Formation of the Carolina Bays: ET Impact vs. Wind-and-Water

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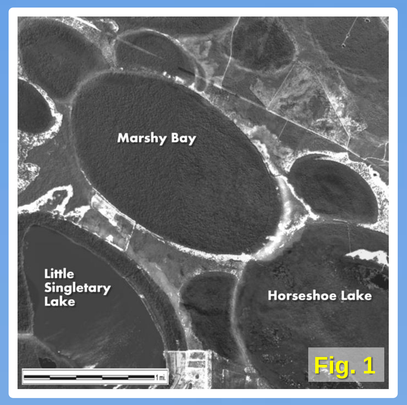


INTRODUCTION

The Carolina Bays are a group of up to 500,000 lakes and wetlands stretching from Florida to New Jersey along the Atlantic Ocean. They are up to 11 km in length and about 15 meters in depth. The elliptical shapes, overlapping rims **(Fig. 1, left)**, and common orientation towards the Great Lakes region have generated many hypotheses about how the Bays formed.

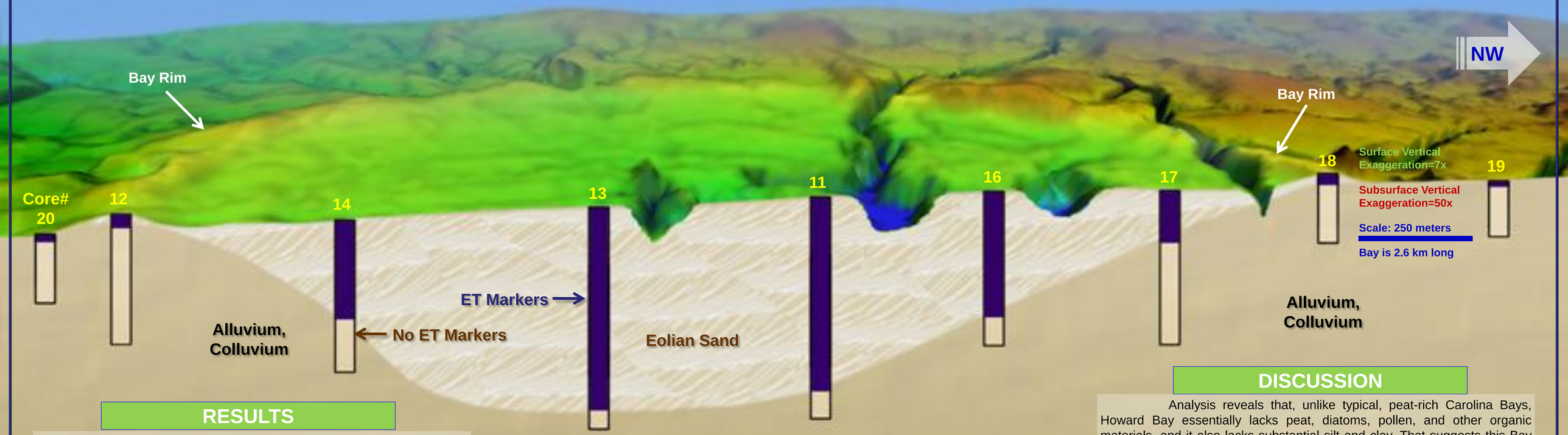
Extraterrestrial Impact. This hypothesis was developed by Melton and Schriever (1933) and expanded by Prouty, (1934) and Eyton and Parkhurst (1970), who proposed that a meteorite or comet exploded above the Great Lakes, producing no primary crater. The secondary fragments and/or shock wave from that blast formed rough, shallow craters on the Atlantic Coast, and, over time, wind and water altered those craters to form the Carolina Bays.

The Impact Hypothesis accounts for the orientation of Bays, overlapping raised rims, and the fact that they do not appear to be forming today. However, there are problems: (a) reported Bay ages vary by tens of thousands of years; and (b) no one has found impact material in the Bays, such as shocked quartz or other ET markers.

Wind-and-Water. This hypothesis was offered in various versions first by Raisz (1934) and others, who suggested that wind created deflation basins or parabolic dunes, which later filled to become lakes that evolved into Carolina Bays. Johnson (1942) proposed that springs or groundwater dissolution of soluble minerals caused subsidence, which formed water-filled depressions that became the Bays. Kaczorowski (1976) formulated what has become one of the prevailing views, suggesting that strong ice-age winds blew across irregular lakes, generating powerful eddy-currents. Those currents gradually reshaped the lakes into oriented, elliptical Carolina Bays, whose long axes were perpendicular to the prevailing wind direction. The rims were built from wind-transported sand that accumulated from the dry lake beds during droughts.

