

July 12, 1992

EVALUATION OF TREE STUMPS EXPOSED ON BEACH NEAR FT. PICKENS ENTRANCE

In early January, 1992, my attention was called to a group of tree stumps that were exposed by localized beach erosion on the Gulf Islands National Seashore, a few hundred yards west of the Fort Pickens entrance station (opposite Transformer #8). The site was visited, photographed and samples taken of the stumps in the first week of January.

Analysis established that the stumps were of Juniperus silicicola (Southern Redcedar), one of the few trees that grows naturally on Santa Rosa Island. A cross-island profile was surveyed in early February but by that time the stumps were nearly covered by beach sand transported and deposited by wave action. In mid-March a vibracoring device was brought to the site by personnel of the Institute for Coastal and Estuarine Research at the University of West Florida and three shallow core holes were made, sufficiently deep to obtain samples of the organic (peaty) sand forming the horizon in which the old tree stumps had been growing. A more detailed cross-island survey was made at the same time.

The Gulf Islands National Seashore agreed to pay for Carbon-14 dates of the wood and the peaty material in order to increase our knowledge and understanding of the age, developmental and erosional history of the Island. Radiocarbon analyses and resulting dates were calculated by Beta Analytic, Inc. of Miami with the following results:

Woody Material (Juniper) = 110 years BP (Before Present),
+/- 50 yrs.
Peaty sub-strate material = 860 years BP, +/- 70 yrs.

My colleague, Dr. Greg Stone and I have evaluated the C-14 dates of the juniper wood and peaty (organic) horizons and have come to the following conclusions:

1. The date on the juniper wood is obviously false. Although we tried to select a piece with no apparent Teredo (ship worm) borings, the sample was obviously contaminated with modern organic material thus making the tree appear younger than it actually is. Based on experience, we feel that it is best to ignore this date and consider it a bad sample.

2. The second date, from the upper six inches of core #3 (a 12-inch thick peaty horizon), appeared to be much more realistic at 860 years BP, (+/- 70 years). We had made a preliminary estimate of 800-1000 years.

3. Based on that date, we calculated that sea level has risen at least 7 feet in 860 years = a rate of rise of 0.008 ft/yr. This is based on the assumption that the original junipers were growing at an elevation similar to present marsh level. If the trees were growing at an elevation higher than average marsh level, for example in the lee of an interior dune, then the rate of rise would obviously be greater.

4. The Pensacola tide gage has shown a continuous, though variable, rate of rise since it was installed some 68 years ago:

1924 - 1948 (24 years) = 0.012 ft/yr.

1948 - 1986 (38 years) = 0.005 ft/yr.

Average rise (1924 - 1986) = 0.008 ft/yr.

Thus the dated organic sand, which reflects a rise of 0.008 ft/yr, and the tide gage data (rise = 0.008 ft/yr) agree and thus suggest a relatively constant rise for the past 900 years or so; although it is recognized that there probably have been variations in the rate of rise during that period.

5. The distance between the stump location and the soundside marsh at that part of the Island is approximately 1000 ft. If we assume that to be an average island width (between surf zone and hammock type vegetation in the lee of the rear dunes) the Island has been retreating ("rolling-over") at a rate of about 1.2 ft/yr. Again, this is in fair accord with the retreat rates of the last 100 years or so that have been established from comparisons of old map shorelines.

These preliminary findings have significant application in clarifying the barrier island geologic history of Santa Rosa Island/Perdido Key and we await additional C-14 dates to further substantiate these conclusions. These and additional data confirm the unique nature of Santa Rosa Island relative to other barriers around the country, where, given similar rates of historic sea level rise, barrier island retreat rates are as much as five times greater (e.g. portions of the Virginia Coast.)

