Archaeological and Geological Evidence of a Recent and Rapid Sea-Level Rise from Sites Along Coastal Florida

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Abstract

Uniformitarians propose that the last major sea-level rise began with the close of the Wisconsin Ice Age 14,000 to 18,000 years ago. Approximately three to five thousand years ago sea level stabilized to its near-present-day level. According to uniformitarian archaeological estimates paleo-Indian cultures have existed in Florida for 10,000 years. Many paleo-Indian sites have been identified across the state with some found underwater, both on and offshore. Large offshore submerged sand dune fields are believed to have become drowned with the last rise in sea level. Many of these same subaqueous sand dune fields contain *in situ* tree stumps within the swales, reflecting once living maritime forests. These former forests existed on the continental shelf at various sea-level lowstands during the Pleistocene. We propose that the now submerged paleo-Indian sites, sand dune fields, and paleo-forests reflect former subaerial environments that were rapidly drowned with the last sea-level rise approximately three to six thousand years ago (associated with the close of the Young-Earth Flood Model—Ice Age Timeframe).

Introduction

Uniformitarian geoscientists believe that the Pleistocene Ice Age ended approximately 14,000 to 18,000 years ago with the termination of the last Wisconsin glacial interval (Andrews and Barry, 1978; Curray, 1961, 1964, 1965; Dolan and Lins, 1986). Global sea level position has risen from this period until a few thousand years ago. Today's sea level position is believed to reflect basically three to six thousand years of near constant levels (e.g., Coleman and Smith, 1964; Curray, 1965; Dolan, Hayden, and Lins, 1980; Dolan and Lins, 1986; Scholl, Craighead, and Stuiver, 1969).

The Young-Earth Flood Model does not support the current uniformitarian model of Earth history, rather we follow our own Bible-based timescale (e.g., Froede, 1995; Reed, Froede, Bennett, 1996; Walker, 1994). As Young-Earth Creationists we can accept the possibility that sea level has probably not changed drastically since the close of the single Ice Age approximately three to six thousand years ago. While we will report uniformitarian dates within this work we do not support or believe them to reflect actual Earth history. We support a six to ten thousand year old earth, in line with what Scripture would have us believe. However, we acknowledge that further research is required to reconcile the disparity between the Pleistocene Ice Age eustatic sea level changes and ^{14}C dates, and our own Bible-based understanding of Earth history.

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Dauphin Island Revisited

Dauphin Island, Alabama provides a working laboratory for gaining insight into the coastal geomorphic processes presently occurring along the northern Gulf Coast, and specifically the Florida Panhandle. Features easily observable at Dauphin Island are not as easily identifiable along Florida's barrier island coast due to commercial development. However, similarities between Dauphin Island and the Florida Panhandle barrier islands are expected with regard to changing environments (both past and present) and beach processes.

Previously, Froede (1995, 1996) discussed the occurrence of a paleo-maritime forest which he found exposed within the surf zone on Dauphin Island (Figures 1 and 2). English and Haywick (1996) also reported the occurrence of tree stumps in several feet of water around the end of the Dauphin Island Fishing Pier approximately 900 feet from the shoreline. Paleosols were also noted by Froede

Figure 1. A paleo-maritime forest exposed in the surf zone at Dauphin Island, Alabama. If sea level rises slowly then the sand dune field rolls landward burying the maritime forest only to expose it again along the surf zone. Wave action, currents, and boring creatures will destroy any unprotected wood exposed within the surf zone. In this case the *in situ* trees are only protected by burial in the beach sand. A rapid rise in sea level would likely spread migrating sand across the former paleo-maritime floor and bury at minimum the lower portions of the existing forest thus serving to protect this portion from erosion as sea level would rapidly move landward.

as exposed within the swash zone along sections of the southeastern side of Dauphin Island. These features suggest that sea level has risen somewhat rapidly as a function of the end of the recent single Ice Age, and also as a function of land subsidence (i.e., sediment/strata consolidation and compaction). Froede (1995) also noted other Gulf and Atlantic Coastal beaches where paleo-maritime forests are exposed within the surf zone. All of these now exposed paleo-forests reflect a dynamic beach/barrier island system which has been impacted by the recent and rapid rise in sea level.

