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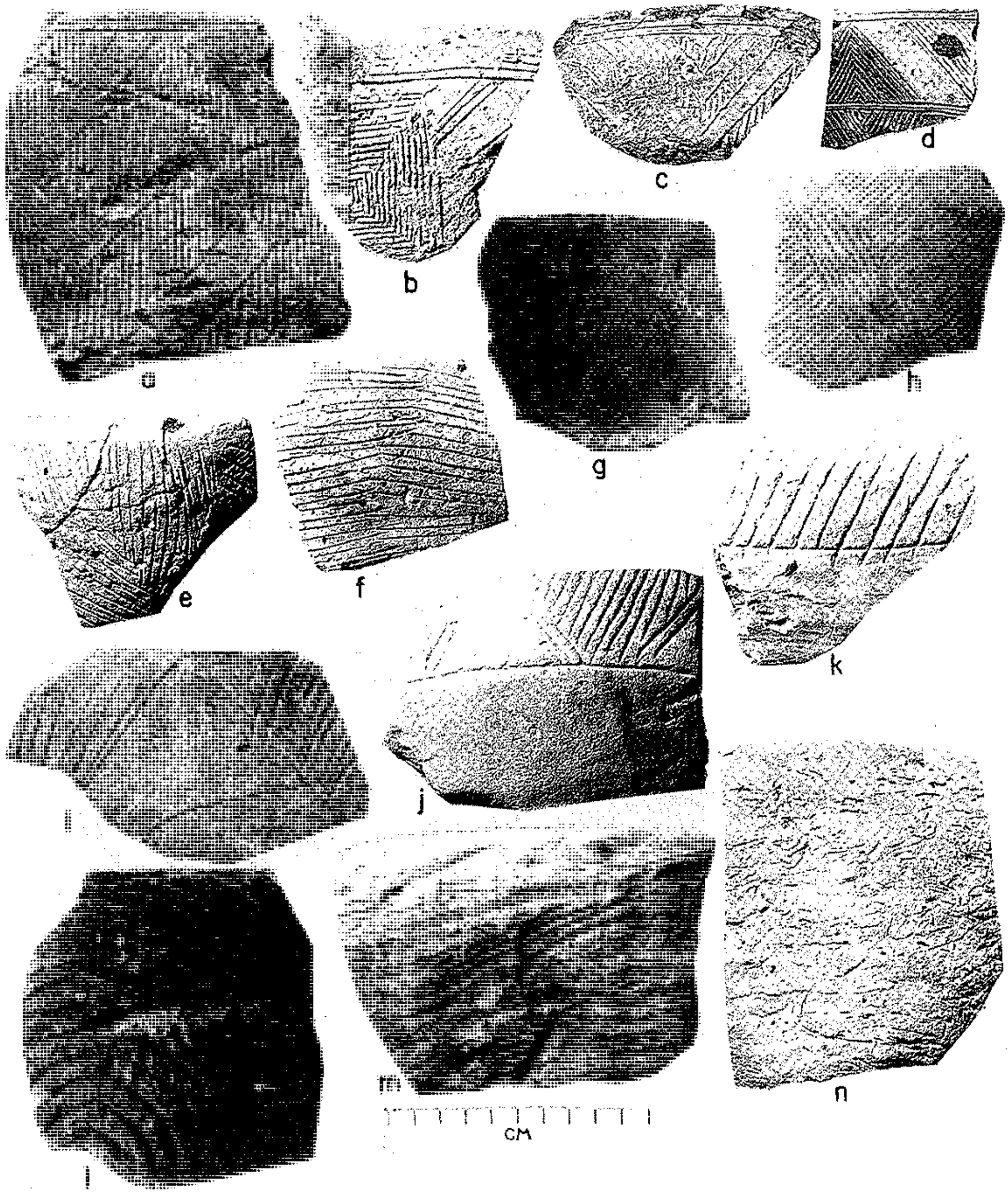
THE FLORIDA ANTHROPOLOGIST

Published by the FLORIDA ANTHROPOLOGICAL SOCIETY, INC.

