



Fig. 1. The savanna and gallery forest of the San Joaquín River, Baures, Bolivia. On some days, pink river dolphins can be seen in the clear waters from a low-flying plane.

Pre-Columbian Roads of the Amazon

by Clark L. Erickson

Traditionally, archaeologists have studied “sites.” Sites include monuments, settlements, cities, cemeteries, mounds, and other important places of the past. The cultural landscape of paths, roads, field walls, irrigation canals, terraces, and other features that fill the spaces between sites is often ignored. A relatively new subfield of anthropology, the archaeology of landscapes, treats the landscape as an artifact that can provide new, detailed insights about the everyday lives of peoples of the past. I will focus here on formal roads as an important element of the pre-Columbian landscape of the Bolivian Amazon.

All civilizations, past and present, require an efficient means of transportation and communication. Societies need to move goods, people, and information throughout the regions they control. Roads also have powerful social, political, and sacred functions. Formal roads are major transformations of the environment. Their patterns on the landscape provide information about the organization of settlements, social interaction, land tenure, ritual, standards of measurement, and the activities of everyday life (Trombold 1990).

The Aztecs, Maya, and Inka constructed impressive roads that linked the vast regions under

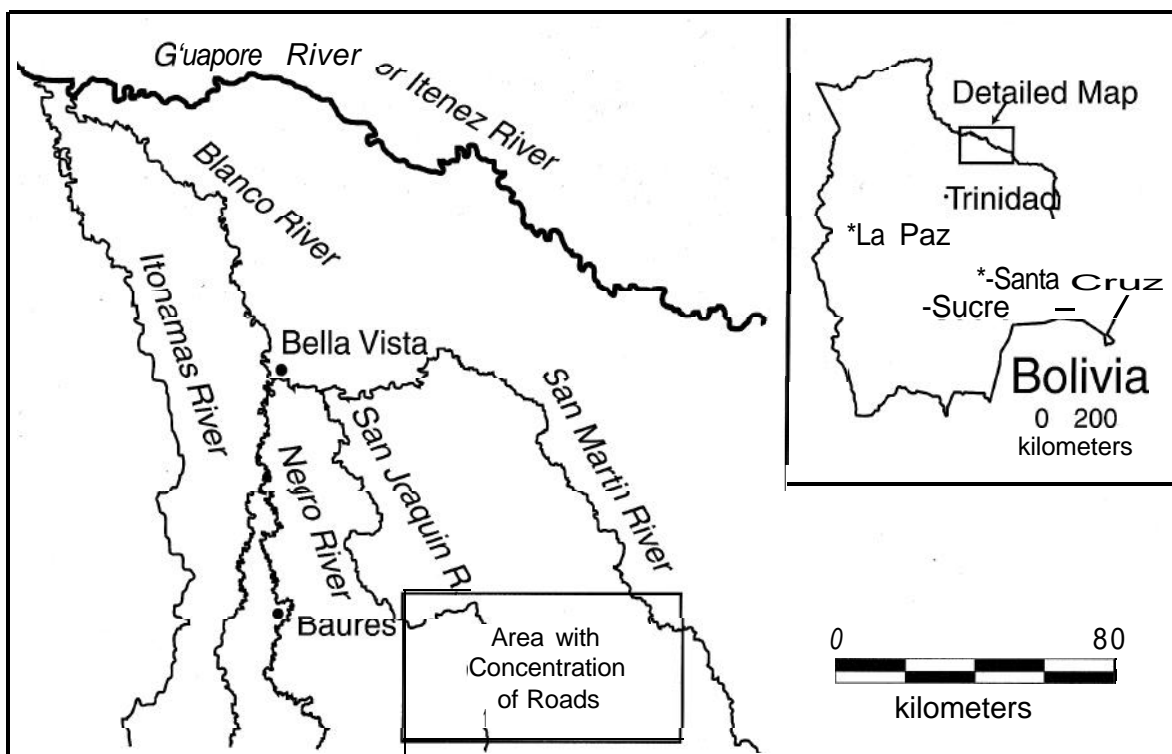


Fig. 2. Location map showing the area with concentration of roads and Baures, Bolivia.

