anaconda, is thought to dominate the other world. On Marajó her image is a prominent effigy, and elements of her creation story are referenced in ceremonial objects, such as small ritual cups shaped as breasts. Depictions of her include references to shamanic procedures, such as rattling (figurines representing her body may contain rattlers), whistling or blowing, containing a spirit in her belly, or wearing a shaman's shirt (Roosevelt 1991).

There are interesting changes as well as the continuities in ritual Amazonian art and presumably the cosmologies behind it as different societies develop and change through time in different spaces. For example, animals from the waters or underground, now considered Woman Shaman's sphere, predominate in the art of Marajó and its successors among the matrilineal Shipibo and Omagua, whereas animals of the land and sky, the Sun's sphere, dominate Santarem art. Yet, even among very different current Amazonian societies, such as the small, patrilineal village societies of the northwest Amazon and the populous matrilineal societies of the upper

Amazon, the basic cosmology is essentially similar, despite the myriad of local particularities. Both the Shipibo and the Tukanoans recognize and worship Woman Shaman as their creator, and both employ very similar customs and rituals to link their societies to the supernatural powers.

How is it that through such a long time span and such diversity of culture and environmental interaction, Amazonians preserved basic outlines of a cosmology? Part of the explanation may be that their cosmology is based on an understanding of the universe, the Amazon basin, and the skies that has not changed much through the millennia of human occupation (Roosevelt 2014). Another explanation is that a cosmology first formed by the Paleo-Indians has been passed down to today because of the continuous settlement in the basin from the beginning. Each new culture that archaeologists recognize shows clear links to earlier ones, and such links can often be traced over wide areas of the basin.

If we can judge from modern customs, ancient Amazonians would have visited other communities to take part in their rituals and would have invited outsiders to their own. In this way local versions of myths that developed would have a chance of influencing other ones. Communities' current myths about their origin often link their region with one of the other important cultural regions of Amazonia, showing that people recognize a mythic-historical landscape much larger than that where they now live and much older than the era in which they live. For example, northwest Amazon peoples who retain the Polychrome Horizon style claim that the Great Anaconda brought their ancestors up in her belly from Marajó Island at the mouth of the Amazon where a woman ruled. Mythic-historical narratives communicated in formal ceremonial enactments and accoutrements, in the iconography of the communal house as well as in informal storytelling, are themselves an important medium of transmission for the cosmology today. For example, modern shamans who have never made or seen a type of prehistoric object, such as the atlatl, are nonetheless perfectly able to recognize pictures of them because of descriptions encoded in mythological accounts. (I observed this phenomenon of ancient knowledge preserved by myths rather than by actual objects in 2005 when discussing pictures of prehistoric objects with shaman and chiefs who had gathered in Santarem for a Brazilian government workshop before they took on the job of being the teachers for their communities.) Also important in communicating cosmological concepts over time and space would have been the material representations of the ideas in ancient and modern Amazonian art. Ancient objects retrieved by later people from deposits of earlier cultures are sometimes found placed reverently in the later cultures' ceremonial deposits (Roosevelt 1991). Today, also, some Amazonians learn about ancient cultural ideas and knowledge through archaeologists' books and presentations, and vice versa.

CHANGES IN THE AUTONOMY OF AMAZONIAN COMMUNITIES VIS-À-VIS RESOURCES AFTER EUROPEAN CONQUEST

Huge changes have taken place at Santarem and its environs and Marajó since the European conquest of the Amazon and their incorporation as provincial municipalities in the modern nation-state. In this situation of lesser local autonomy, new patterns of human-environment interaction have changed the approaches to the landscapes around occupation sites. The environment around Santarem—now a much larger and more urbanized settlement—has become even more depauperate in diverse life forms than in late prehistory. With the much larger modern population, the addition of large transient visitor populations, rampant illegal gold-mining upstream, few cheap local fuel sources, a large interregional market, and the introduction of domestic animal pasturing, what was fast-growing secondary forest in later prehistory has now diminished to open savanna woodland over much of the land around the city. The loss of forest is associated with a loss of rainfall in both Santarem and Monte Alegre, close by across the river. As a result, at Santarem larger forest and river faunas and the diverse, succulent wild and domestic Amazonian fruits have become expensive to obtain because they are no longer available in the thinly vegetated, ravaged environment around the city. Ordinary people cannot afford these foods or the petroleum-based fuels of the modern economy, with the result that their general nutrition and health are not good, and their fuel scavenging has further reduced the woody vegetation around the city, which otherwise could furnish them with valuable dietary supplements in the form of fruits, herbs, and small faunas. In the overgrazed, overburned cattle pastures on the upland areas around Santarem and Monte Alegre, the *Attalea* palms so appreciated by the Paleo-Indians are flourishing, but the cattle grazing there are the primary beneficiaries.