VOLUME 56, NUMBER 1 MARCH 2003



Testing Partially Submerged Shell Middens in the Apalachicola Estuarine Wetlands, Franklin County, Florida

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The University of South Florida's (USF) 1993 test excavations of submerged shell midden deposits in northwest Florida's lower Apalachicola River wetlands required complex equipment and logistics, but provided new information on Late Archaic coastal/estuarine subsistence and technology. Van Horn Creek shell mound also had later Woodland and Fort Walton components. The single-component Sam's Cutoff shell mound had a single, shallow burial. Both sites produced microtools and fiber-tempered pottery, radiocarbon dates, and information on the Apalachicola's fluvial history.

Background

The Apalachicola River is formed by the confluence of the Flint and Chattahoochee rivers at the Florida-Georgia border, and flows 107.4 river miles (ca. 175 km) southward into the Gulf of Mexico. It is the largest river in Florida in terms of flow (Livingston 1984), with a great valley rich in archaeological resources. The lower delta protrudes into the Gulf (Figure 1), built by continual progradation (accumulation of alluvial deposits) and shifting of delta lobes as tributary and distributary streams flow and change. It is today a vast watery wilderness of tupelo swamp, oak hammocks, stands of pine, and grassy marshland, throughout which are scattered many mounded shell middens demonstrating human occupation from at least Late Archaic through late prehistoric Fort Walton times.

Previous work in shell mounds here (White 1994a; White and Estabrook 1994) revealed the presence of submerged cultural deposits that could not be investigated by conventional methods. Testing Late Archaic components at Van Horn Creek and Sam's Cutoff shell middens in 1993 was ambitiously planned to involve dewatering with a large pump and well points. One goal was to obtain better dates for fiber-tempered pottery in this valley; another was to explore relationships with the Late Archaic Poverty Point adaptations known from Louisiana (Gibson 2000, Webb 1977) and elsewhere along the Gulf Coast and in the lower Mississippi Valley, including the Elliott's Point complex of northwestern Florida (Lazarus 1958).

Another area of investigation was ancient sea level fluctuations and the geomorphological history of the lower river. The 1987 testing at Van Horn Creek (White 1994a), on the east side of the lower delta, had suggested there was freshwater *Rangia* clam harvesting during the later prehistoric time periods but utilization of oyster and more saltwater fish earlier, during the Late Archaic. Sam's Cutoff shell mound, with only a single Late Archaic component and slightly farther east, is made predominantly of oyster. If the main channel of the Apalachicola River was farther west during the earlier time, conditions would have been more saline around these two sites, resulting in Late Archaic exploitation of oyster and more saltwater species. When the river migrated eastward it would have brought fresh water conditions to the local environment. All the shell middens on the western side of the delta are composed predominantly of freshwater *Rangia* clamshells, even in Late Archaic levels. The hypothesis to be tested was that these easterly Late Archaic components would contain more saltwater fauna if fresh water was farther away in the earlier Holocene.

This article summarizes the investigations and adventure of the 1993 project (reported in detail in Fradkin 1994; Weill and White 1994; White 1994b). Fieldwork was conducted with a crew averaging 12, including USF field school students, volunteers, and technicians from the Apalachicola National Estuarine Research Reserve. The field season comprised 6 weeks, from June through mid July. We used (and abused) 3 trucks, 4 boats, 3 pumps, and lots of ingenuity to achieve partial dewatering of cultural sediments. This also was the first year that I videotaped all field operations, for future (research, inspirational, and entertainment) use.

Van Horn Creek Shell Mound

Logistics, Excavations, and Stratigraphy

First investigated was Van Horn Creek shell mound, 8FR744, on the banks of a tiny stream deep in the river swamp (Figure 1,2). Located during survey in 1983 (White 1987) and tested briefly in 1987 (White 1994a), this site is a long, narrow *Rangia* mound oriented southeast-northwest but not parallel with the current stream bank. It is 30 m wide, 90 m long, and rises 1.5 m above the surrounding wetlands. The four units dug in 1987 demonstrated later components of Fort Walton and possible Early or Late Woodland age (the latter based only on the presence of check-stamped and plain ceramics occurring deeper than the Fort Walton materials). Late Archaic deposits were at the very base of the excavations just before reaching the water table, and clearly extended well below this depth (148 cm below surface on the mound summit in Test Unit 1). The upper cultural components were mixed, doubtless continually disturbed by repeated prehistoric occupations, as