their influence. Less known but equally impressive are the pre-Columbian roads in the tropical region of Bolivia, South America (Denevan 1990). I have been investigating the pre-columbian earthworks of the Bolivian Amazon since 1990 (Erickson 1995). The research team includes Wilma Winkler, a Bolivian archaeologist who is co-director of the project, and students from the University of Pennsylvania and the National University of Bolivia. In 1995, we were invited by the local government to begin a multi-year study of the archaeology of the Baures region. Baures is located along the upper headwaters of the Amazon drainage basin near the Brazilian border in northeast Bolivia (Fig. 2). The area can be reached by boat along a circuitous river route, by horseback, or by small aircraft. The complex landscape of gallery forests, crystal clear lakes, rivers, swamps, forest islands, and vast savanna is a spectacular sight from the air (Fig. 1). During the rainy season, much of the flat savanna grassland is covered with shallow floodwater. As the rains end at the beginning of the dry season, the floods recede and the savanna slowly dries out. At this

time, controlled fires rage across the savanna as ranchers and hunters burn the old grass to encourage growth of new grass for their cattle and game. Based on archaeological and historical documentation, I believe that this annual burning is an age-old practice that is necessary to maintain the open savanna. Gallery forests are found along the courses of rivers and streams, and forest islands are located on high ground surrounded by savanna. The native people practice slash-and-burn agriculture in the gallery forests and forest islands to raise maize, manioc, sweet potatoes, rice, and cacao for making chocolate, and wealthy ranchers raise cattle on the open savannas.

Early Spanish documents provide valuable information about the Baure, the native peoples of the region. The Jesuits wrote detailed eyewitness accounts about all aspects of Baure life in the early 1700s (Eder [1772] 1985). The Jesuits described them as "civilized peoples" who were "clean and tractable" in their fine cotton tunics (Fig. 3). Their chiefs had great powers to make war, mobilize soldiers, keep public order, and organize farming. Anthropologists of the 1950s

Fig. 3 (right). Drawings of native peoples of Baures from a 1772 Jesuit account.

From Eder [1772] 1985: Figs. 6,8, 9, 10, and 11

considered the hereditary political organization of the Baure a classic example of "chiefdom." Their towns had large public plazas with a large men's house or temple in the center. Around the plaza were hundreds of houses arranged along streets and wide avenues. Deep defensive moats and tall palisade walls surrounded many settlements. In 1703, the Baure gave the Jesuits their first Bolivian martyr, Padre Cipriano Barace, who was killed for insulting a powerful Baure chief. In retaliation, the Spanish sent an army to punish them. In 1708, the remaining conquered Baure were gathered in new mission towns for indoctrination in Christianity and European culture. Crowded into mission towns, the Baure were nearly wiped out by European diseases to which they had little resistance. The population of the region today is probably smaller than in the past.

READING THE LANDSCAPE

While exploring for oil in the late IqsOs, a North American expatriate named Kenneth Lee discovered and reported the pre-Columbian roads and canals of the Baures region. Until he passed away in 1999, Lee was a determined promoter and interpreter of the archaeology, history, and culture of the region. To show off the huge network of pre-Columbian roads, Lee would fly visiting journalists and scholars over the region in a small plane. As a result, the national and international press rediscovered the "Lost Civilization of Baures" in regular ten-year cycles. Despite this sporadic attention, we were the first archaeologists to do a serious study of the region. The governor of the Department of the Beni loaned us his Cessna airplane for three hours of flight time. Like the previous visitors who flew over the region, we were immediately captivated by the extent, patterning, and size of the roads and other earthworks.

These pre-Columbian roads are raised causeways of earth. Abandoned roads are easily



