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A Case for Archaeological Reconnaissance of the Cabo Catoche – Porvenir Region of the Northeastern Yucatan Peninsula

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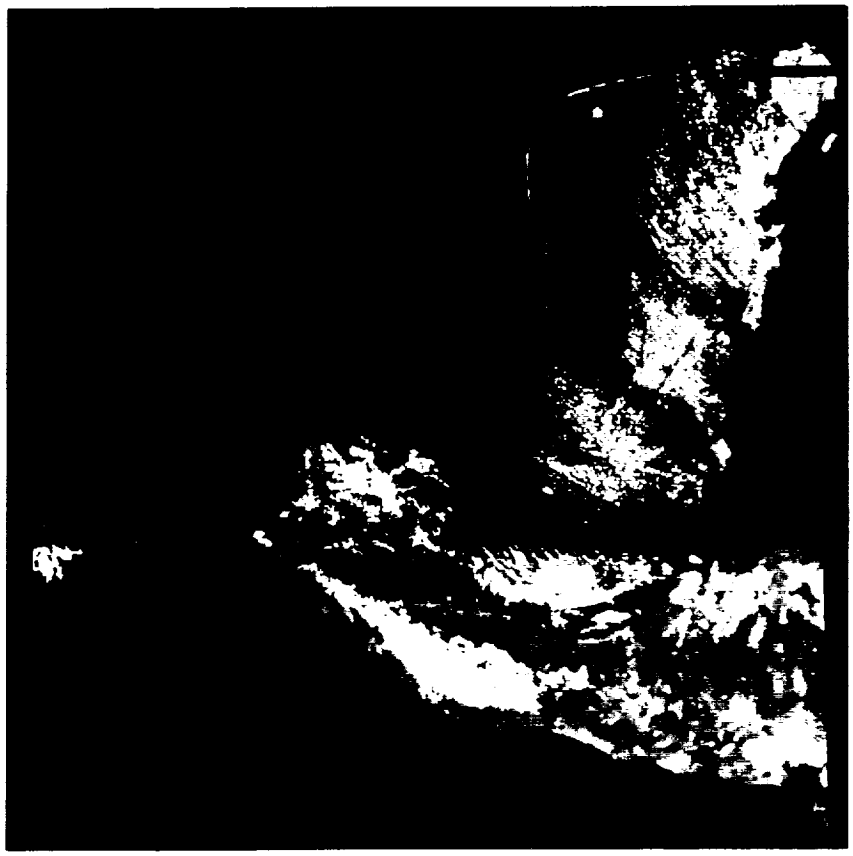

The Yucatan Peninsula, imaged by the Advanced Very High Resolution Radiometer (AVHRR) sensor aboard a NOAA weather satellite. Image resolution is 1.0 kilometer.

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SUMMARY

Satellite remote sensing technology is a tool with which archaeologists can, with relative ease, survey a region that is otherwise inaccessible. The northeast corner of the Yucatan Peninsula is such an area: it is isolated and sparsely inhabited, with dense forest and extensive swamps. From Cabo Catoche inland to Cancun, this remote corner of the ancient Maya world is virtually unexplored. Recent satellite images disclose evidence of past human activity in this unexplored region and offer a compelling argument for an archaeological reconnaissance.

INTRODUCTION

Archaeologists have been exploring the jungles of the Yucatan Peninsula for one hundred and fifty years, probing for knowledge about one of the greatest ancient civilizations to people the Americas—the Maya. Awareness of the Maya began with the explorations of John Lloyd Stephens and Frederick Catherwood, from 1839 to 1842. Through the years, Mesoamerican archaeology has come of age technologically as a modern, competent, interdisciplinary science. A wealth of knowledge has been gleaned from excavating the ruins of Maya cities and ceremonial centers, and from the study of artifacts, tombs and stelae. However, much archaeological fieldwork remains to be done, and much as in John Lloyd Stephens' day, accessibility in a country of few roads and dense jungle is still a problem. The northeast corner of the Yucatan Peninsula is a case in point. From the city of Cancun, roads to the north penetrate only a few miles into the interior. Traveling farther north requires a coastal boat trip; there are no public landing sites for aircraft. The area remains virtually unexplored archaeologically (Andrews, 1985), because the logistics and expense involved in getting people and equipment into such an isolated region for an archaeological survey are prohibitive. A recent application of space technology, satellite remote sensing, has provided archaeologists with a new and easier means of visual access to inaccessible regions. This report discusses satellite imagery that provides evidence of past human activity in the unexplored Cabo Catoche–Porvenir area of the northeastern Yucatan Peninsula. A rationale is offered for the hypothesis that an ancient Maya culture was present in this area, as a compelling argument for a field reconnaissance of the area.