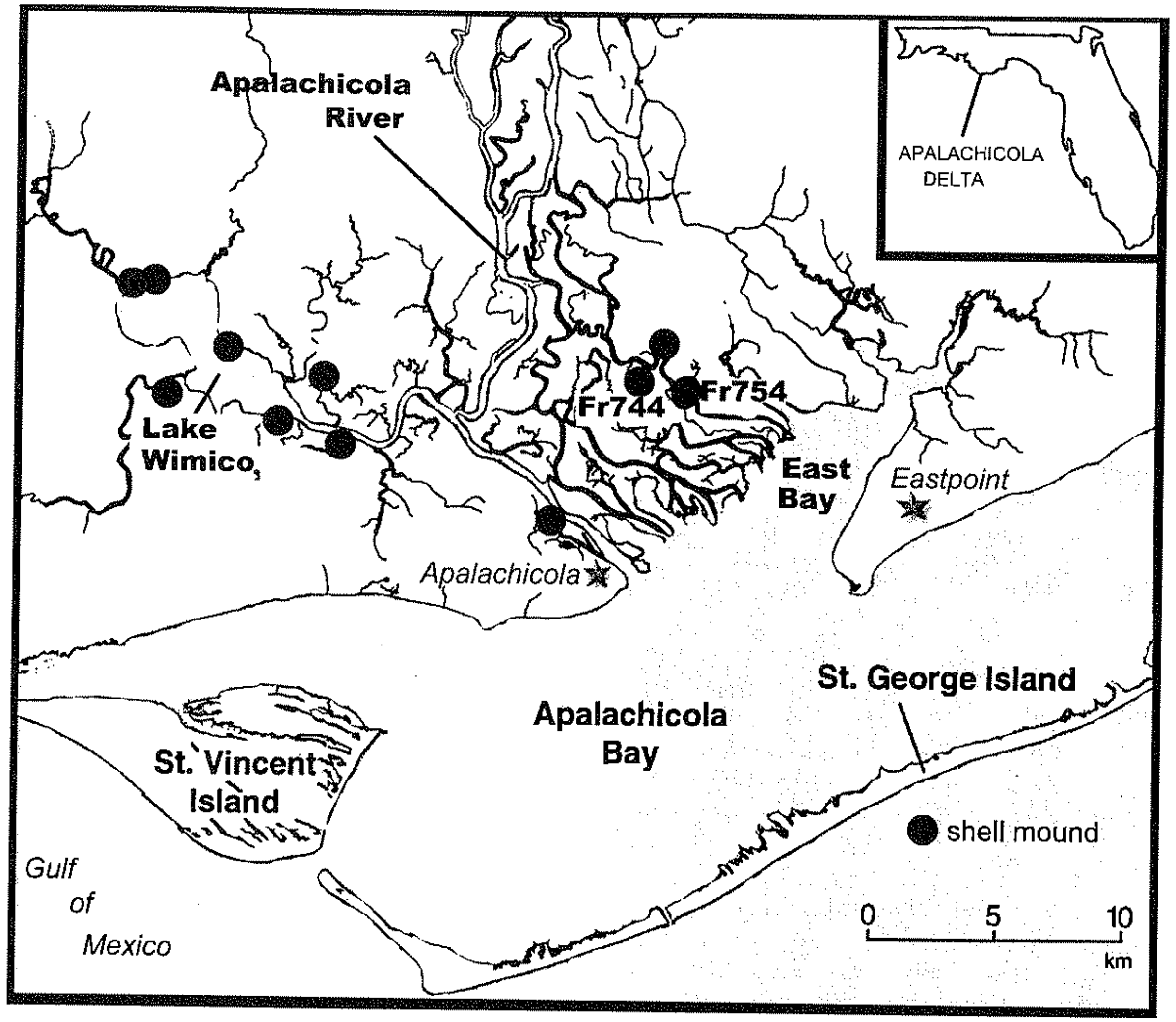

Figure 1. The lower Apalachicola valley, showing Van Horn Creek (8FR744) and Sam's Cutoff (8FR754) shell mounds, and other mounded shell middens in the estuarine/river swamp area.

well as pothunters (incredibly, in this extremely remote location). This resulted in recovery of some fiber-tempered pottery and microtools in upper levels of the site. Thus our work in 1993 also sought to find less-disturbed Late Archaic materials.