While this overall hypothesis clarifies many Bay features, it has several key weaknesses. The theory cannot explain: (a) how wind and water could create up to four layers of stacked Bays with overlapping Bay rims, as seen in Fig. 1; and (b) why modern severe wind and water action, such as occurs during hurricanes, does not produce or reshape Bays on the Coastal Plain today.

Objective: Because of the above questions, the Bay controversy has remained unresolved from more than 80 years. In this investigation, we tested these various hypotheses by examining Howard Bay, which is located about 2 km north of the town of Duart in Bladen County, North Carolina.

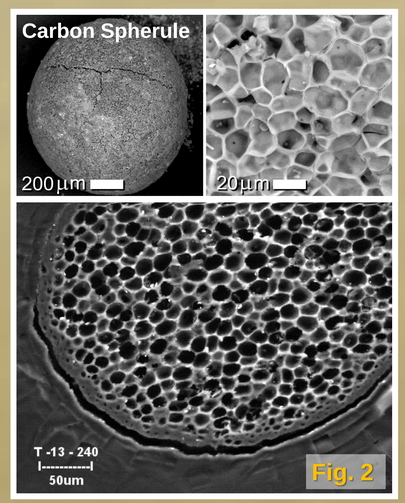


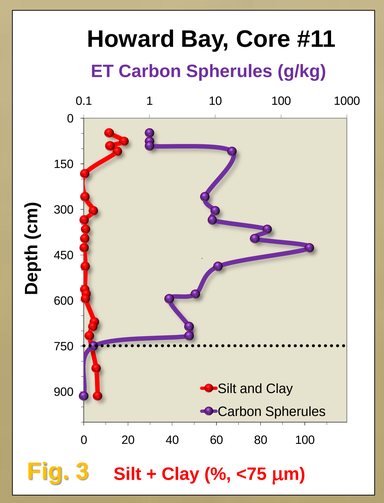
RESULTS

Nine suites of samples were extracted along the 2.6-km long axis of Howard Bay using a combination of trenching and coring with an AMS Soil Core Sampler. Maximum depths varied from about 2 to 10 meters.

ET Markers. Analysis of the samples reveal an assemblage of abundant carbon spherules (Fig. 2), magnetic grains, microspherules, glass-like carbon, and iridium, typical of the 12.9-ka YDB impact layer found at many other non-bay sites across North America. The impact layer conforms to the bottom of the basin (dark blue on the core symbols), suggesting that the markers began to be deposited immediately or soon after the Bay formed. Fig. 3 shows the results from Core #11 near the center of Howard Bay, where carbon spherules are found from nearly the surface down to about 7.5 meters deep. Glass-like carbon abundances (not shown) followed a similar pattern. Iridium (15 ppb) was found at the lowest level of the basin.

Silt and Clay. Trenching shows that the Bay is filled with >6 m of cross-bedded eolian sand (Fig. 4) with no evidence of lacustrine sedimentation. As a further test, sediment from Core #11 was analyzed with Standard ASTM sieves, and the results are shown in Fig. 3. The top 1 meter averaged about 14% silt and clay, and from about 1 to 9 meters, there is 0.3% to 6% silt and clay, values consistent with eolian deposition. There is typically less than a few percent of any particles larger than medium sand.





DISCUSSION

Analysis reveals that, unlike typical, peat-rich Carolina Bays, Howard Bay essentially lacks peat, diatoms, pollen, and other organic materials, and it also lacks substantial silt and clay. That suggests this Bay never held water for a sustained length of time. Furthermore, the presence of extensive eolian sand calls into question prevailing hypotheses (a) that all Bays were lakes and ponds in the past and that their shapes were formed by wave action, and (b) that groundwater movement led to subsidence that formed the Bay. In addition, the presence of impact markers, including high concentrations of iridium in a layer just above the basal sediments of this Bay, supports the impact hypothesis for Bay formation. The age of Howard Bay appears consistent with and not older than the YD impact event; however, our research did not address the reported anomalous ages of other Bays, a question which remains unresolved.

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