Scientists studying a pre-Columbian bayou crevasse in south Louisiana have a lesson for today's coastal restoration efforts: Use mud instead of sand. It's even more prevalent in the Mississippi River, and when used properly, it makes for longer lasting land.

The team of researchers from The Water Institute of the Gulf, Tulane University and Carolina Coastal University drilled hundreds of cores into the splay of land formed by what's called the Attakapas Crevasse, a break that developed on the western bank of Bayou Lafourche sometime between the years 800 and 1400. They found the crevasse was extremely effective in naturally building land composed of 95 percent mud, plus a combination of clay and silt particles.

"You're looking at a location hundreds of years after its last depositional episode; it has not been active in 600 years," said Christopher Esposito, lead author of the study, published on Wednesday (July 12) in Earth Surface Dynamics. "This is the area where Napoleonville is located and includes land still elevated enough to support agriculture far from Bayou Lafourche."

The study's conclusions contradict the general view of how diversions, including the proposed $1.2 billion Mid-Barataria sediment diversion project near Myrtle Grove on the West Bank on Plaquemines Parish, will make use of the river's sediment load. The prevailing view is that sand in the river will create the most land when flowing into wetland areas, because the lighter silt and clay particles are more likely just to wash away.

The state is trying to fast-track permitting for Mid-Barataria, which it hopes will build 22 square miles of new land and wetlands in the upper Barataria Bay. State officials often tout this project's potential by pointing to the success of the Wax Lake Outlet, which has built land just west of the mouth of the Atchafalaya River.

Researchers have estimated that the Wax Lake Outlet captures no more than 30 percent of the sediment -- more sand than mud in this case -- coming through the diversion channel. The rest of the sediment, suspended in water, is lost to open water.

But the new study at Attakapas Crevasse put the mud-capturing efficiency of the Bayou Lafourche breach at 75 percent. That means only a quarter of the sediment was lost to open water.

To understand the difference between the two, one must travel back to the time of the crevasse, which is named for one of the original groups of Native American tribes living along the Louisiana coast when Europeans arrived in the 1500s. During the period of the crevasse, Bayou Lafourche was still carrying about half of the flow of the Mississippi River, and the bayou channel's average depth was similar to the present-day depth of much of the lower Mississippi below New Orleans: almost 100 feet.

"Bayou Lafourche was a major river at that point," Esposito said. "Now, it's not much more than a large ditch."

In the years 800 through 1400, the crevasse might have opened twice for long periods. "The entire region was covered by a cypress swamp at the time, and when the crevasse opened, it started depositing sediment there quite rapidly, in places up to five to 10 meters [16 to 33 feet] of thickness," Esposito said.

"We were looking not so much at the total volume, but at the retention efficiency: For every kilogram of sediment exported out of the river, how much stayed in that topographic bump that we now see on the map under Napoleonville."

Esposito said the scientists reviewing what happened then think that the Mississippi and the bayou together were carrying about the same load of sediment as the Mississippi alone does today. That might seem to contradict other scientific studies, which conclude the river now carries half the sediment it did 200 years ago.

But that's because 200 years ago, the river was capturing huge amounts of dirt washed off of newly developed agricultural land in the central United States, and the Bayou Lafourche crevasse shut down long before Europeans brought farming to North America. Today's reductions in sediment load are the result of the placement of dozens of dams in the river's watershed, including six major dams along the Missouri River, as well as efforts to reduce erosion caused by farming.

Bayou Lafourche, meanwhile, has been getting shallower. The connection between the bayou and the Mississippi was dammed off at Donaldsonville in 1905, dramatically reducing the flow of water and sediment.

The Napoleonville crevasse location included three characteristics that Esposito and his colleagues think planners of Louisiana's proposed diversions should make priorities:

Protection from marine processes, meaning the sediment should be delivered to areas where storm surges and waves are less likely to wash away the lighter clay and silt particles

Existing land that has already emerged from the water, with vegetation already established on it. Such areas can be more efficient at slowing the flow of water, to allow sediment to drop out and be captured. The Corps of Engineers created just such emergent land forms at the West Bay sediment diversion near the Mississippi's mouth, a strategy that Esposito said state officials could use with new diversions.

Low risk of submergence from sea level rise.