Van Horn Creek is not easily accessible. After crossing the wide Apalachicola near its mouth we had to go into increasingly smaller streams until the creek mouth itself was reached, then it was 45 minutes of navigating 2 km up this creek, in many places barely wider than our 14-foot boat. The daily tides seriously affected navigation and excavation. If the tide was in, the creek had more water and was easier to tackle (though we had to duck for overhanging branches) but the water table was higher in the units. At low tide the digging was easier but we often had to push our boats through a few cm of mud and water, fending off alligators that fled and logs that attacked!

Relocation of old test units brought additional problems worth describing. We had backfilled well in 1987 and pounded the southwestern corner stake of each of the four units into the ground. With the heavy ground cover it was possible to relocate only TU 1, apparent because of a rectangular depression, and even there the southwestern corner was not to be found; the wooden stake rotted away in 6 years. We finally found the southwestern corner of TU 3, recognizable only as a perfect rectangle (the size of the former stake) of orange flagging in the ground. In 1993 we pounded iron rebar into the southwestern corners of the units.

Two tests were excavated in 1993, numbered sequentially after the 1987 units. Test Unit 5 was 3 x 3 m (dug in 1-meter squares for better control) and TU 6 was 1 x 2 m. As we excavated and the water began to seep in, we began setting up the well point system to pump the units dry (Figure 3). The intent was to surround the units with points all connected to a single system and pump the water out, isolating the block of the unit within which excavation could continue downward into dry deposits. Equipment was rented from pump company that also provided a dewatering advisor for a day. Hauling in the huge pipes, pumps, and other equipment was tricky. The double-diaphragm mud hog diesel pump, weighing 465 kg

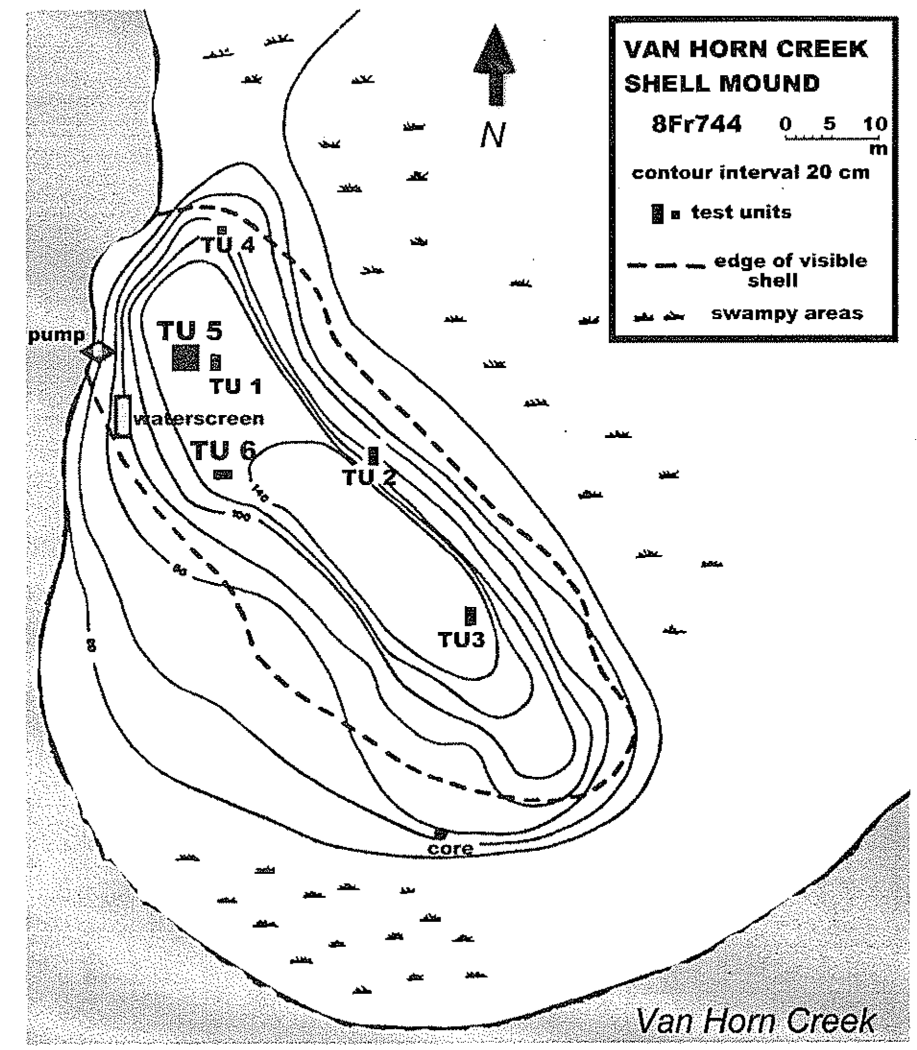

Figure 2. Van Horn Creek shell mound, showing 1987 and 1993 excavations.