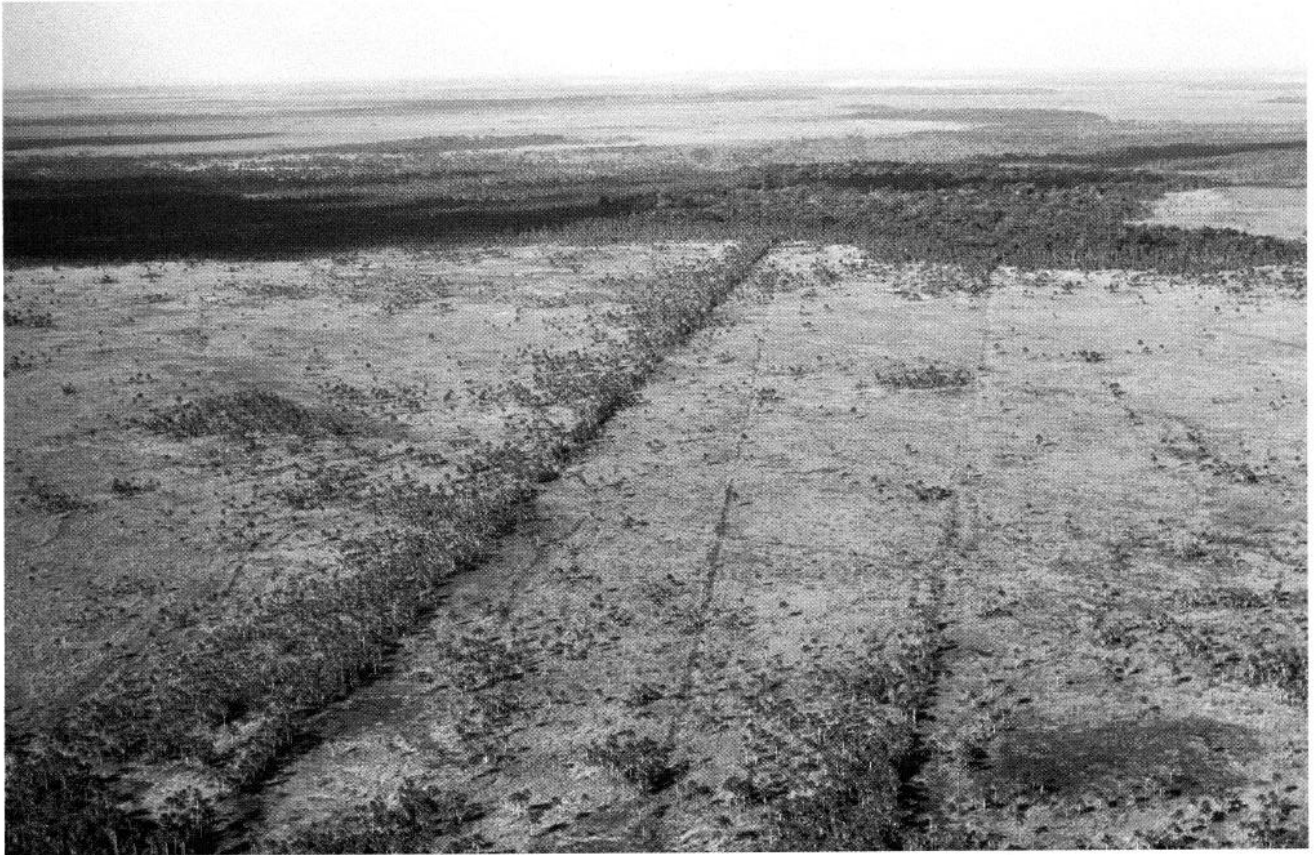


Fig. 4. Aerial photograph of two palm-covered parallel roads crossing the savanna between two forest islands in Baures. A smaller road can also be seen (center). Each road is approximately 1 mile long.

identified from the air as dark straight lines covered by small trees against the lighter-colored grasses of the savanna. The larger roads of Baures can even be seen from satellites orbiting 470 miles above earth. Most of the roads are perfectly straight for several miles and paired parallel roads are common (Fig 4). Important questions immediately come to mind: (1) Who built these roads and when? (2) Why were they built? (3) What did they connect?, and (4) Why are there so many roads?

In 1995, my team and I landed on a tiny dirt airstrip in the town of Baures to begin an archaeological investigation to answer these questions. There are no modern towns or settlements in the area of the densest concentration of roads. The only people using the area are hunters who come each year in canoes to hunt the deer, peccaries, and tapirs that thrive in the savannas, wetlands, and forests. I hired three of the best hunters as my guides in 1996.

We used mule, horse, canoe, and what the locals call the *buey caballo*-an ox saddled for a rider-for the three-day journey into the area (Fig. 5). Most of the trip was on foot sloshing through the wet savanna.