SATELLITE IMAGERY

A research project was initiated at NASA Ames Research Center in 1984 to investigate the utility of satellite remote sensing imagery as a tool for studying the environmental settings and settlement patterns of Mayan archaeological sites. The primary imagery used in this report is from the Thematic Mapper (TM) sensor aboard the LANDSAT satellite.

The LANDSAT satellite, originally called ERTS, the Earth Resources Technology Satellite, is an Earth satellite launched into near-polar, sun-synchronous orbit. The newest satellite, LANDSAT 5, was launched in 1984 to a circular altitude of 706 km (438 mi). The spacecraft makes one orbit approximately every 99 min, recording spectral radiance reflected from the earth in seven bands of the visible,

geometric features discernable throughout the proposed survey area. This figure will be discussed further in the following section. Figure 4 is a line drawing showing features in figure 3. Figure 5, in TM bands 5, 2, and 1, depicts a segment of the Hondo River bordering Mexico and Belize. The river appears as a black, meandering line; its flood plain is blue, and vegetation shows in varying shades of brown and green. Figure 6 is a TM image in bands 5, 4, and 3. Water in this image is black, and shoreline marshland along the rivers and inland swamps appears in dark green. Soils and savanna show in hues of reddish brown to almost white. (Figure 8 is a single-band image from the SEASAT SAR sensor. This image was generated for comparison to the LANDSAT image in figure 3, particularly the area between Cabo Catoche and the mainland, as SAR data is especially suited for studying areas of standing surface water (Pope, 1989).)

The images presented were subjected to manual interpretation by the author and colleagues experienced in remote sensing analyses of tropical wetlands imagery from both LANDSAT and SAR sensors. Comparative analyses were done between the two types of imagery, with images of the proposed survey area and of other areas of the Yucatan Peninsula containing similar ecological and geometric features of verified origin. The images have been shared with archaeologists actively engaged in Mayan studies in the Yucatan, and their views have been incorporated in this work.

EVIDENCE

The linear features noted in figure 3 are thought to be the anomalous signatures of vegetation, either different from surrounding vegetation, or differentiated in some way by the ground upon which it grows. The linearity and geometry of these vegetation patterns suggest human activity at some point in time. The "central feature" noted in figure 3 appears to be the hub, as many of the linear features radiate outward from it. Lines and lattice networks are most evident in the immediate vicinity of this feature, which measures seven pixels, or 199.5 m (650 ft), in diameter. Lattice patterns appear to extend well to the south. There are lattice patterns north of the central feature as well, along an apparent waterway that traverses the northern boundary of the presumed savanna. Irrigation networks are implied by the imagery, throughout the savanna as well as in the mangrove swamp that forms the western tip of land (see the line drawing, fig. 4). The reader is also invited to compare the features in figure 3 with the images of verified canal systems in figures 5 and 6. Figure 5 depicts ancient Maya canals on the Rio Hondo, which forms the border between Mexico and Belize. The canals appear as lines running perpendicular to the river, across the flood plain. Figure 6 shows the confluence of the San Pedro (center) and Caribe (upper right) rivers, which form the Candelaria River in Campeche, Mexico. Canals appear as light and dark lines intersecting the rivers and connecting lakes and swamps in the flood plains (Millett Camera, 1984; Thompson, 1974; Pope, 1989; Pope and Duller, 1989).