(1023 lbs.), was towed up the narrow creek on a motorless, 18-foot boat using another, 20-foot boat, a process that took 4 hours one way. Jetting in well points around the units was impossible through the clam and oyster shell matrix with only waterpower from the 4-hp jet pump. Instead, several workers had to grasp the metal jet pipe and physically pound it into the ground for 20 minutes for each well point, then quickly yank it out and stick in the pvc pipe to be connected to the rest of the system. Even hauling in 100-lb bags of clean white sand to fill the hole surrounding each well point to avoid pumping air from the spaces between the shells, and getting plenty of groundwater rushing out the outflow hose of the big pump, did not allow dewatering down to the depth of the points. Therefore the bottom of the cultural deposits was not reached, though we learned it was at about 3 m depth when we reached soft sand under the shell during installation of the well points.

After setting up 7 well points, five on the bigger unit and two on the smaller, we were able to pump with only modest success. Excavation was done in 15-cm arbitrary levels since there was no discernible cultural or natural stratification, just varying proportions of *Rangia* and oyster shell. Nine-liter (30 x 30 x 10 cm) soil samples from the southwestern corner of all levels were saved for flotation and one-liter samples for permanent storage. All other soils were waterscreened using 1/8" mesh; a smaller 3-hp pump was set up at a waterscreening station on the creek bank. I use the word "soil" advisedly, since there was little sand and mostly solid shell throughout.

Test Unit 5. This unit was placed on the highest area of the summit, with its southeastern corner 72 cm west of 1987's TU 1, which had produced the best evidence of later freshwater environments and earlier deposits dominated by oyster and more saltwater fish species (Walker 1994), suggesting a more saline earlier local environment. In all deposits there were at least a few of both kinds of shell, however, and in TU 5 we encountered mixing of the components, with Late Archaic fiber-tempered ceramics and microtools present in the upper levels of both units, as well as in the deepest, and presumably undisturbed levels. One source of the mixing was a 50-cm-diameter pit feature filled with *Rangia* clamshells originating

Table 1. Cultural materials recovered from Van Horn Creek shell mound, 1993, by counts and weights (grams).

