Solving ancient Maya civilization mysteries dating back over 1,300 years has become a way of life for LSU professor Heather McKillop. Her ‘modus operandi’—shallow underwater excavation—make her feats that much more intriguing.

She has literally transformed the knowledge of ancient Maya architecture and economy through her discoveries of ancient Maya wooden building remnants, a massive salt industry, and the first ancient Maya wooden canoe paddle. She also proved that tropical trees have tree-rings that can be used to determine their age.

Dr. McKillop was awarded a LA EPSCoR Pfund or seed grant to fund an important segment of her archaeological fieldwork at ancient Maya sites in Belize. During the past 30 years, she has located, investigated and mapped the country’s shallow coastal and underwater sites.

“Following earlier discoveries of salt works on the Belize coast, in 2004 I initiated a comprehensive survey aimed at investigating the scale of salt production in southern Belize. Knowing that Late Classic Maya (A.D. 600-900) sites were buried at least one meter below the water table, I decided to look where no-one else was looking, in the water,” she says.

She and a three-member team began the search by systematically traversing lagoons in five square acres in an isolated edge of Belize Paynes Creek National Park.

“What we found—posts and beams of wooden buildings and artifacts—stunned the archaeological community and transformed our knowledge of the ancient Maya architecture and economy,” says Dr. McKillop.

Preserved in a peat bog below the sea floor, untouched for 1,300 years, they provided the only evidence of walls and other wood from ancient Maya architecture. Twenty-three underwater sites with wooden architecture and the wooden canoe paddle were discovered during the 2004 survey; 100 sites were found in 2005-07 field trips.

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A 200-year gap in the radiocarbon dating of her team’s early wood discoveries led the LSU professor to turn to tree-ring dating for more precise dating. In part dependent on the amount of moisture available to a tree, tree-ring dating is in its infancy in the tropics; some doubted it could be done.

“Researchers had long wondered where the some 80 Maya city states obtained salt. The 103 sites that we ultimately discovered indicate there was a large industry for the production, storage and distribution of salt, the white gold of the ancient Maya.”

The first evidence of ancient Maya waterborne navigation, the wooden canoe paddle, corroborates the shape of paddles shown in ancient Maya art, which differs from modern Maya and other paddles.

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“We could see rings in teak, leading me to believe we could use annual rainfall data for dating purposes,” she says. “A nearby family had collected and recorded daily rainfall records for 35 years. Coupling that information with our enormous database of waterlogged wood samples, we created a sequence by comparing modern core samples to the water samples.”

In 2008, with funding from her LA EPSCoR Pfund grant, Dr. McKillop carried out basic experimental research in tropical tree-ring dating in Belize. “We collected 124 increment core samples from modern trees in order to investigate the occurrence and interval of rings at the LSU Forestry Departments Tree-Ring Lab. Cross-sections of the cores were photographed and the 35-year rainfall information were compared with the increment core rings.”

“The LA EPSCoR grant opened new doors for me,” she says. “My number of collaborators and participating students has increased and we now have a proper lab and equipment. It also enabled me to bring in a number of experts: A leading wood anatomist to identify the waterlogged wood and establish a protocol for preparing samples and identifying wood species of selected posts, and two conservation specialists to evaluate and experiment on how to best cut and study the waterlogged samples for the tree-ring study, which is ongoing.”

“We are able to see rings in the ancient wood post samples. Our wood is deteriorating from bacterial growth so it’s critical to study it as soon as possible after its removal from the peat bog. In the future, we will cut samples in our Belize field lab, photograph them under a microscope and have them identified in the field by our wood anatomist.

“We are also in the process of extending our underwater excavation by literally diving into deeper waters. So far, we have removed 15 levels of sediment from below the seafloor, representing 4,000 years of sea-level rise, that we are now in the process of studying and analyzing.”