DISCUSSION

The author believes that the features noted in figure 3 are indicative of an extensive ancient Mayan agricultural precinct, possibly including the structural remains of ancient settlements, although these are not evident in the imagery. This hypothesis is based in part on the written accounts of the

CONCLUSIONS

The author concludes that: (1) the Cabo Catoche–Porvenir area did support a Maya population, probably moderate in size through the preclassic to the early classic period, possibly much larger in postclassic times, judging from the evidence at known Maya sites in this part of the Yucatan; and (2) the satellite imagery showing unexplained linear and geometric features attests to human activity of some sort, at some point in the past, in the proposed study area. Reports of a large Maya population on Cabo Catoche in 1517, and the evidence of a land bridge from Cabo Catoche to the mainland, support the hypothesis that a Maya presence was the source of the human activity. Whether this activity was Mayan or colonial, it bears relevance to the archaeology of the Yucatan. A field reconnaissance would substantiate or refute the evidence presented.

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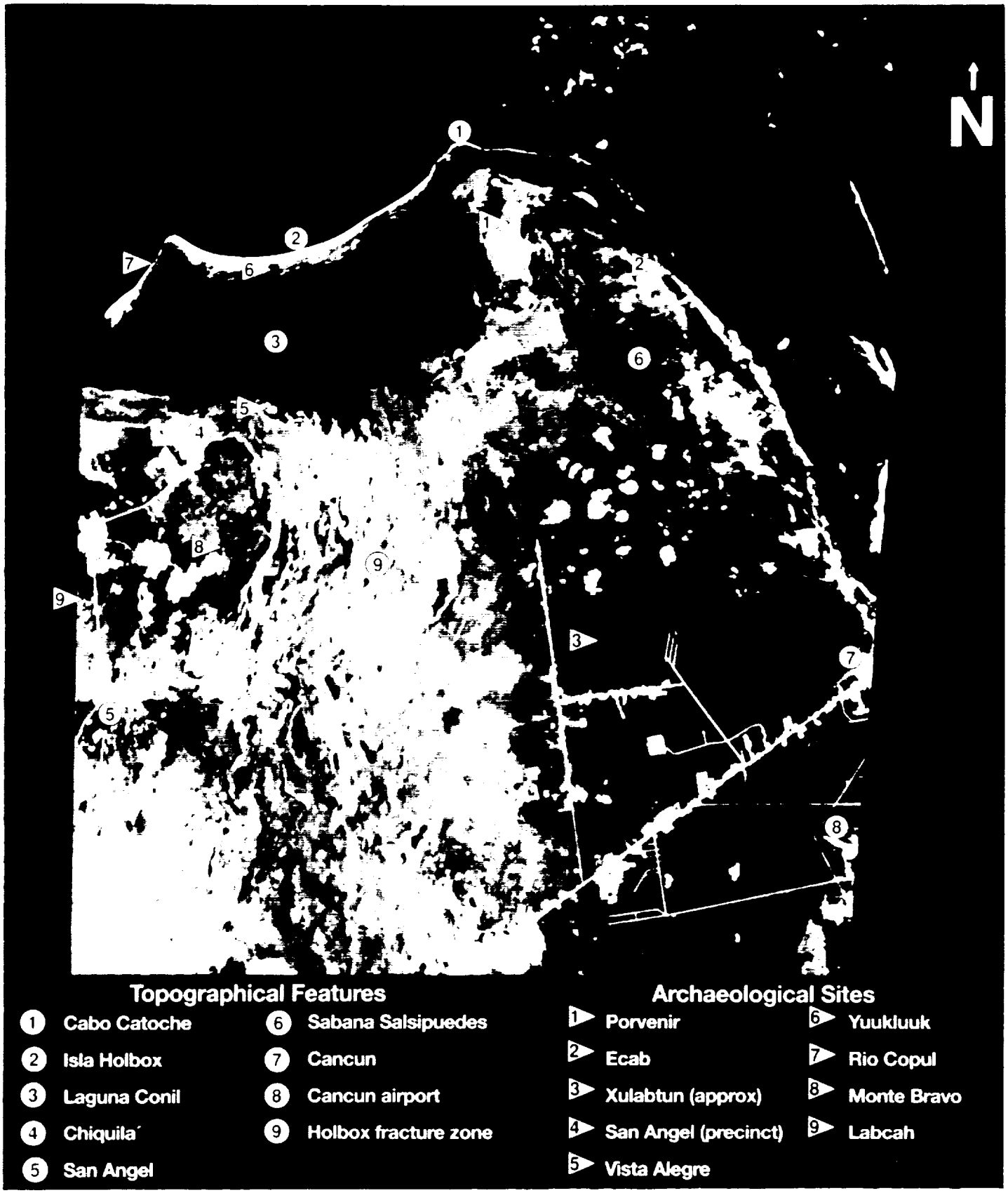

Figure 1.– The northeastern Yucatan Peninsula, in Landsat TM imagery.

