

Blast In the Past

Did something from space carve out the strange Carolina Bays?

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From ground level, Big Bay in South Carolina appears to be nothing more than a swampy, shapeless tangle of bay trees. But from the air Big Bay's true form is clear. It's a nearly perfect ellipse, pointing northwest.

Stranger yet, Big Bay is surrounded by many elliptical (oval) features just like it. In fact, an estimated 500,000 of them, called the Carolina Bays, pockmark the coastal plains from Delaware to Florida. All are pointed in the same direction, like a vast school of swimming fish.

What formed the Carolina Bay? Most scientists say it was wind and water. Others contend it came from outer space.

PERFECT ELLIPSES

Any good theory about the Carolina Bays must account for the vast number of them. It must also explain their generally northwest orientation and their smooth-as-a-jelly-bean shapes. Most of the bays also have flat, shallow bottoms and a low rim of white sand on the southeast side, and they occur in loose sandy soil.

Some bays overlap, and a few are nested inside others. Some are lakes, others are swamps, forests, or just subtle outlines in fields. They range in length from 100 meters (328 feet) to 11 kilometers (7 miles). No new Carolina bays are forming, so whatever shaped them is history.

Richard Firestone, a physicist at the Lawrence Berkeley National Laboratory in Berkeley, California, thinks he knows what links all the Carolina bays. They all point toward Michigan. And that's where, he believes, a comet exploded over the ice sheets that covered Michigan at the end of the last Ice Age. "Such a large impact would have created large shockwave in the atmosphere," Firestone told *Current Science*. The shock wave scooped out the Carolina bays.

As evidence of the comet's impact, Firestone and colleagues point to a layer of material in the Carolina bays and other places in the United States. That layer, they say, contains evidence of *nanodiamonds*. A nanodiamond is a microscopic form of carbon that is telltale evidence of a comet's impact.

When did the comet hit? Firestone puts the date at 12,900 years ago. That's when a dramatic cold snap called the Younger Dryas cooling event happened. Firestone claims that the comet's impact kicked up enough dust and gas to block the sun and cause the dramatic drop in temperatures.

NOT SO FAST

"Rubbish" says geologist Bruce Thom of Firestone's comet hypothesis. He and other scientists say Firestone's theory is full of holes.

Some scientists have searched for the nanodiamonds that Firestone claims are there but can't find them. The shape of the bays doesn't match the comet theory either, says geologist Ray Kaczorowski. "There aren't any impact craters anywhere in the solar system that are elliptical," he says.

"The impact theory has a lot of appeal, but mainly to non-scientists who don't typically apply the scrutiny or testing or evidence," says Kaczorowski.

ICY WINDS

Kaczorowski, Thom, and other geologists believe that wind and water formed the Carolina bays over a period of tens of thousands of years. Each bay started as a low area in the loose sand of the coastal plains. Dense clay under that sand held water, which formed small ponds. Meanwhile, cold air over the Great Lakes ice sheets drove strong, persistent winds, whipping up steady waves on the ponds. Over time, the waves re-shaped the ponds into neat ovals, all oriented perpendicular (at right angles) to the wind.

To test that idea, Kaczorowski built a plywood model. He added sand and water, then revved up some industrial fans. Sure enough, miniature waves began to scour out miniature Carolina bays.

Could such conditions really have formed thousands of bays? Kaczorowski points to swarms of similarly oriented lakes now forming in the cold, dry environment of Alaska.

Andrew Ivester, a geologist at the University of West Georgia, says his work strikes another blow to the comet theory. Ivester used an instrument that measures how long sand has been sitting undisturbed to determine when the sand along the Carolina bays piled up. His results? Not all Carolina bays formed at the same time. Though many bays are 15,000 to 35,000 years old, a few are 100,000 years old.

LEARNING EXPERIENCE

Each side in the debate admits that it doesn't have all the answers. Still, says Ivester, very few geologists favor the comet theory. There just isn't enough down-to-earth evidence. And they don't need a comet to explain the Younger Dryas cooling. It probably happened when the collapse and melting of the big ice sheets sent an influx of cold water into the North Atlantic Ocean, shutting down warm oceanic currents.

Whether the comet hypothesis is right or wrong, its critics recognize that bold theories can be good for science. Such theories can spur more research. "Other scientists take the time to look for evidence backing up or refuting (the) ideas," wrote climatologist Gavin Schmidt in the blog RealClimate.

Ivester adds that the Carolina bays still have much to reveal about geology and prehistoric climates. "I think they are exciting even if they aren't from an impact," he says.