Research by Dr. Stone suggests that Gulf side erosion has been localized primarily in the western sector of Santa Rosa Island and the eastern half of Perdido Key due to repetitious overwashing by hurricanes and by the focusing of wave energy along specific shoreline areas. From a regional perspective, based on detailed shoreline change analyses, it can be concluded that, although Santa Rosa Island is retreating ("rolling-over") slowly under wave attack it remains one of the most stable barrier islands in the country.

James P. Morgan
Senior Research Scientist
Institute for Coastal and
Estuarine Research
University of West Florida

CC: Dr. Greg Stone
Mr. Eugene Phillips, GINS

BETA ANALYTIC INC.

MURRY A. TAMERS, PH.D.
JERRY J. STIPP, PH.D.
CO-DIRECTORS

4985 S.W. 74 COURT
MIAMI, FLORIDA
33155 U.S.A

August 5, 1992

Mr. Carl Zimmerman
Gulf Islands National Seashore
1801 Gulf Breeze Parkway
Gulf Breeze, FL 32561

Dear Mr. Zimmerman:

Please find enclosed the result on the soil sample recently submitted for radiocarbon dating analysis.

The soil was pretreated by first picking for any apparent rootlets. It was then dispersed in hot acid to eliminate carbonates, repeatedly rinsed to neutrality, brought to dryness and given multiple combustions in an enclosed system. The following benzene synthesis and counting proceeded normally.

We are sending our invoice under separate cover. It includes the supplementary fee for bulk soil samples. This is for large sample pretreatment, the multiple combustions necessary to extract enough carbon for good measurements and extended counting time in the cases that only small amounts were obtained. Also included is giving special priority status to the sample in the line for the chemical treatments so that we can still be within the promised delivery time.

If there are any questions or if you would like to confer on the date, my direct telephone number is listed below. Please call us if we can be of any help.

Sincerely yours,



Murry Tamers
Co-director

P.S. We are sending this letter and the date report sheet by fax in addition to regular air mail. Copies are also being sent to James Morgan.



BETA ANALYTIC INC.

(305) 667-5167

UNIVERSITY BRANCH

P.O. BOX 248113

CORAL GABLES, FLA. 33124

REPORT OF RADIOCARBON DATING ANALYSES

FOR: Carl Zimmerman / James Morgan
Gulf Islands National Seashore

DATE RECEIVED: July 15, 1992
DATE REPORTED: August 5, 1992
SUBMITTER'S
PURCHASE ORDER # _____

OUR LAB NUMBER YOUR SAMPLE NUMBER C-14 AGE YEARS B.P. $\pm 1\sigma$

Beta-54584	VWF/GINS CORE #3 LOWER SECT.	1300 +/- 100 BP	(sediment)
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These dates are reported as RCYBP (radiocarbon years before 1950 A.D.). By international convention, the half-life of radiocarbon is taken as 5568 years and 95% of the activity of the National Bureau of Standards Oxalic Acid (original batch) used as the modern standard. The quoted errors are from the counting of the modern standard, background, and sample being analyzed. They represent one standard deviation statistics (68% probability), based on the random nature of the radioactive disintegration process. Also by international convention, no corrections are made for DeVries effect, reservoir effect, or isotope fractionation in nature, unless specifically noted above. Stable carbon ratios are measured on request and are calculated relative to the PDB-1 international standard; the adjusted ages are normalized to -25 per mil carbon 13.



Department of Sociology, Anthropology,
Earth and Atmospheric Sciences
College of Arts and Sciences
(904) 474-2797

April 23, 1992

Mr. Carl Zimmerman
Gulf Islands National Seashore
1801 Gulf Breeze Parkway
Gulf Breeze, FL 32561

Dear Carl:

Greg and I have evaluated the C-14 dates of the juniper wood and peaty (organic) horizon we sampled on Ft. Pickens beach, near the entrance station, and have come to the following conclusions:

1. The date on the juniper wood is obviously false. Although I tried to select a piece with no obvious Teredo (ship worm) borings, the sample was obviously contaminated with modern organic material. We must simply ignore this date.