Figure 2. A regional view of the proposed survey area (inside yellow square), between Cabo Catoche and the known site of Porvenir.

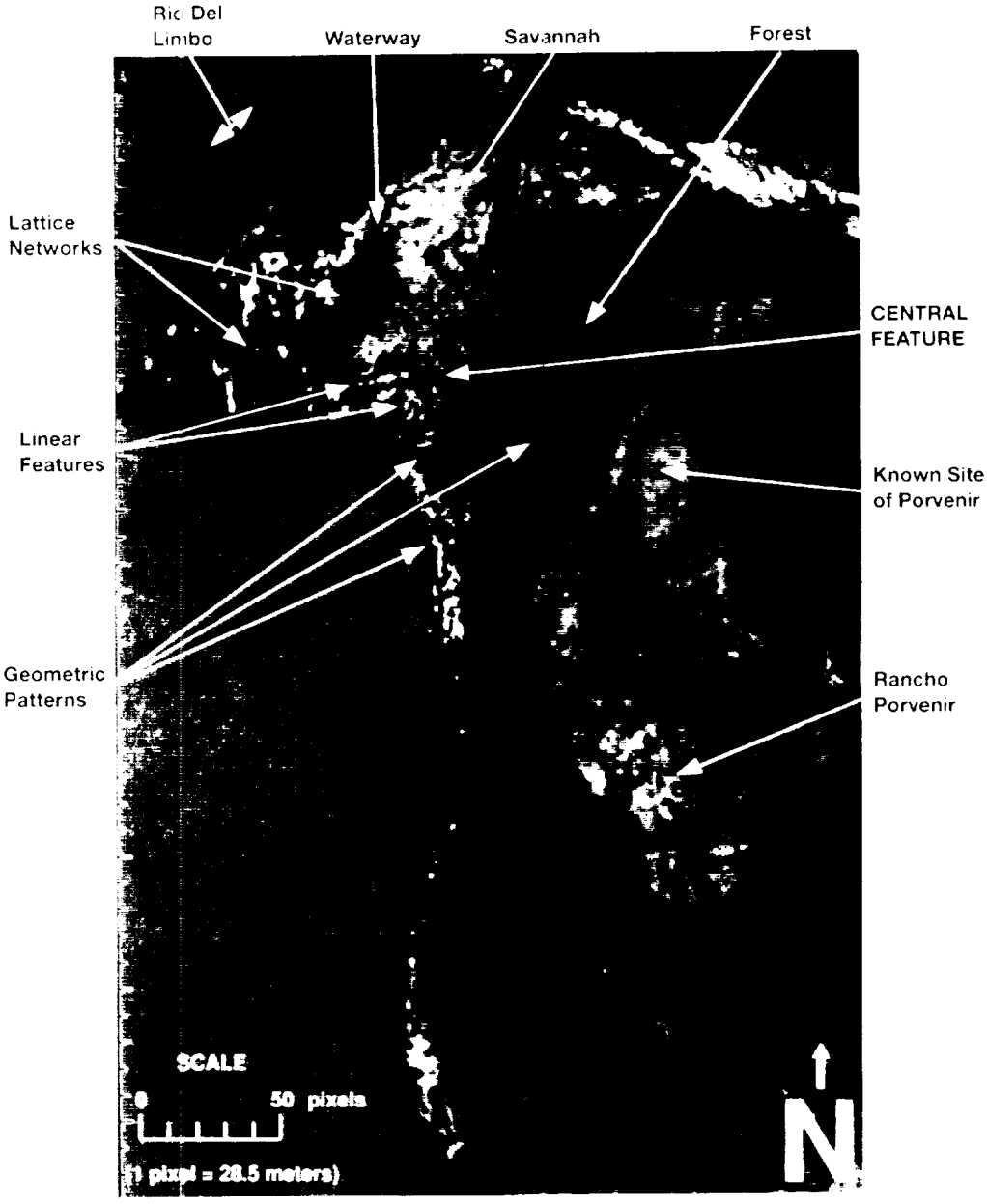

Figure 3. Closeup image of the proposed survey area. The linear and geometric vegetation patterns suggest past human activity.