In the Monte Alegre hills, the human population seems to have diminished since later prehistory. No one has lived at or near the cave site since the conquest, we know from the cave radiocarbon dates and cultural remains, though there is now a village of dispersed houses and gardens down the hill on the floodplain at the lakes, as there was in later prehistory, and its inhabitants regularly come into the hills to hunt, gather, or pasture animals. A wide range of fruits and fish continue to be easily available to the lakeside villagers, both from the hill forests and from the floodplains, their gardens, and their corrals. Deer and other sizeable game still can be caught in the hills, despite the creation of much pasture for the cattle economy and despite hunting now being illegal there. Although the population in the Monte Alegre hills lacks a nearby clinic for treatment of ailments, people's health is quite robust, for they continue to support themselves with local cultivated, collected, and hunted foods without undue effort into advanced old age. And there is still more than enough forest around to supply their fuel needs.

The general Amazonian pattern of using the abundant smaller fishes for daily food continues in the Lower Amazon today, and many riverside communities earn cash by selling their surplus catches. But the larger species can be had mainly in city restaurants for tourists or elites or in the outer hinterlands, such as the Monte Alegre hills, where the population is low enough and isolated enough that people can get still the larger fish for themselves. The industrial fishing industry in both municipalities of Santarem and Monte Alegre is causing big problems for local people now because the large mechanized boats can easily overfish, using refrigerators to preserve the large catches for sale in the city markets. Despite the existence of laws on the books that protect local communities' resources from outsiders' use without permission, enforcement is nonexistent.

On Marajó, the ancient forest has been removed over much of the eastern part of the island, and cattle herds have replaced the flourishing population centers of the ancient mound-building societies. Indigenous languages, religion, and social organization have been effaced for the most part on Marajó. Both new migrants and families with local roots now live in small villages and towns, and scattered tenant ranchers serve the ranchers who own most of the anthropic pastures. The land in much of the Amazon was distributed as huge baronies to the generals who led the defeat of the final uprising against the Portuguese, and Marajó was divided into large ranches. Conversion of so much land to grassland must have diminished rainfall, and overgrazing and trampling by herds has muddied Marajó rivers and lakes. However, many indigenous skills continue to be held: pottery making, artisanal fishing and foraging, and cultivation of fruit trees and native crops, which continue to be important in people's diets.

Something that stands out about recent change through time in Amazonia is the contrast between Euro-American and indigenous attitudes toward settlement mobility in regard to resources. Some archaeologists, colonial administrators, missionaries, and development aid specialists tend to feel that permanent settlement is the preferable pattern. Certainly it fits an environment in which most land is privately owned, as it is today. Archaeologists tend to think it was an important evolutionary advance to produce enough food locally with agriculture to stop having to forage over a lot of territory to get enough to eat. Missionaries and colonial administrators felt that it was more civilized, organized, and Christian to produce food with domestic animals and plants, and it was certainly more convenient for them when the Indians they were trying to control stayed in one place near colonial centers. Modern development experts don't approve of shifting cultivation and hunting, which they assume harms the land and wastes people's time traveling to dispersed fields and hunting sites. However, shifting settlement has been one of the ways that Amazonians have managed their environments without permanently reducing their economic productivity.

For example, indigenous Amazonians who have been interviewed seem to give a high value to what social anthropologists refer to as trekking (e.g., Politis 2007). Listening to what Amazonian people have said about it over the years makes the trek seem a combination rest cure, second honeymoon, hiking-and-swimming vacation to the cabin for the children, going fishing with dad and mom, tourist trip to commune with the wilderness, gourmet picnicking, and special expedition to gather valued resources to bring home. People do not complain about having to go on trek. They look forward to it. Trekking means getting away from it all, being away from noise and smoke and chatter of the village or town. It means the family and its special friends and affiliates can be together. The water at trekking sites is cleaner, and the beach is less crowded. The kids get to snack on especially delicious unusual fruits and bite-sized faunas you can catch with your hands. Participants can get together for dam-fishing picnics on small streams and eat as much as they can hold of delectable smoked fish, then collapse in their hammocks and sleep peacefully in the quiet of the currently uninhabited forest.

Spiritual reasons for trekking also have been articulated by Amazonians. For example, the Nukak of the northwest Amazon in Colombia told anthropologist Gustavo Politis that they like to go deep into the heart of their territory to special long-standing groves of domesticated palms such as pupunha because they believe that their ancestors established those, and they can commune with their spirits there (Politis 2007). Away from crowded settlements and their unsanitary conditions, there's less exposure to infectious disease, a pattern that might be interpreted as spiritually safer, since evil spirits are thought by Amazonians to be a cause of illness. In addition, the faraway places have culturally special foods and materials not available at current horticultural villages, and people appreciate and seek these out between harvests. Many ethnographers have written that Tukanoans and Arawakans in the northwest Amazon schedule their important initiation dances with the fruiting time of special groves of trees with a mythological relation to the creation time when the ancestral lines of humans were born. Such ancient groves have been identified over large areas of the Amazon and stand as witnesses to the long-term management of vegetation by indigenous people. As such, they are not only a seasonal resource but also an important tangible cultural ecological property for future generations. That seasonal and periodic changes of settlement are good for the environment as well as good for people is unarguable. Game animals and faunas helpful for pollination or other services come back in greater numbers in the now-quiet settlement. Secondary vegetation containing nutrients for future harvests can grow back in gardens and fields left fallow when people spend time away.