Sea Level Still-Stand Indicators

Many sea level positions have been postulated using geomorphic data collected along the Florida Peninsula (Donoghue and White, 1995; Locker, Hine, Tedesco, and Shinn, 1996; Milliman and Emery, 1968; Scholl, Craighead, and Stuiver, 1969; Scholl and Stuiver, 1967) as well as other Atlantic and Gulf Coastal areas (Coleman and Smith, 1964; Curray, 1961, 1964, 1965; Kaye and Barghoorn, 1964; Schroeder, Shultz, and Pilkey, 1995). The reasoning behind the use of the Florida shelf is the belief that this area has been tectonically stable since the Pleistocene (at least from 35,000 years before present [YBP]). Hence, sea level would change and the land surface would remain stable, thus providing a means of measuring relative sea level change over the proposed vast period of time. However, Otvos (1995) has cautioned against comparing the Atlantic sea level record with that of the Gulf Coast, and he suggests that sea level highstands lack significant means of correlation between the two areas. Additionally, he suggested that many surface features previously identified as sea-level highstand markers on the north central Gulf Coastal Plain are structural lineaments and not actual sea-level indicators (Otvos, 1981). Many questions and issues remain to be resolved in addressing and correlating various Pleistocene sea level positions, especially along the Southeastern United States Atlantic and Gulf Coasts.

Despite the potential for correlative error, many sea level highstands have been documented around the Southeastern United States by comparing relict shoreline features such as scarps, swales, and dune ridges (Brenneman and Tanner, 1958; Gremillion, Tanner, and Huddlestun, 1964; Healy, 1975; Ludwick, 1964; MacNeil, 1950; Tanner, 1992, 1994; von Drehle, 1973; Winker and Howard, 1977). What is missing are evidences which document sea level lowstand positions.

Various studies have lead to the recognition of older sediments (identified as "relict sediments") which lie submerged on the Gulf Coast continental shelf. These deposits formed at a lower sea level position during the Pleistocene (e.g., Curray, 1965; Donoghue, 1989; Emery, 1968; Gould and Stewart, 1955; Hyne and Goodell, 1967; Lawrence, 1974, p. 97; Kwon, 1969; Vause, 1959). These

Figure 2. Pine trees undermined with approaching surf zone. Without sand dune roll-over to bury and protect the forest it is subjected to direct undermining of its sand/soil support. In this case no trees of the maritime forest are preserved with the slow landward advance of the surf zone. Only rapid sea level rise would prevent the wash-out of this forest. Hence, finding tree trunks offshore underwater suggests a rapid sea level rise.

relict sediments remain unburied as a result of rapid sea level rise, and the resulting loss of additional sedimentary input (Boone, 1973; Emery, 1968; Stone et al., 1992). We propose that these subaqueous features (relict sediments in combination with the offshore paleo-maritime forests, buried peat deposits, and sand dune ridges) can provide us with valuable information about sea level lowstands when they can be properly identified and correlated. Additional evidence such as Indian relics and artifacts found both in now submerged limestone caves, along river courses, and in areas offshore, reflect human habitation before the last major sea level rise (Anuskiewicz, 1988a, 1988b; Bense, 1994; Clausen, et al., 1979; Dunbar, 1988a, 1988b; Faught, 1988a; Rucker, 1996; Rupert, 1988). We will review documented evidence which reflects a recent and rapid sea level rise (associated we believe with the end of the Young-Earth Flood Model—Ice Age Timeframe) for a portion of the submerged continental shelf along the Florida Coast.

Paleo-Indian Artifacts and Environments

The oldest physical evidence of human existence in the state of Florida comes from a wooden stake found 33 to 37 feet below the water surface at Little Salt Spring, near Sarasota (Figure 3). The piece of wood ranged in age (Carbon-14 method) from 12,078 YBP (Bense, 1994) to 12,030 YBP (Clausen et al., 1979; Stamm, 1994).

According to Bense (1994, p. 65) the environment of the Southeastern United States was different at the time of early paleo-Indian occupation:

> The most important differences were vegetation and sea level. At the onset of the Archaic period (9998 YBP), sea level was 90 ft lower than today, and most of the Southeast was covered with an oak-hickory forest. (parenthesis ours)

There is mounting evidence which documents that paleo-Indians (early Native Americans) not only lived in areas which are today found onshore, but at many sites which are found offshore (Figure 3). An interesting comparison can be made between the dates when the paleo-Indians lived in Florida and the uniformitarian geological sea level changes during the close of the Pleistocene (Figure 4). The physical evidence appears to indicate that there was a recent and rapid sea-level rise likely caused due to Ice Age climatic phenomena. Interestingly, some of the Florida offshore paleo-Indian sites reflect a sea level rise event which is not currently recognized within the uniformitarian sea level curve[1].

During the Pleistocene, sea level was believed to have been vastly lower, ranging from 60 to 380 feet lower than today's sea level. At the lowest levels the western coastline of peninsular Florida possibly extended 40 to 70 miles offshore exposing a considerable portion of the continental shelf (Doyle et al., 1984) [Figure 3]. Caribbean land routes, broken by relatively short water gaps, bridged Florida with South America (Bullen, 1975; Cockrell, 1980; Dunbar, Webb, and Faught, 1992; Garrison, 1992; Hyne and Goodell, 1967; Kraft, Belknap, and Kayan, 1983; Lazarus, 1965; Milanich, 1994; Stright, 1986; Thomas and Campbell, 1993; Wolfe, Reidenauer, and Means, 1988).