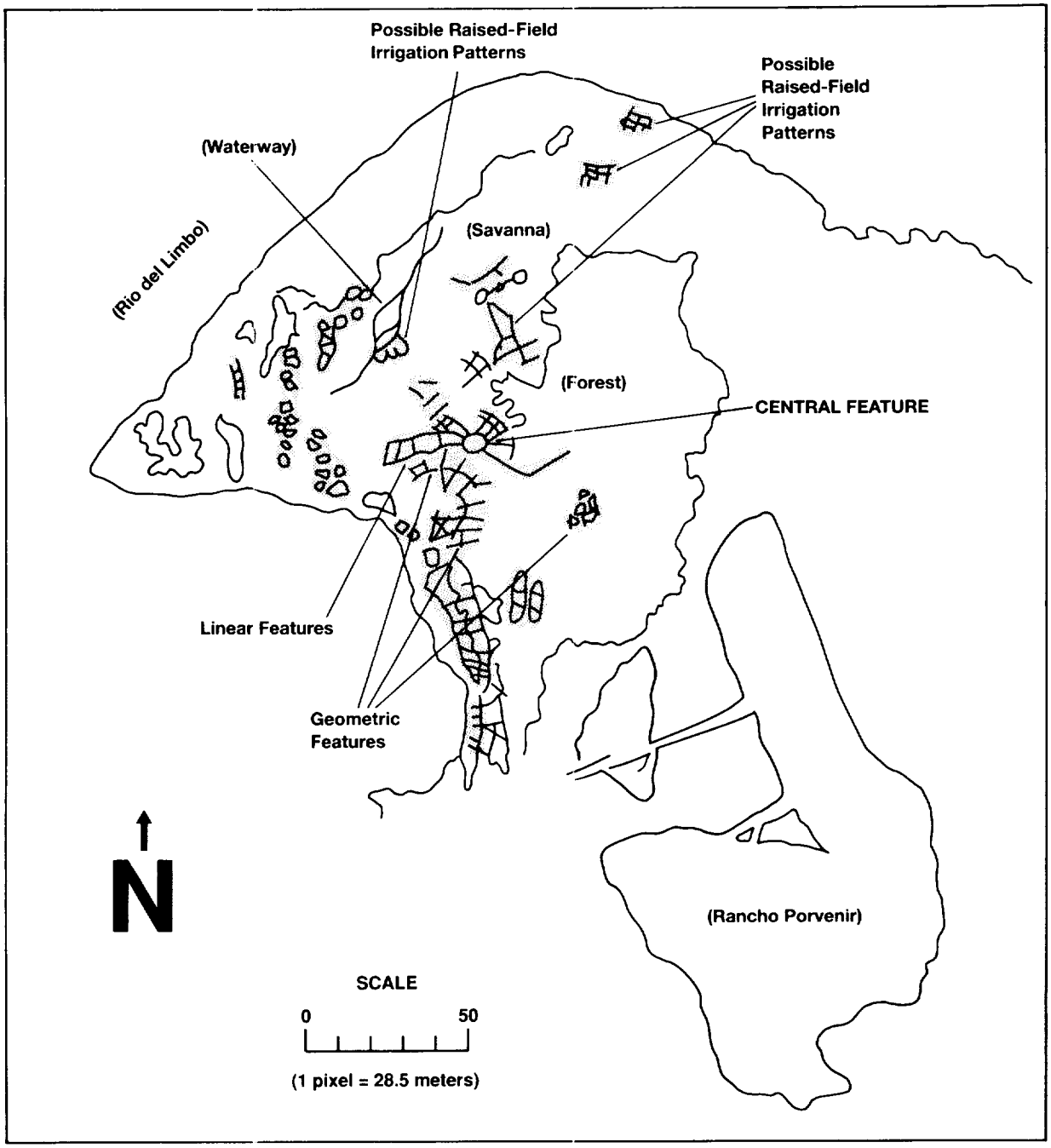

Figure 4.– Line drawing of features noted in the satellite image in figure 3.