2. The second date, from the upper six inches of core #3 (a 12-inch thick peaty horizon), was right on target = 860 years BP: +/- 70 years. I had given them a preliminary estimate of 800-1000 years.

3. Based on that date, sea level has risen at least 7 feet in 860 years = a rate of rise of 0.008 ft/yr. This is based on the assumption that the original junipers were growing at an elevation similar to present marsh level. If the trees were in the lee of a dune at a higher elevation then the rate of rise would obviously be greater.

4. The Pensacola tide gage shows a continuous, though variable, rate of rise:

1924 - 1948 (24 years) = 0.012 ft/yr.

1948 - 1978 (30 years) = 0.006 ft/yr.

Average rise (1924 - 1978) = 0.009 ft/yr.

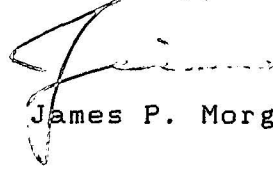
Thus the data from the organic sand (rise = 0.008 ft/yr) and the tide gage data (rise = 0.009 ft/yr) are in reasonable accord and suggest a relatively constant rise for the past 900 years (+/-).

5. The distance between the stump location and the soundside marsh at that part of the Island is approximately 1000 ft. If we assume that to be an average island width (between surf zone and hammock type vegetation in the lee of the rear dunes) the Island has been retreating ("rolling-over") at a rate of 1.2 ft/yr +/-). Again this is in fair accord with the retreat rates that have been established from comparisons of old maps.

6. When we sent the samples to Beta Analytics Lab I also sent them the bottom half of core #3 and asked them to retain it for possible future datings. Do you think your budget would stand another date? It should confirm the 860 years or possibly be slightly older. I would be much happier if we could have two confirming dates - especially in light of the contaminated wood sample.

Thanks for the participation of GINS in this small micro-research project. Someday we will know all about Santa Rosa Island (maybe).

Sincerely,



James P. Morgan

CC: Greg Stone
Encl: Photographs

BETA ANALYTIC INC.

MURRY A. TAMERS, Ph.D.
JERRY J. STIPP, Ph.D.
CO-DIRECTORS

4985 S.W. 74 COURT
MIAMI, FLORIDA
33155 U.S.A.

April 14, 1992

Mr. Carl Zimmerman
Gulf Islands National Seashore
1801 Gulf Breeze Parkway
Gulf Breeze, FL 32561

Dear Mr. Zimmerman:

Please find enclosed the results on the wood and sediment samples recently submitted for radiocarbon dating analysis. We hope the dates will be useful in your research.

Your wood was pretreated by first examining for rootlets. The sample was then given a hot acid wash to eliminate carbonates. It was repeatedly rinsed to neutrality and subsequently given a hot alkali soaking to take out humic acids. After rinsing to neutrality, another acid wash followed and another rinsing to neutrality. The soil was pretreated by first picking for any apparent rootlets. It was then dispersed in hot acid to eliminate carbonates, repeatedly rinsed to neutrality, brought to dryness and given multiple combustions in an enclosed system. The following benzene syntheses and countings proceeded normally.

We see that the date for Beta-52363 is younger than expected. I've gone back and triple checked the computer calculations, chemistry notes and statistical analysis of the counter tape. No error surfaced.

We are enclosing our invoice. Would you forward this to the appropriate office for payment. If there are any questions or if you would like to confer on the date, my direct telephone number is listed below. Please don't hesitate to call us if we can be of help.

Sincerely yours,



Murry Tamers, Ph.D.
Co-director

P.S. We are sending this letter and the date report sheet by fax in addition to regular air mail.