A recent announcement from anthropologists (who are not adherents to the Young-Earth Flood Model) for

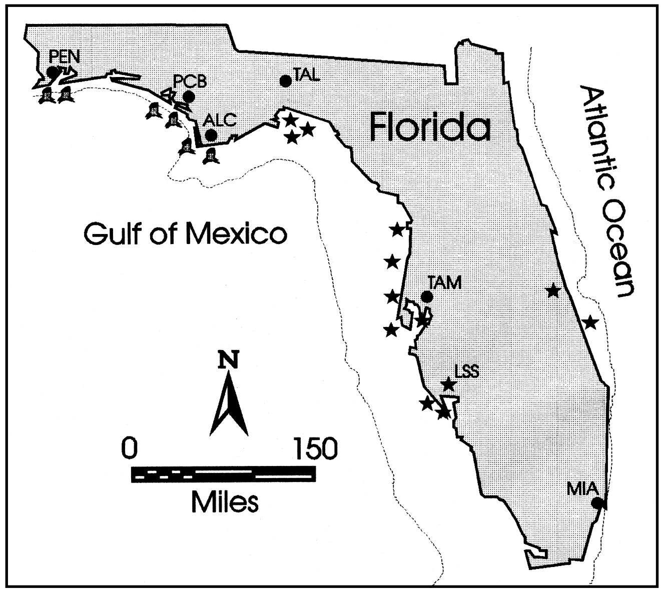

Figure 3. Map of Florida showing the areas with documented paleo-maritime forests (stump symbol) and inundated archaeological sites (star symbol). Modified from Dunbar, 1988a and Burgess, 1977. Bathymetry contour value is 60 feet (Tanner, 1992, p. 14) and possibly represents the area available for habitation following a drop in sea level (during the Wisconsin Ice Age glacial). All of these underwater locations suggest a rapid sea level rise in the recent past. Abbreviations: PEN–Pensacola; PCB–Panama City Beach; ALC–Apalachicola; TAL–Tallahassee; TAM–Tampa; MIA–Miami; LSS – Little Salt Spring.

[1]Uniformitarians have documented several Holocene sea-level fluctuations along the Gulf Coast (Dolan, Hayden, and Lins, 1980; Stapor, Mathews, and Lindfors-Kearns, 1987). However, these features have not been formally linked together into a comprehensive Holocene sea-level curve for the Gulf Coast. This is because the individual indicators of sea-level change do not directly correspond to one another. Pleistocene sea level curves remain in a flux over the rate and number of changes which are believed to have occurred with the close of the Wisconsin Ice Age.]

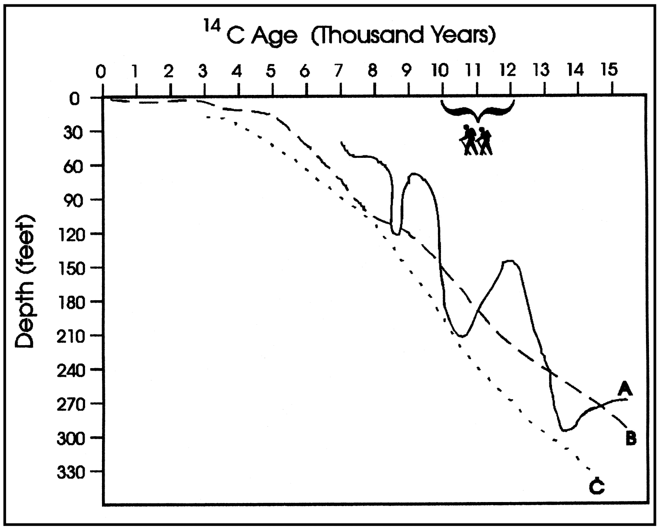

Figure 4. Three uniformitarian sea level curves for the Gulf of Mexico suggest that sea level has been rising for the past 15,000 years. This chart suggests that the Gulf Coastal sea level basically stabilized about three to four thousand years ago. However, inundated Florida paleo-Indian locales suggest a much more recent sea level rise. The human figure represents when man is believed to have appeared in Florida. Modified from sea level curves found in: A) Curray, 1960, B) Curray, 1965, and C) Fairbanks, 1989.