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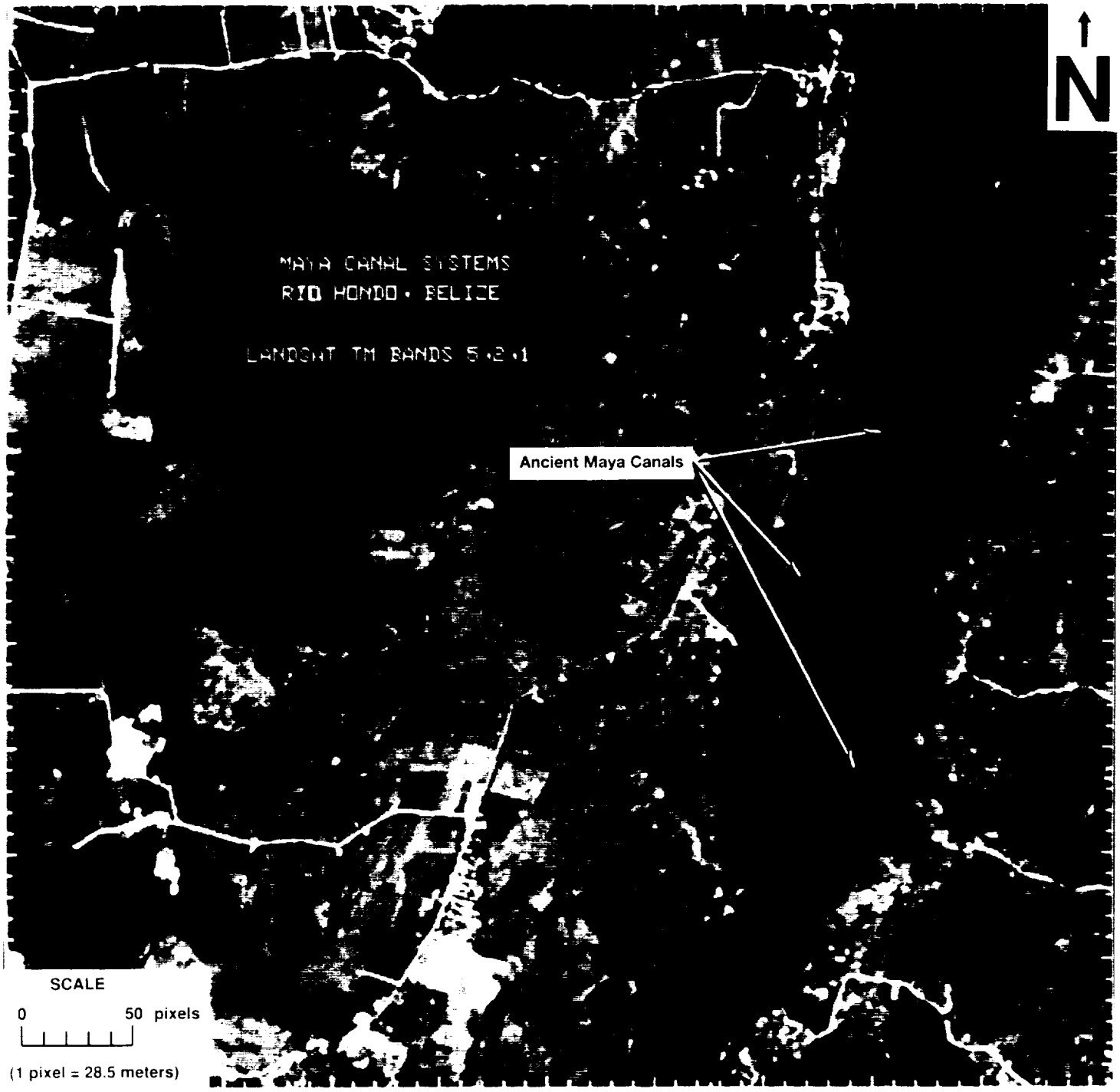

Figure 5. LANDSAT TM image of Maya canals along the Hondo river bordering Mexico and Belize