Although abandoned and badly eroded, the roads are still prominent on the landscape. On the ground, we could see that the roads were constructed of earth removed from canals on one or both sides of the platform (Fig 6). Raised road platforms 10 to 15 feet wide and 2 to 3 feet high provided a dry walking surface (Fig 7). We assume that the roads were kept clear of vegetation, although shade trees may have lined the wider roads. Roads range in size and complexity from simple to truly monumental. Some raised roads in the savannas 100 miles southwest of Baures are 40 to 60 feet wide. In Baures, we have mapped several roads that are over 3 miles long. Most of the roads are straight from start to finish; thus, we assume that roads were carefully

planned before construction. The impressive number of roads, their wide geographical distribution, and the effort put into their design and construction suggests that roads were important to the people who built them.

During eight field seasons in the Bolivian Amazon, our archaeological team perfected a strategy for recording and studying roads. They are mapped from the air with aerial photographs and satellite imagery and on the ground using surveying instruments. Long narrow trenches excavated through road platforms and canals provide clues about time of construction and abandonment, building technique, volume of earth moved, and function (see cover). In excavation trenches throughout the Bolivian Amazon, we recovered charcoal that could be radiocarbon dated, documenting that roads were built and used between 2000 and 400 years ago. A date from a causeway excavation in Baures showed that it was built before AD 1630. In the early 18th century, the Jesuits reported that old roads were still in use but not maintained. A 7-mile pre-Columbian road was used between Baures and Guacaraje until the 1930s.

MULTI-FUNCTIONAL EARTHWORKS

Roads served many overlapping functions. The tens of thousands of linear miles of roads provided a vast transportation network for foot traffic. The canals alongside them were probably just as important. These canals hold water much of the year; thus, heavy loaded dugout canoes could be poled, paddled, or pulled across the savannas. My workers continually complained about having to walk across the hot savanna carrying our heavy gear. They told me to return in the rainy season when they could pole a dugout canoe anywhere in the savanna (Fig. 8). The native peoples of this region were a classic example of the "canoe cultures" of the Amazon. Using raised roads for pedestrians and canals for canoe traffic, the Baure had an efficient and sophisticated means of connecting settlements to navigable rivers, agricultural fields, and neighbors.

In other parts of the Bolivian Amazon, raised roads functioned as dikes for controlling flood-

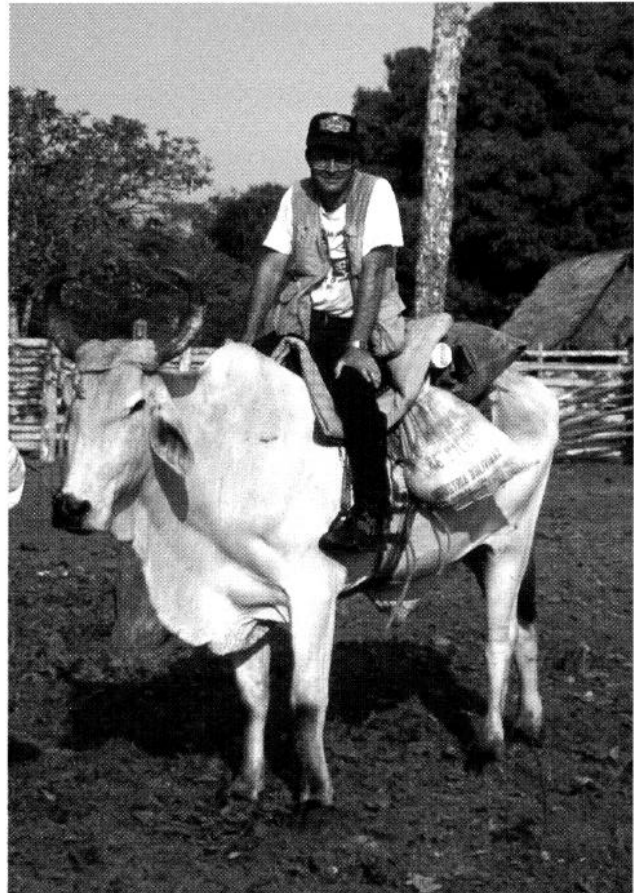


Fig. 5. The author gets an awkward ride on a buey caballo, the project vehicle.

waters within raised fields. (In Expedition 30 [3] 1988, I described a similar raised field farming technique found in the Andes.) In Baures, the roads may have regulated floodwaters, extending the period when canoes could be used in the savannas (Fig 9). They may also have maintained optimal water levels for the fish weirs built to control and trap fish migrating across the flooded savannas of Baures (Erickson 2000). Further, roads and canals may have been markers to define ownership of farmland and natural resources within and between communities.