man's arrival in North America is ca. 14,000 YBP; scientists argue about the exact dates but generally agree that man arrived in North America between 15,000 to 11,000 YBP (Anderson, O'Steen, and Sassaman, 1996; "Big barbecue sets new date," 1996). For many years scientists questioned the whole idea of early man living in Florida during the Pleistocene. Proposals that these paleo-Indians once inhabited the then exposed continental shelf met with great skepticism. But field work over the last 20 to 30 years has conclusively shown that paleo-Indians lived in Florida and were coexistent with mastodons, giant ground sloths, saber-toothed tigers, and other Pleistocene megafauna. When human and Pleistocene fauna remains began to be excavated from rivers, springs, and sinkholes — which were oases when sea level dropped creating a higher, and drier Pleistocene Florida — researchers began to turn their attention to potential submerged sites on the continental shelf (Anderson, O'Steen, and Sassaman, 1996; Cockrell, 1980; Dunbar and Webb, 1996; Dunbar, Webb, and Faught, 1992; Lazarus, 1965; Leverett, 1931; Milanich, 1994).

Archaeologists began to predict where potential paleo-Indian sites could be found by correlating these features with early Indian patterns of subsistence. Ridges along relict river channels became possible sites for Indian middens (refuse heaps which accumulated at campsites). Sinkholes would have been utilized as freshwater sources; and rock outcroppings would have been sites of weapon-producing quarries for these early Indians (Anuskiewicz, 1988b; Dunbar, 1988a; Faught, 1988a; Garrison, 1992; Hyne and Goodell, 1967; Jordan, 1951; Wolfe, Reidenauer, and Means, 1988).

Paleo-Indian Sites as Sea Level Still-Stand Indicators

Florida sites reflecting a lower sea level position during paleo-Indian times are numerous. On the Atlantic coast, submerged Indian remains have been located at Vero Beach, South Ponte Vedra Beach, and Douglas Beach. At Douglas Beach, near Fort Pierce, a site was found approximately 1,969 feet offshore from the beach, in water depths ranging from 10 to 39 feet. Radiocarbon tests at Douglas Beach have yielded dates ca. 5,000 YBP (Bullen, 1975; Cockrell, 1980; Stright, 1988). On the Gulf side of Florida, numerous Indian oystershell middens have been located in Tampa Bay, with artifacts and fossils continually being dredged from it, including paleo-Indian projectile points and other tools, Pleistocene vertebrate fossils, mineralized human bones, and even a mineralized wooden bird effigy (Cockrell, 1980; Dunbar, Webb, and Faught, 1992; Stright, 1988; Warren, 1971).

Early Native American artifacts have also been found in the shallow waters of Choctawhatchee Bay, in the Florida panhandle (Thomas and Campbell, 1993), but one of the best sources for the Pleistocene paleo-Indian remains has been Apalachee Bay, south of Tallahassee, where a number of inundated sites have been located 0.6 to 6 miles offshore at water depths ranging from 1.5 to 17 feet (Milanich, 1994). The St. Marks, Aucilla, and Econfina rivers drain into Apalachee Bay, and this has allowed a favorable archaeological study site because alluvial sedimentation is minor to non-existant due to the lack of sufficient flow for sediment transport, and the abundant limestone source rock of the drainage basin (Faught, 1988a). A relict channel of the Econfina River was identified in 12 feet of water, 2.5 miles offshore. Several submerged paleo-Indian chert quarry sites (in 12 to 16 feet of water - six miles offshore) have been located with artifacts (Dunbar, Webb, and Faught, 1992). Remains of cypress tree roots were also recovered, with radiocarbon dates assigned to ca. 5,000 YBP (Dunbar, Webb, and Faught, 1992; Faught, 1988a, 1988b).

Archaeologists have determined that numerous submerged Pleistocene sites exist in Apalachee Bay, but one of the most striking and potentially promising sites is Ray Hole Spring, 24 miles from the nearest Florida coastline, lying in 38 feet of water. This site is a drowned sinkhole that may have been utilized by early Native Americans. Archaeologists have recovered several large chert flakes that may have been produced by paleo-Indians. Waterlogged live oak wood and oyster shells were also located, and radiocarbon dates assigned to each; the wood was dated at ca. 8,200 YBP, and the oyster shell dated at ca. 7,400 YBP. The wood, and younger oyster shells found at the site, suggest that the spring was originally a freshwater site that later became subject to sea-level rise which eventually supported a shellfish population in a brackish water environment (Anuskiewicz, 1988a,, 1988b; Dunbar, Webb, and Faught, 1992).