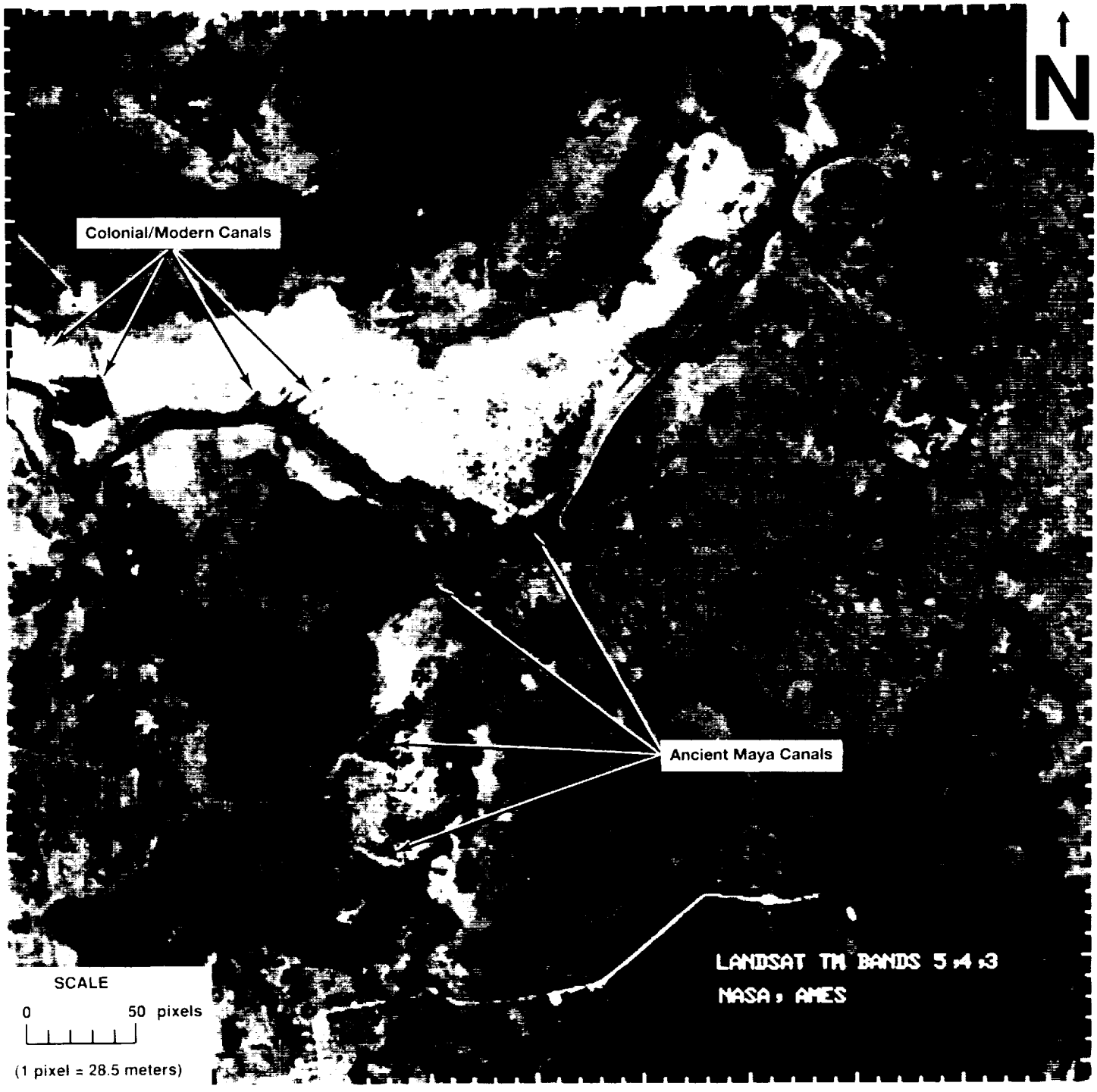

Figure 6. LANDSAT TM image of ancient Maya and Colonial modern canal systems along the Candelaria river, Campeche, Mexico.