Trekking in the forests has become an unavailable luxury, though, for many people in the Santarem-Monte Alegre region because of the rise of industrialized

and globalized soybean farming to the south and north. In league with a Brazilian government port-administration company, the US Cargill Company has developed a truly enormous facility at Santarem to load soybeans onto large transport craft from as far away as Europe. The Brazilian company CDP bulldozed large areas of the archaeological mounds in Santarem to create the port for this trade, and the remaining deposit is being heavily polluted by illegal dumping of dangerous chemicals used in mechanized loading operations. To feed the international shipping trade, very large areas of ancient cultural forests in the south of Para State have been deforested for permanent farms to grow the beans to be exported from Santarem. Established by outsiders with sweetheart loans from Cargill or the Brazilian government, these farms are not being managed in a sustainable way. The widespread clearing and exposure of land to weather lead to drought and nutrient deficiencies, and with time it reverts to pasture for the cattle herds that replace the former local Indian communities, who have withdrawn further south ahead of the bulldozers.

At the mouth of the Amazon, on the tidal rivers of Marajó and the other delta islands, local people both feed themselves and their families and make money making floodplain forest products such as the valuable water palm acai. The local family concerns work sustainably, living on fish and forest products and both harvesting and regenerating the groves. Their sites are literally covered with dense anthropic acai groves (figure 10.8). In contrast, foreign companies usually destroy these ancestral groves as they harvest the trees, limiting future production in those spaces.

Finally, perhaps the most harmful change since the conquest was the forced acculturation that people along the Amazon mainstream underwent during the first two centuries of missionization and that continues still today. This process separated people both from their conceptual cosmology and from their social organization, neither of which suited the Christian religion and Western notions of proper social organization that conquerors forced on them. This deculturation process did not, however, separate people from their deep knowledge of their habitats and basic artisanal skills, which continue quite intact. And, despite statements to the contrary (Fraser et al. 2014), Amazonian Indians have not disappeared. Indigenous people who still speak their traditional languages and carry out their ceremonies and art traditions still dominate populations in the hinterlands of Amazonia. However, this situation will not remain for long, because indigenous lands and cultures are not in practice being protected from forced dispossession by Amazonian countries, despite all the laws that provide for maintaining them on their ancient lands.

Figure 10.8. Anthropic acai grove, Marajó Island.

NATIVE AMAZONIANS, RESEARCH, AND REPARATIONS

Native Amazonians, incorporated into projects both as informants and as assistants and participating in debate as members of conferences, have contributed further observations and interpretive insights of their own about both ancient and modern relationships of people to their habitats (Neves et al. 2010; Posey 2002; Visigalli and Roosevelt 2010). Whether they are Native Americans or rural nationals of mixed heritage and geographic origins, these people from the Amazonian regions being studied by anthropologists turn out to have their own range of research interests relating to cultural development and landscape management.

The following are some of the thoughts that indigenous community members have articulated to me. Some leaders of Cayapo communities in the southern Amazon drainage have expressed interest in studying examples of ancient Marajó art, which they regard as the work of their ancestors. They also express strong interest in the possibility of archaeological excavation of their ancestral sites and the maintenance of museum collections of special prehistoric art objects in the local community, rather than in national museums. When we retrieved from gold miners a huge, jewel-like crystal projectile point that had been removed from the area (figure 10.9), the Cayapo living at the find-site requested that it be returned to be kept in their ritual men's house (Roosevelt et al. 2009). At present, Cayapo chiefs of communities in the middle Xingu interior south of Santarem

Figure 10.9. Paleo-Indian quartz crystal point curated by a Cayapo community, middle Xingu.

and Altamira still make gorgeous museum-quality ritual paraphernalia and ornaments of semiprecious materials, such as mother-of-pearl ceremonial tiaras, that they like to sell to visitors.

The Curuaia community a little further north on the Curua River in the middle Xingu in the direction toward Santarem also sees anthropological research as a validation of their cultural histories. When we invited Curuaia leaders to recruit adolescents from their community to take our intensive field-training course in environmental archaeology in the future, the leaders expressed the wish to learn the archaeological techniques and evidence themselves. They were especially interested in our archaeological evidence for long-term intensive occupation of the region by indigenous groups. They felt that the information was ammunition for being more assertive in maintaining their independence, holding onto their land, and being more involved in negotiations when companies or government agencies wanted to implement large projects locally. When Brazilian nationals try to deny that the Curuaia have always been there, as they are wont to do, the

community now can use the archaeological evidence to prove their long-term presence in the landscape.