The excellent preservation of so many Pleistocene and early Holocene paleo-Indian remains from Florida is astonishing. At the Windover wet site in Florida numerous remains were located, and dated to ca. 7,000-8,000 YBP. This particular site also had preserved human brain tissue! Other sites, such as Warm Mineral Springs and the Page/Ladson site on the Aucilla River, have also yielded excellently preserved artifacts, the latter which yielded a deposit of mastodon digesta radiocarbon dated to 12,500 YBP (Anuskiewicz, 1988b; Cockrell, 1980; Cockrell, 1988; Doran, 1988: Dunbar, Webb, and Faught, 1992; Milanich, 1994; Stright, 1988). The offshore underwater sites have also yielded well-preserved remains. Various factors have allowed many of these sites to be preserved, as Cockrell (1980, pp. 140-141) aptly points out:

> Common sense tells us that an advancing surf line will destroy a beach-front archaeological site. However, studies of primitive people today and our knowledge of later prehistoric cultures show that Stone Age people would have preferred to live on an estuary or lagoon than on an open beach. This is simply because unspecialized gatherers find more food in shallow estuaries and lagoons than they do on open beaches. Thus we should expect to find their settlements not there but on the inland waterways behind. By the time that a rise in sea level had drowned such a site, accumulating sediments and the depth of overlying water would have been enough to protect it from wave erosion and bottom surge. This supposition proved itself in the excavation of the Douglas Beach site—a site submerged in the Atlantic Ocean off a coastline pounded by surf for much of the year. Despite wave battering, the site is preserved, even to the Pleistocene tree stumps intact beneath the sand.

While on the surface Cockrell's statement appears sound, he assumes that the presence of these artifacts and preserved tree stumps validates where "common sense" would require their complete destruction. We propose that his concept of preservation can only occur when sea level rises in a rapid manner. Otherwise, the churning surf zone would have destroyed these sites (Figures 1 and 2). Various researchers have also reached the same conclusion regarding the need for a rapid sea level rise (Garrison, 1992; Kraft, Belknap, and Kayan, 1983). At the One Fathom Site, half a mile offshore from New Port Richey, Florida, are the remains of a Deptford Period Indian site, dated to ca. 2,000-3,000 YBP (Lazarus, 1965; Stright, 1988). At Battery Point, near Bayport, Florida, is an inundated native American site dated to 2,998 YBP (Bullen, 1975). At Venice Beach, Florida, in 6.5 feet of water, is an Indian midden from the Formative Period, dated to around 2,000 YBP (Cockrell, 1980; Stright, 1988). All of these sites were preserved because of a rapid sea level rise.

On the Atlantic side of Florida, the evidence of post-Pleistocene rapid sea level rise exists as well, although the present uniformitarian sea level curve fails to reflect this late rapid rise. Inundated Indian sites have been located on the St. Johns River dating to 2, 998 YBP. Vero Beach has an inundated site which dates to ca. 2,843 YBP. More evidence that both the Atlantic and the Gulf coastlines have encroached landward can be seen at Jacksonville Beach where the base of a cypress swamp was exposed after a hurricane, and at South Ponte Vedra Beach where clearing operations revealed that trees were once growing at lower elevations than at present (Bullen, 1975). Even more recent occurrences of sea-level rise can be found. Some Indian sites along the Crystal River in Florida were occupied between ca. A.D. 400-600, after which time portions of the sites were inundated (Bullen, 1975). The presence of submerged trees in the shallow water of Choctawhatchee Bay has provided evidence of sea-level fluctuation in historical times (Wolfe, Reidenauer, and Means, 1988). The archaeological excavation of the Spanish colonial city of Santa Rosa Pensacola on Santa Rosa Island in the Florida panhandle, occupied between 1723-1752, showed evidence of a water table lower by two feet for that period (Lazarus, 1965).

One thing is certain. The various dates offered by archaeologists working on early Native American sites in Florida show numerous discrepancies, but generally the recent research has helped to bring the dates for the end of the Pleistocene age closer to the present (Dunbar, Webb, and Faught, 1992; Garrison, 1992; Kraft, Belknap, and Kayan, 1983; Lazarus, 1965; Milanich, 1994; Stright, 1986; Thomas and Campbell, 1993; Wolfe, Reidenauer, and Means, 1988).

Subaqueous Dune Ridges

Offshore along the western portions of the panhandle of Florida are many large sand dune ridges. These submerged sand ridges remain relatively fixed and stable, and are presently beyond the reach of all but the most violent of tropical storms (Hyne and Goodell, 1967; Wolfe, Reidenauer, and Means, 1988). They are recognized as once being wind-blown dune ridges by the composition and size of their quartz sands (Hyne and Goodell, 1967). They provide evidence of a former lower sea level position. A slow rise in sea level would have moved these sand dunes landward, or the surf zone would have eroded them down to the then existing sea level position. Only a rapid rise in sea level position would have left these sand dunes stranded offshore.