In addition to transportation and water management, roads and canals probably had important political functions. Interactions between Amazonian communities are characterized in the historical and ethnographic literature as a complex and dynamic balance between alliance and warfare. Highly visible earthworks may have been used to establish and cement political

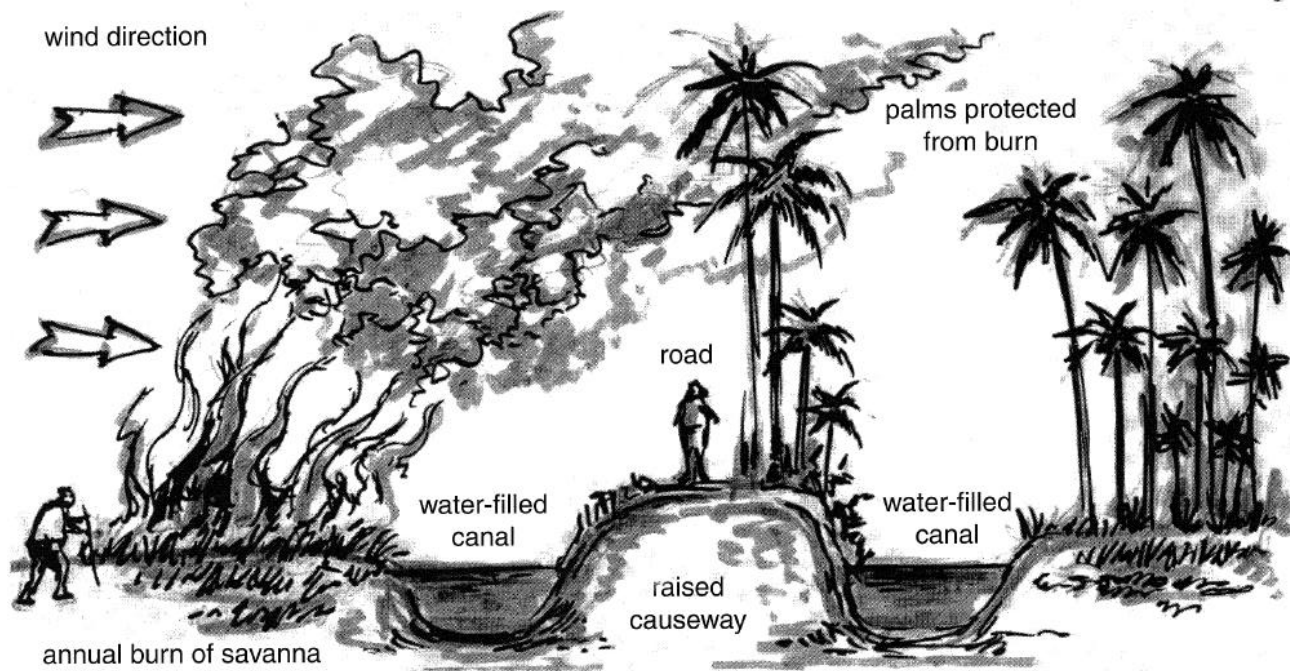


Fig. 6. Cross-section of a road platform and adjacent canals. Over time, the water-filled canals protect the palms that colonize the abandoned roads from the annual burning of the savanna.

Drawing by Dan Brinkmeier, Field Museum, Chicago

alliances with neighboring communities. Most roads connect pre-Columbian settlements located on forest islands within the savannas and gallery forests on rivers. We can safely assume that settlements physically connected by artificial roads and canals were part of a larger political universe. We located several concentrations of roads associated with large settlements on forest islands. Between 10-50 roads and canoe paths converge on or radiate from each large island (Fig. 10). These roads can be followed to archaeological sites on smaller forest islands distributed over the landscape. Each of these interconnected concentrations of roads may represent an independent political, social, or ethnic group.

SYMBOLS OF CIVIC PRIDE OR RITUAL RACEWAYS?