TYPE	TEST UNIT 5*												TEST UNIT 6*									MIXED*
CERAMICS	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	TOTALS	L1	L2	L3	L4	L5	L6	L7	L8	TOTALS	
Pensacola Inc	2 (29)											2 (29)										
Cool Branch Inc	6 (62)											6 (62)	5 (39)								5 (39)	1 (31)
Marsh Island Inc	2 (10)											2 (10)										2 (86)
Pt. Washington Inc	12 (108)	4 (51)										16 (159)										
Lake Jackson	7 (75)											7 (75)	5 (9)								5 (9)	2 (12)
FtWalton Inc	56 (287)	16 (50)										72 (337)										4 (52)
indet punctate	22 (122)	1 (5)	1 (1)									24 (128)	5 (14)								5 (14)	2 (28)
indet incised	72 (275)	9 (23)	2 (3)									83 (301	5 (13)								5 (13)	4 (31)
shell-t pl	20 (64)	1 (1)	3 (3)									24 (68)	1 (7)	2 (13)							3 (20)	15 (75)
limestone-t pl	192 (630)	9 (81)	13 (22)									214 (733)	3 (10)								3 (10)	18 (71)
check-st	88 (519)	56 (299)	28 (195)	10 (10)								182 (1023)	85 (334)	5 (14)							90 (348)	32(199)
limestone-t ch-st													2 (10)								2 (10	
indet stamped	7 (19)	5 (25)			1 (1)							13 (45)	11 (34)								11 (34)	3 (19)
grit-t pl	592 (2225)	40 (152)	25 (55)	1 (1)								658 (2433)	27 (170)	2 (5)							29 (175)	19(167)
grog-t pl	84 (221)	1 (1)	8 (23)	3 (2)								96 (247)	16 (58)	8 (31)							24 (89)	18(186)
sand-t pl	575 (1011)	332 (512)	63 (55)	17 (17)	7 (11)							994 (1606)	184 (447)	49(153)						2 (1)	236 (602)	81(329)
fiber-t	9 (48)	19 (83)	18 (195)	9 (31)						4 (22)	2 (1)	61 (380)	3 (17)	1 (3)	2(8)		1(3)			6 (17)	13 (48)	1 (1)
clay ball frag		1 (13)										1 (13)		2 (94)	1(20)		1(15)			2(55)	6 (184)	
clay lump	28 (52)	24 (44)	17 (12)	2 (9)	1 (1)	1(1)	4(2)	1(15)		21 (17)	43(64)	134 (217)	5 (10)	6 (10)	1 (1)	5(9)	3 (4)		2(2)	52(60)	74 (96)	6 (16)
TOTAL	1774(5757)	518 (1340)	178 (564)	42 (17)	9 (13)	1(1)	4(2)	1(15)		25 (39)	45(65)	2589 (7866)	357(1172)	75(323)	4(29)	5(9)	5 (22)	1(1)	2(2)	62(78)	511 (1691)	208(1203)
LITHIC**																						
microtool	1 (4)	2 (3)	3 (5)		1 (1)		1(1)					8 (14	2 (2)				1(1)			1(1)	4 (4)	2(2)
blade/frags		2 (2)	2 (5)							1 (1)		5 (8)	3 (3)	2 (2)							5(5)	2 (6)
tool frag	2 (6)											2 (6)								2(72)	2(72)	1(249)
core/frags	1 (26)	3 (66)	1 (129)	2(191)	1(194)							8 (606)	4 (246)	2 (50)						1(49)	7(345)	7 (542)
block shatter		3 (11)				3(1)						6 (12)	3 (9)	4 (12)						4 (4)	11 (25)	4 (77)
primary decort		3 (9)	1 (8)	4 (16)								8 (33)	1 (1)						2(8)	3(10)	6(19)	9 (83)
2ndary decort flake		3 (11)	9 (72)	8 (28)	1 (45)					2 (2)		23 (158)	2 (4)	1 (1)	1 (2)	1(1)	1 (1)		1(1)	2 (2)	9(12)	12 (63)
2ndary flake	2 (2)	10 (13)	8 (10)	4 (10)		1(1)		1 (1)	1(1)	9 (4)	1 (2)	37 (44)	5 (2)	2 (11)	2 (4)				2(2)	16 (13)	27(32)	9 (9)
quartzite frag				1 (6)								1 (6)										
sandst/limest rock	1 (2)											1 (2)	6 (17)	2 (4)	8 (10)	1(5)			1(1)	2 (1)	20 (66)	2 (36)
TOTAL LITHICS	7 (40)	26 (115)	24 (229)	19(251)	3(240)	4(2)	1(1)	1(1)	1(1)	12 (7)	1 (2)	99 (889)	26 (284)	13 (80)	11 (16)	2(6)	2 (2)		5(12)	31(152)	138 (1619)	48(1067)
WORKED SHELL	2(202)	2 (74)		1 (.3)	2 (74)					1 (13)		8 (363							1(135)	2(35)	7 (327)	4(157)

* **TU 5**: Levels 1-4 = 3 x 3 x .15 m; Levels 5-8 = 1 x 3 x .15 m; Level 10 = 1 x 1 x .15 m; Level 11 - 1 x 1 x .13 m; **TU 6** levels all = 1 x 2 x .15 m; **MIXED**= mixed levels, wall fall, both units, and site surface.
** primary decortication flake= over 50% cortex; secondary decortication flake = under 50% cortex; secondary flake = no cortex, secondary lithic reduction product; sandstone, limestone may be naturally occurring.