The Case of a Submerged Forest

Other features which support to our view of a recent and rapid sea level rise are *in situ* tree stumps exposed underwater in the swales of various sand dune ridges. These paleo-forests have been found offshore from Pensacola to Apalachicola (Burgess, 1974; Dietz, 1963; Hyne and Goodell, 1967; Lawrence, 1974; Salsman and Ciesluk, 1978) [Figure 3]. Tree stumps found within these areas are still held firmly in place by their roots. The fact that they still exist in a woody state testifies to their recent burial.

The following is a summary of one paleo-forest locale found offshore from Panama City Beach, taken from Burgess (1977). Additional background references and information are provided in parenthesis:

Top secret studies were conducted by the United States Navy off the coast of Panama City Beach in 1961. These tests were conducted to determine if a new device could be used to map the seafloor. This new device was a prototype of the side-scan sonar. During these tests it was noted that the seafloor out on the continental shelf contained a series of sand waves which could only have formed as a result of a lower sea level position. Additionally, it is suggested that these sand waves can only be moved if sea level were at a lower position (see Hyne and Goodell, 1967).

Navy divers were sent to investigate the seafloor in the areas off Panama City where the tests were conducted in order to document the accuracy of the instrument. During these underwater investigations it was noted that tree stumps appeared to be rising up from the seafloor in areas between these sand waves. Further investigation showed that these stumps were in fact the remains of actual trees which formed a forest when sea level was lower in Earth's past (i.e., the Pleistocene). The woody tree stumps were not mineralized or fossilized. Additional investigations further revealed a whole underwater "forest" of these tree stumps as similar to those found along the coastal areas of the panhan-

Figure 5. Photograph showing the ship channel to Saint Andrew's Bay adjacent to Panama City, Florida. The submerged trees were found exposed along the sidewalls of this ship channel following its dredging. Also tree stumps, roots, and humus were found offshore from this area in waters approximately 8 to 50 feet.

dle of Florida today. All of these stumps were found in waters 45 to 65 feet deep with their roots intact. Carbon dating of the wood was conducted by Shell Oil Company and Isotopes, Inc., with the wood age dates ranging between 27,000 to 35,000 YBP.

The age of the wood is older than the last recognized sea level lowstand. So it is proposed that a maritime forest existed immediately offshore of the present shoreline extending along the panhandle of Florida. Sea level then rose resulting in the burial of this paleo-maritime forest due to migrating sand dunes. Sea level then fell (not exposing the forest still buried in sand, rather preserving the forest for tens of thousands of years) then rose again to near present levels.

Woody tree stumps have also been noted during dredging operations associated with maintaining the ship channels at Pensacola and Saint Joseph Bay, to the east and west of Panama City, respectively.

In a Masters thesis project, Marc Lawrence (1974) took up the study of recently uncovered tree stumps associated with the dredging of the ship channel for Saint Andrew's Bay. While dredging the ship channel it was noted that tree stumps became exposed along the edge of the channel sidewalls (Figure 5). These trees were found in 25 to 35 feet of water. Lawrence (1974) also documented tree stumps and peat layers in waters as deep as 55 feet.

In summary it has been documented that all of the tree stumps found were still held in place by their roots. The tree stumps were not mineralized in any manner. Carbon dating of the tree stumps has suggested that the tree stumps and woody material found in deeper water (from 20 to 60 feet deep) were part of a forest which existed 27,000 to 35,000 YBP, and was buried and protected from destruction by a covering of beach sand (Lawrence, 1974). The submerged tree stumps (protected from destruction by a covering of beach sand) in waters 10 feet deep were dated to 4.7 to 4.8 thousand YBP (Lawrence, 1974).

One factor which may help date the submerged Pleistocene forest found off Panama City Beach, Florida, is by an analysis of the varieties of trees found. Pines are the most dominant tree found submerged near Panama City Beach. Hardwood tree stumps such as oak, hickory, and elm are found underwater but in fewer numbers. The hardwood forest of the last glacial maximum now located just offshore on the submerged continental shelf is very similar to the vegetation of present-day stands located 20-30 miles north of Panama City (Burgess, 1977; Wolfe, Reidenauer, and Means, 1988). Ecologists theorize that during the last glacial stage the Gulf Coast was then characterized by more hardwood forests, with pine forests becoming dominant only at the end of the Ice Age with the onset of rising sea levels (Thomas and Campbell, 1993; Wolfe, Reidenauer, and Means, 1988).

Young-Earth Flood Model Perspective

What are we to make of this information and its suggested interpretation? What does this information hold with regard to our model? First and foremost we must recognize the differences in time between our two competing models. The Young-Earth Flood model seeks to define Earth history within the span of six to ten thousand years. Following the global Flood, isostatic and diastrophic forces were still in operation which probably affected eustatic sea level position (e.g., isostatic rebound, tectonics, etc.). The single Ice Age (Oard, 1990), immediately following the Flood, ended approximately three to six thousand years ago. Hence, changes in eustatic sea level position are expected within our model, but would have occurred more recently and in a more rapid manner than is currently recognized by the uniformitarian model.