But why did the Baure build so many fine roads? My colleagues joke that every individual must have had his or her own road. The Baure had no draft animals or wheeled vehicles, thus they had little need for wide straight roads.

Landscape archaeologists refer to roads that are much larger, straighter, or more numerous than what would have been necessary for basic transportation as “overconstructed,” “overengineered,” and “landscape oblivious.” However, I believe these roads were conspicuous symbols of a community’s political power, civic pride, and ability to mobilize labor. Rather than construct permanent public buildings, shrines, cities, or temples in stone, the pre-Columbian peoples of the Bolivian Amazon expressed monumentality in the form of prominent earthworks on the vast flat landscape. Guests attending feasts, pilgrimages, dances, and other events must have been suitably awed when approaching neighboring villages and towns on the wide avenues bordered by deep water-filled canals (Fig. 11). Competition between communities for the largest, widest, longest, straightest, and most impressive roads may help account for the emphasis on these earthworks. The social use of roads is specifically mentioned in the 1772 Jesuit account. Father Eder complained that the native peoples used roads for social visits with friends in neighboring villages, the sole purpose of

which was to get drunk on the local beer brewed from maize and manioc!

In addition, the earthworks may have had specific sacred functions. As noted earlier, the roads are extraordinarily straight over long distances. As many as six canals and roads may run parallel to each other—a costly mismanagement of labor if the roads were constructed simply to get from Point A to Point B. Of course, we could argue that the roads were one-way streets, thus two were necessary for a round trip. Could the concern with precision and straightness be related to ritual processions, ceremonial races, or pilgrimage routes? Could the roads be sacred or astronomical alignments? Some straight roads in Baures bypass forest islands and have no apparent destination. The similarity between the roads of Baures and the famous Nasca Lines etched on the coastal deserts of Peru comes to mind. Scholars have demonstrated that some Nasca Lines were used for ritual processions and determining astronomical events, and as indicators of sources of water and markers of social groups (Aveni 2000). We have begun to map and measure the orientations of the roads of the Bolivian Amazon to test the hypothesis that roads were constructed according to astronomical alignments or as a giant landscape calendar.

Roads may have converged on political centers or sacred sites. Early Spanish explorers reported entering towns on large formal roads. The larger towns of Baures had hundreds of houses organized around a large open plaza with public buildings and temples in the center. The indigenous peoples of central Brazil still live in similar, although much smaller, villages. Clean, wide straight roads cut through the forest and converge at the men's house in the center of the plaza. During important ceremonies, young men carrying heavy logs race each other along these ritual roads. Many important roads are deeply furrowed by years of use for ritual processions and racing.

How WERE THE ROADS BUILT?

How difficult are roads to construct? The roads of the Bolivian Amazon are major,

formally designed features of the built environment. Archaeologists often attribute the construction and use of formal roads to centralized state governments (Trombold 1990). This conclusion is based on the assumption that the labor organization and engineering for constructing roads were beyond the abilities of small-scale societies. The total labor involved in pre-Columbian earthmoving in the Bolivian Amazon is staggering, but our archaeological research shows that the work was spread out over many generations and could have been accomplished by small groups.

Although roads are often long and straight, the engineering and design of these earthworks are not complicated. The roads were built using simple tools of hardwood such as digging sticks, paddle-like shovels, and baskets documented in the historical literature. Similar tools are still used today for digging and moving earth, although the blades are now of metal. Our earlier experiments building raised fields showed that digging canals and constructing platforms is relatively easy if done at the time when soils are neither too wet or too dry.

These issues of engineering and organization of labor became clear one day while doing fieldwork near a native village in Baures. I came across a "new" road 12 feet wide, 3 feet high, and over a half mile long (Fig. 12). When I asked a local resident walking about it with me, he explained that he and a small group of neighbors built it in a week. I asked, "How did they make the road so straight?" He rolled his eyes at the silly question and said, "We simply sighted along three wooden poles to lay out a direct route between the settlements. Anyone can do it." This modern example of the design and construction of roads by a community using hand tools demonstrates that many small groups working a few weeks a year could have easily constructed the entire road system given enough time.