**BETA ANALYTIC INC.**

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CORAL GABLES, FLA. 33124

REPORT OF RADIOCARBON DATING ANALYSES

FOR: Carl Zimmerman
Gulf Islands National Seashore

DATE RECEIVED: March 23, 1992

DATE REPORTED: April 14, 1992

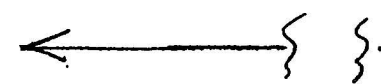
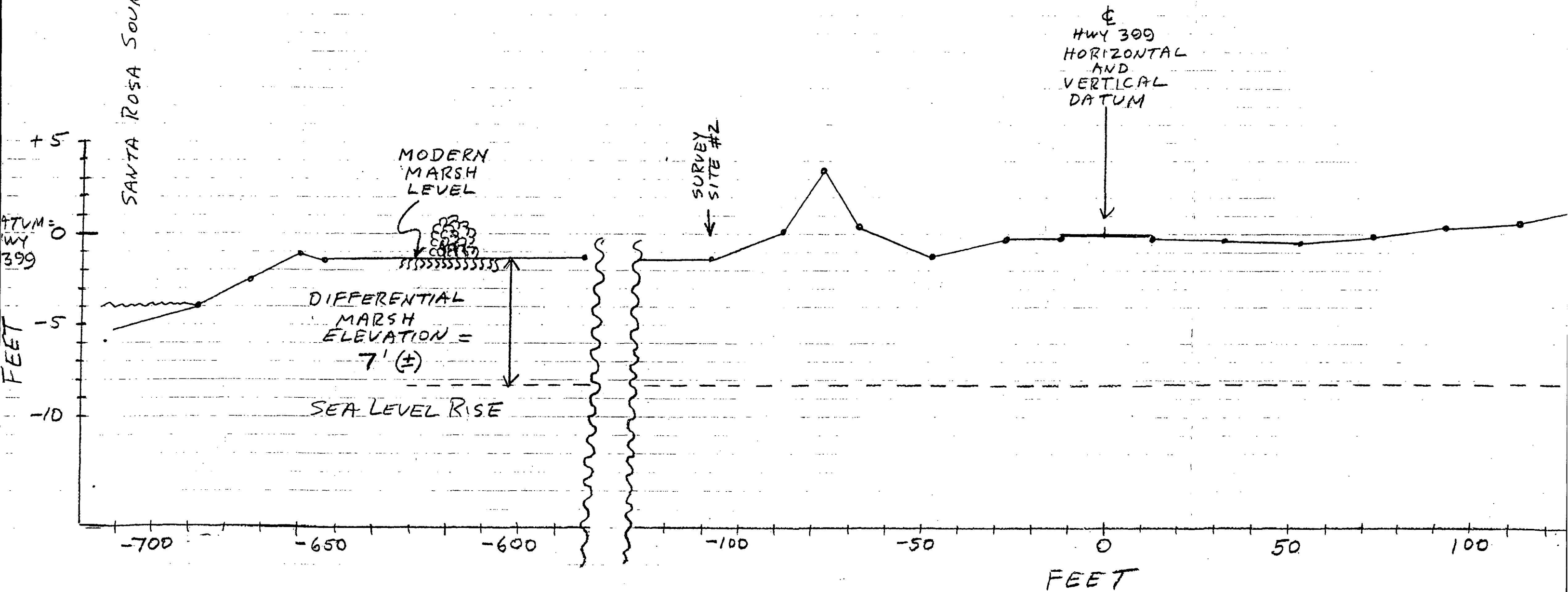
SUBMITTER'S
PURCHASE ORDER # _____

OUR LAB NUMBER YOUR SAMPLE NUMBER C-14 AGE YEARS B.P. $\pm 1\sigma$

Beta-52363	Juniper Wood Sample	110 +/- 50 BP	(wood)
Beta-52364	VWF/GINS Core 3 Upper Sect	860 +/- 70 BP	(sediment)