A drop in sea level position would have allowed the existing coastal flora and fauna to move into the recently exposed terrestrial areas. Ecological succession could then follow with an "Old Growth" forest developing in as little as 150 years (Odum, 1971). However, it should be noted that most of the trees identified in the now submerged paleo-maritime forests are comparable to what is found onshore today (i.e., mainly slash pine and scrub oak) [Lawrence, 1974; Marsh, 1966]. We suggest that the lack of any extensive numbers of hardwoods found as tree stumps reflect the short-lived nature of this paleo-maritime forest. A pine forest can reach maturity in 75 to 100 years (Odum, 1971). With the waning of the Ice Age, and the rising sea level, the hardwood forest would retreat northward, being replaced by the predominant pine forest characteristic of the panhandle today (Thomas and Campbell, 1993; Wolfe, Reidenauer, and Means, 1988). With these factors in mind, we would propose that the submerged forest off Panama City Beach would date from the later stages of the single Ice Age (approximately three to six thousand years old), and is much more recent than the uniformitarian scientists claim.

Slow Versus Fast Sea Level Rise and Its Impact on the Paleo-Forests

A slow rise in sea level would erode away most if not all evidences of a once existing paleo-maritime forest due to the churning surf zone (e.g., Bruun, 1962; Davis, 1994;

Dietz, 1963; Fischer, 1961; Komar, 1983; Leatherman, 1988; Swift and Palmer, 1978). This is occurring today along the surf zone at such places as Dauphin Island, Alabama (Figures 1 and 2). For some areas the slow rise in sea level would cause the beach sand dunes to migrate shoreward. As they moved shoreward they would migrate over existing maritime forests. These forests would be buried under the dune sands and would remain somewhat preserved until the beach dune migrated past this point and re-exposed the forest within the surf zone (see Leatherman, 1988, p. 45) [Figure 1]. The tree stumps exposed to the pounding surf and biological activity would not last for very long under these conditions. Mineralization (i.e., petrifaction) is also not likely to occur in this environment. In areas with no sand to bury and protect the tree stumps and roots, the surf zone would serve to erode away all evidences of the once existing maritime forest (Figure 2).

A rapid rise in sea level would create very different conditions such that not all sand dunes would be able to migrate shoreward at the same rate. In many cases these sand dune fields would be inundated, and only move as storm waves directed. However, some of the sand dunes would have moved shoreward with the rise in sea level quickly burying existing coastal environments. The rapid nature of sea level rise would also effectively move the surf zone landward. Once sea level stabilized it would erode and transport sand away from the surf zone, eventually exposing the formerly buried forest (e.g., Dauphin Island, Alabama).

Conclusions

The uniformitarian model proposes that sea level began to drastically change its position starting with the close of the Wisconsin Ice Age approximately 14,000 to 18,000 years ago. However, it is believed to have changed very little in the past three to six thousand years.

Today we find many paleo-Indian sites submerged both on and off the Florida coast. These locales suggest that humans once lived in areas we presently find unavailable to us. The identification of the offshore sites has depended on little to no sedimentary cover. A slow rise in sea level would destroy these sites due to the pounding surf zone. Hence, we propose that the very existence of these sites requires a rapid sea level rise.

Offshore from the Florida coastline are found submerged sand dunes. Some are found to contain paleo-maritime forest tree stumps within their interswale areas which infer both a recent and rapid rise in sea level. To suggest that beach sand can preserve woody material for 27,000 to 35,000 years (involving at least two separate and distinct sea level low- and high-stand events) defies reason and is not acceptable to the authors. Additionally, it appears that there are still unresolved matters when it comes to selecting the appropriate woody material for carbon dating (Otvos, 1979).

The physical evidences (e.g., paleo-Indian relics, sand dune ridges, and paleo-maritime forests) suggest that sea level has changed both recently and drastically. We interpret the evidence to reflect and support the short amount of time that has elapsed since the end of the Young-Earth Flood Model Ice Age Timeframe, approximately three to six thousand years ago. Clearly other interpretations are possible and we welcome further discussion and investigation of these physical evidences.