The surviving people of the ancient Polychrome Horizon have been especially engaged with researchers in the past. For example, the Shipibo communities of the Ucayali drainage in lowland Peru have long collaborated with social anthropologists and archaeologists, giving help to their research and at the same time learning about their past culture from sources they get access to through exchanges with the scholars (Lathrap 1970; Roosevelt 2013; Weber 1975). Some Shipibo leaders have even come to US cities to go over museum collections from their culture, and they keep in touch with anthropologists through the Internet. Important results that some ethnographers have had through interviews with Shipibo artists on the subject of the symbolic and spiritual meaning of iconography suggest that further work with other living descendants of the ancient Polychrome Horizon in, for example, French Guiana, would be useful. Polychrome-descendant people have already given important testimony about their understanding of the ritual and ecological meaning of animal images, and their interpretations of specific images on the ancient pots from nearby archaeological sites promise to be illuminating in the future. As mentioned above, Shipibo say that their large female effigy beer pots represent the Great Anaconda, who created the heavens. This Shipibo belief is just one example of the stories with which Amazonian Indians integrate the great tradition of their cosmology with their acute observation and understanding of the natural world and their societies.

Rio Negro Tukanoans and Arawakans, also descendants of the Polychrome Horizon, have been collecting, interpreting, and publishing with scholars their research relating archaeological features such as petroglyphs with their current mythology, cosmology, and landscape ecology (Cabalzar 2010; Roosevelt 2013). Their take on the iconography of the Great Anaconda, whose image they portray on their longhouse, is parallel to that articulated to ethnographers by modern Shipibo. Northwest Amazon people's concepts integrate their expert knowledge of social life and the anthropic environment into a complex and vivid legendary landscape populated with ancestral animal-human characters. For them, the Amazon mainstream is the Great Anaconda, who they believe carried them up to the Rio Negro from Marajó Island, where they say the Woman Shaman ruled before she was defeated and fled with her minions to the otherworld in the sky. They point to the Paleo-Indian petroglyphs on rock outcrops as the marks they made in the course of their escape. Shamans say that they can obtain her precious, life-protecting milk from the sap of the sinuous, mottled-bark *Banisteriopsis caapi* vine, her magical plant species. Not surprisingly, the patterns of the anaconda's skin has become a pan-Amazonian symbol of solidarity in the northwest Amazon and beyond (Jean Jackson in Roosevelt 1994).

I can envision in the future a conference of indigenous Polychrome Horizon–descendant groups from all over the Amazon with researchers from all over the world, to pursue further study of this cultural tradition and discussion of its broader significance in the memorializing of historic landscapes and the interpreting of Amazon ecology. To record and explore further the range of traditional concepts connecting particular species of plants and animals with ancestral deities and social and ritual practices would be a great advance. People's current understanding and practices in regard to the anthropic dark earths of the Amazon would also be illuminating. But even just collecting a registry of all known cultivated trees, vines, shrubs, and herbs, all recognized animal species, and their characteristics and linkages within the ecosystem and the mythic cosmos would go far in clarifying the details of ancient indigenous management and ritual systems.

Today, Native Amazonian communities have the option to contribute to research more assertively as both project directors and contractors, and their concepts of the integration between humans and spiritual ancestors could contribute to an even more holistic and nuanced approach to the study of humanized landscapes through time and space. Such pursuits might lead to an entirely different approach from all past scholarly ones, not envisioned by anthropologists. In any case, the communities' active participation in research on their regions could give important incentives and pressures for the acceptance of more assertive leadership from indigenous people and communities in the face of the growing power of governments and outside companies to intervene in locales without the permission of their inhabitants. It's clear that recent industrial-scale, globalized systems of land use in the Amazon have been unsustainable economically and destructive both ecologically and culturally. But it's also clear that Amazonia is a durable land of great natural resources and can certainly continue to both support its populations and produce abundant wealth. By their dynamic cultural sequence, native Amazonians have given ample proof of their ability to devise ingenious new ways of resource management and lifeways over time, all the while keeping very much alive their regional cosmology. Their long-lived prehistoric societies and the evident continuity in their culture sequences are a testament to their success. And they have done these things without destroying the region's fundamental resource base. One might even say that they had enriched the soil as well as the forest's diversity of useful species and at the same time built one of the great cultural traditions of the world. Therefore, in addition to their unassailable human right to a strong role in decision making about this region, their patrimony, they bring an unbeatable record of effective and innovative land management and cultural development, a contribution that is sorely needed now.

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