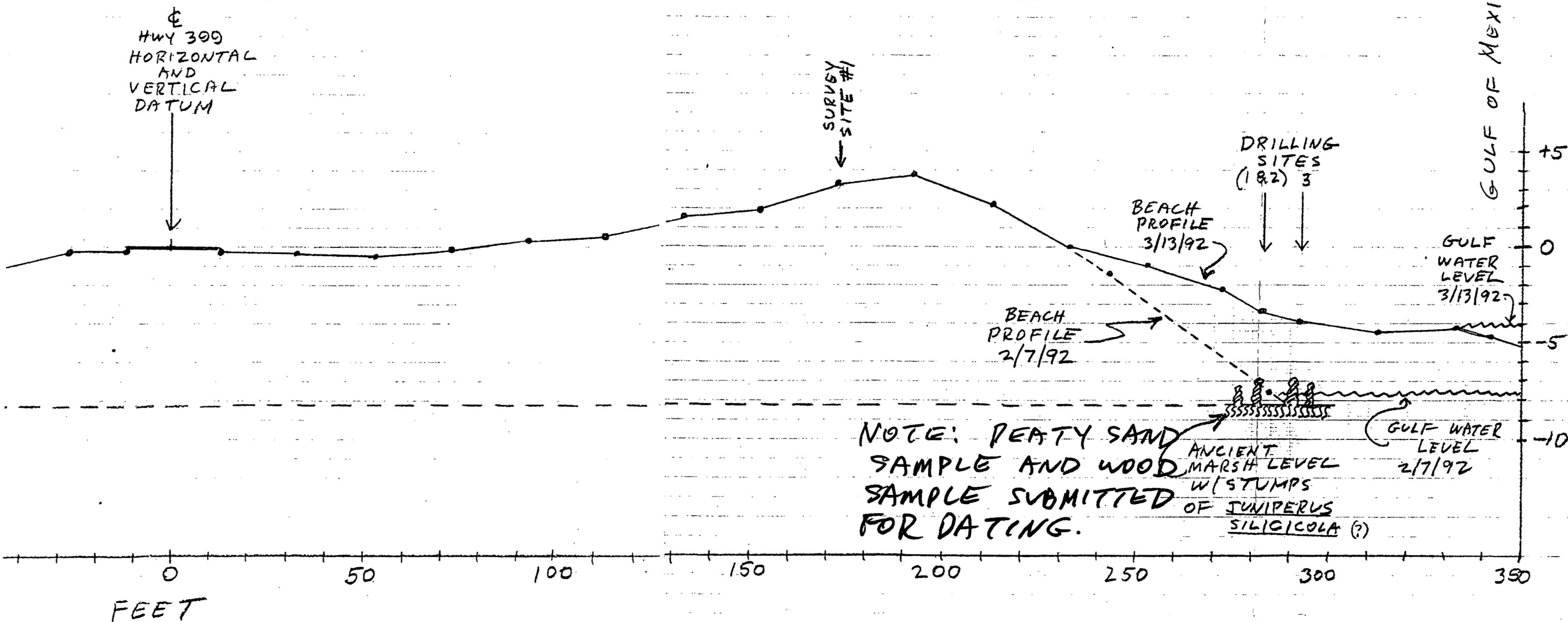
These dates are reported as RCYBP (radiocarbon years before 1950 A.D.). By international convention, the half-life of radiocarbon is taken as 5568 years and 95% of the activity of the National Bureau of Standards Oxalic Acid (original batch) used as the modern standard. The quoted errors are from the counting of the modern standard, background, and sample being analyzed. They represent one standard deviation statistics (68% probability), based on the random nature of the radioactive disintegration process. Also by international convention, no corrections are made for DeVries effect, reservoir effect, or isotope fractionation in nature, unless specifically noted above. Stable carbon ratios are measured on request and are calculated relative to the PDB-1 international standard; the adjusted ages are normalized to -25 per mil carbon 13.

SANTA ROSA ISLAND PROFILE FT. PICKENS AREA (TRANSFORMER #8) PROFILE BEARING N-S



ISLAND ROLLOVER = 900' -

A ROSA ISLAND PROFILE PICKENS AREA (TRANSFORMER #8) PROFILE BEARING N-S



ISLAND ROLLOVER = 900' - 950'

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