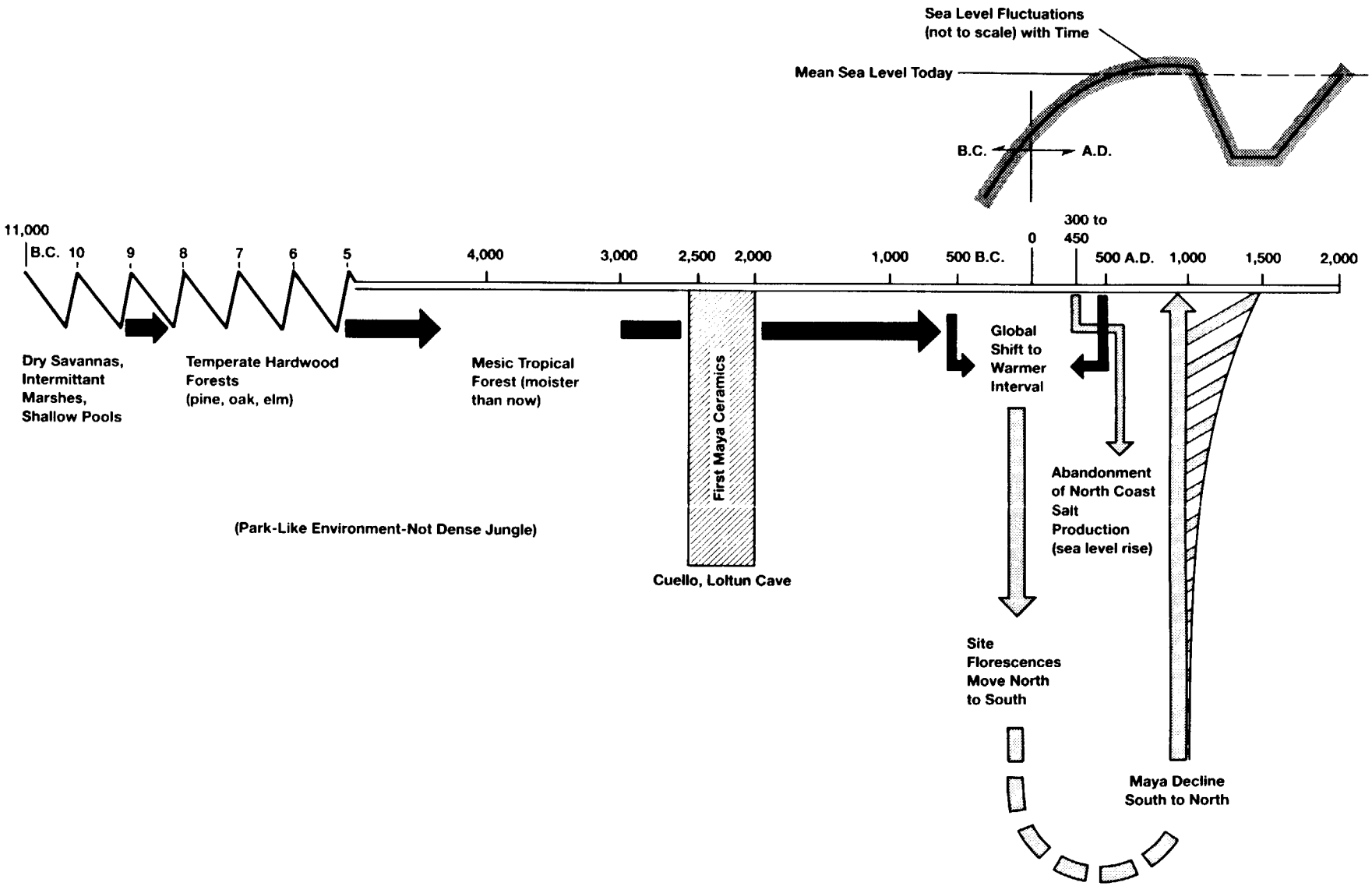

Figure 7.– Climatic profile of the Yucatan Peninsula during the time of the Maya.

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16. Abstract

Satellite remote sensing technology is a tool with which archaeologists can, with relative ease, survey a region that is otherwise inaccessible. The northeast corner of the Yucatan Peninsula is such an area: it is isolated and sparsely inhabited, with dense forest and extensive swamps. From Cabo Catoche inland to Cancun, this remote corner of the ancient Maya world is virtually unexplored. Recent satellite images disclose evidence of past human activity in this unexplored region and offer a compelling argument for an archaeological reconnaissance.

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