I believe that roads and other earthworks were the Amazonian version of monumental, highly visible public construction. The monumentality of this engineered landscape at a regional scale rivals the works of better-known civilizations. Although most are abandoned,



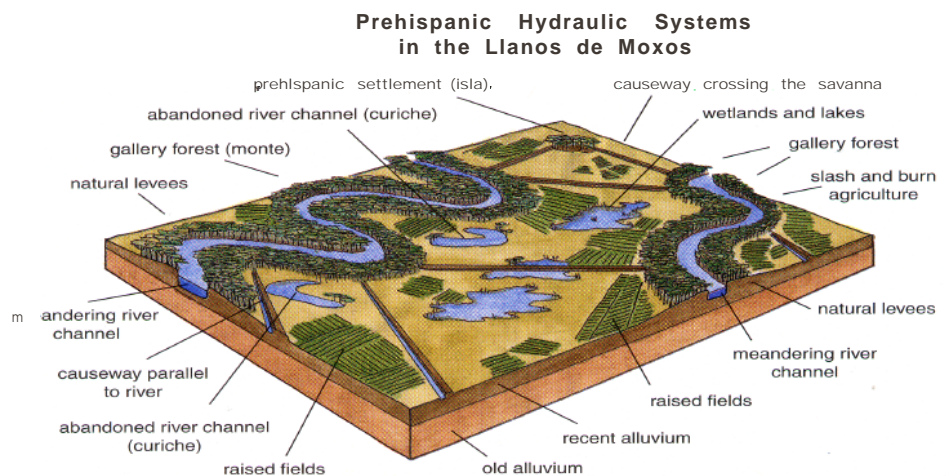
Fig. 7. A 15-foot-wide and 2-foot-high road (center) covered with palms in Baures.

eroded, and neglected, the old roads, canals, and other earthworks continue to play a major role in shaping the landscape of the Bolivian Amazon. Pre-Columbian roads structure patterns of vegetation, soil fertility, water availability, and wild resources. Through their transformation of nature on a massive regional scale, the pre-Columbian inhabitants of the Bolivian Amazon left an indelible mark on the landscape.



Fig. 8. Guides paddling a dugout canoe through a pre-Columbian canal in Baures, Bolivia.

Fig. 9. An idealized landscape of roads, canals, raised fields, and settlements in the Bolivian Amazon. In addition to transportation, roads may have functioned as dikes to control water levels within raised fields and fish weirs in the rainy season.



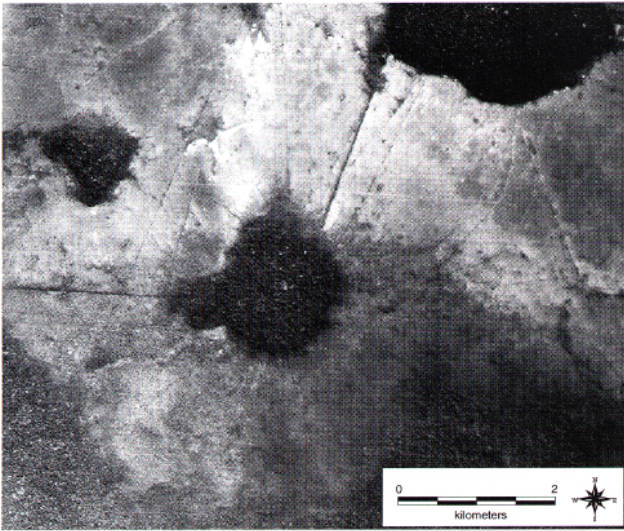


Fig. 10. Aerial photograph of a concentration of roads and canals crossing the savanna in Baures, Bolivia. The largest of several hundred roads are visible in the photograph as dark straight lines. Most of the roads radiate from San Martin Forest Island (dark area in center).



Fig. 12. A new road built by the native community of Cairo, Baures, Bolivia. The perfectly straight, half-mile road crosses the low flooded savanna between two towns.



Fig. 11. A landscape of roads and canals in the Bolivian Amazon. The raised road platform was used by pedestrians, and the canals for dugout canoe traffic.
Drawing by Dan Brinkmeier, Field Museum, Chicago

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Visit these websites for more information on the Archaeology of the Bolivian Amazon:

Applied Archaeology in the Bolivian Amazon:
<http://www.sas.upenn.edu/~cerickso/applied.html>

Pre-Columbian Fish Weirs in the Bolivian Amazon:
<http://ccat.sas.upenn.edu/fishweir>

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