Appendix

A reviewer noted that this work failed to address the seemingly rapid dispersion of people across the Earth following the global Flood of Genesis. While this was not the theme of this effort, we do feel compelled to briefly address this and several other related issues. First, the theme of our article is to document the rapid rise of sea level in a manner (using geologic and archaeological evidences) which has NOT been widely addressed within the uniformitarian literature. It appears to us that geologists and archaeologists are defining the close of the Pleistocene (specifically the end of the Wisconsin Ice Age) in different ways, using different dates. The physical evidence (both archaeological and geological) supports the Young-Earth Flood Model. We observe no evidence which requires long periods of time and slowly changing sea levels, as the uniformitarian model dictates. Rather, we note rapidly changing sea-level positions with subaerial environments occurring, in some cases, well offshore (and there are only a few of these—where many would be expected if hundreds to thousands of years were truly available for the development of paleo-environments). A simple test in support of the passage of long-periods of time can be demonstrated by noting the "age" of the trees composing the forests found in these offshore settings. Most of the tree stumps found submerged offshore do not reflect climax forests.

Secondly, we believe that the rapid penetration of the western hemisphere by the eastern migration of paleo-Indians is not spectacular, when compared with the tremendous ecological flux which occurred following the global Flood, and which continued throughout the Ice Age. A barren post-Flood Earth was quickly covered with grasses and vast savannahs before forests became more dominant. For large herbivores and many other animals it must have seemed like paradise, tempered by the onset of the Ice Age. As animals, such as mammoth, bison, etc., searched for new pastures (areas not threatened by climatic changes associated with the Ice Age), nomadic human groups followed them, eventually into the western hemisphere. As the Ice Age diminished, continuing climatic changes pressed animals and humans ever onward in search of hospitable environments (Anderson, O'Steen, and Sassaman, 1996; Gunn, 1996; Oard, 1990).

Finally, dating the time of the first human settlements in the western hemisphere appears to be in a major state of flux, with the recent discovery (and supported by valid dates) of ancient human artifacts at Monte Verde, in southern Chile. This discovery raises the possibility that some humans might have crossed the Pacific from Southeast Asia, as much as 33,000 years ago (Toner, 1998). While this is an interesting discovery, it does not contradict Scripture (we reject the age dates of these artifacts on the basis, in part, of rapidly changing post-Flood climatic conditions and its impact on C-14 generation). We would counter that these new archaeological discoveries reflect that mankind was far more advanced than has been given credit (see Petersen, 1987). The ability to undertake an oceanic voyage across the Pacific Ocean reflects an intelligent group of people. Ignorant "hunter-gatherers" would have been unable to build a boat and supply it in a manner which would have allowed successful transoceanic travel. Again, none of this new evidence for the global migration of people from Asia to the Western Hemisphere contradicts the Bible. The Bible does not provide us with mankind's history apart from God's chosen people, and we must determine what happened to mankind as they spread across the globe following the Flood.

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Book Review

Where Garden Meets Wilderness **by E. Calvin Beisner**
William B. Eerdmans Publishing Company, Grand Rapids. 1997. 256 pages. $16.
Reviewed by Don B. DeYoung

The Creation Research Society has always been interested in stewardship of the Creation. Former CRS Board member John Klotz (19 18-1996) wrote the still-popular book *Ecological Crisis* three decades ago, in 1971.

Currently there are several conservative Christian environmental organizations including the Society of the Green Cross and also the Au Sable Institute. These groups are active in raising awareness of our responsibility to care for the created earth. While fully supporting Christian stewardship, author Calvin Beisner has taken the task of exposing some of the doubtful Scripture interpretation and faulty data used by well-meaning environmental groups. Beisner is a professor of interdisciplinary studies at Covenant College, Lookout Mountain, Georgia. His book is both controversial and carefully written.

In Beisner's view the original Garden of Eden was locally ideal. However the rest of the world was a wilderness that needed to be tamed. He believes Adam was commissioned to manage and transform (Genesis 1:28, subdue) the earth while cultivatingand protecting the original Garden (p. 19). The Curse later complicated this task worldwide.

Beisner has an optimistic, non-alarmist view of population growth. His data shows that the world is far from over-populated. Why then are people starving today? It is mainly because of incompetent governments and civil strife (p. 153). Beisner states that people in general produce more than they consume (p. 157). That is why real prices of nearly every resource on earth continue to fall as world population increases.

The book's many refreshing ideas, whether right or wrong, need to be considered. For example, entropy is said to apply only to the physical world, not the spiritual (p. 26). Beisner challenges the notion that "nature knows best" and should be left to itself (p. 21). He also presents data to show that global warming is not affected by man. Also, species extinction is not 100,000 per year as suggested by Vice President Al Gore (p. 218), but perhaps only one species lost per century (p. 163). If Beisner is correct, then Al Gore is in error by one billion percent! Beisner shows that there has been a positive reversal of the past decades problems of deforestation, soil loss, water degradation, and global toxification.

Beisner accepts a long time scale for earth history (p. 66). One minor swipe is taken at the creationist view of thermodynamics. Still, the book is a refreshing counterbalance to much of the current dismal environmental news. The book provides subject, Scripture, and name indexes.