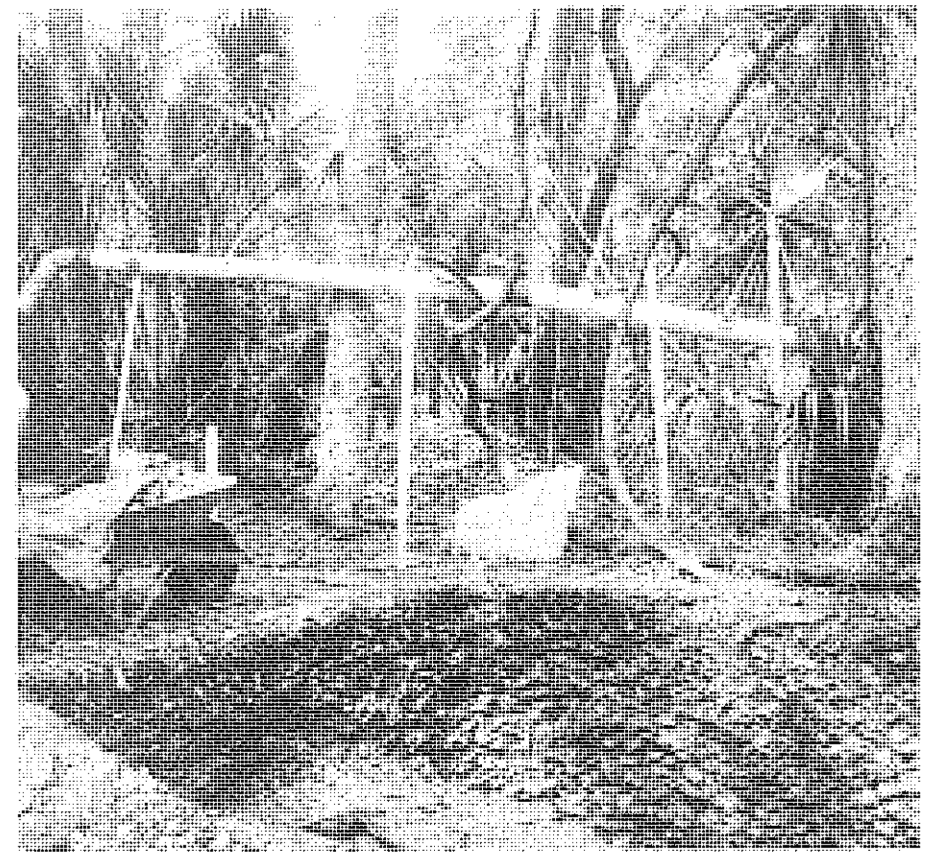

Figure 3. Test Unit 5 at Van Horn Creek shell mound, view facing southwest, showing beginning of excavation of Level 4 and well points in place to begin dewatering.

in the topsoil, that was only distinguishable near its bottom in Floor 3 (45 cm deep) and in the unit wall. Within the matrix of solid shell coated in dark yellowish brown (10YR4/4) slimy clay, the pit deposit consisted of the same solid shell but coated in black (10YR2/2), more sandy clay.

To meet field deadlines, excavation of TU 5 continued down into the undisturbed Late Archaic deposits only in the three western 1-m squares. Only faunal remains and very few lithic artifacts but no ceramics except for clay lumps were recovered between 75 cm and 135 cm deep (Levels 6-9). Then in Levels 10 and11 were more stone tools and fiber-tempered pottery (Table 1). After excavation of Level 9, time and dry deposits were running out. Despite having curtailed work at TU 6 and moved the other two well points to surround TU 5, it was still not possible to excavate more than Levels 10 and most of 11 in the single 1-m southwestern square of TU 5 before the water seeped in even during pumping.

In retrospect, it seems we were still pumping lots of air from the spaces between the shells. In addition, there was a small amount of clay content in some of the upper strata (the dark and greasy coating on the shells, perhaps the residue of human activity or other organic decay) which may have been holding in a perched local water level, so that while we were pumping out water below this, some remained trapped above the pumping zone, seeping into the unit. At the time nobody, including the dewatering professional, realized that perhaps the pump should have been kept running 24 hours, not just a morning, before digging deeper, to give the needed time for it to dewater properly. Nor was it realized that raising or shortening some of the well points could have been done to drain the water that may have been perched above the dewatering zone, as has been done successfully elsewhere in Florida (McGee and Wheeler 1994:338)

The final depth of excavation was 163 cm below the surface. This is only 15 cm or one level deeper than was achieved in 1987 without pumping. From the jetting/excavation of the well point holes we knew the midden was at least 3 m thick, so about half the depth of it was sampled in TU 5. A core taken in 1987 off the southern end of the mound had shown clayey soil, mixed with crushed shell, continued to a depth of 2 m under the mound edge. It is entirely possible that deeper materials were left by even earlier cultural groups than those represented by the Late Archaic deposits.

Test Unit 6. This unit was placed 15 m south-southeast and downslope from TU 5. It was taken to a final depth of 117 cm below surface when water seeped in despite pumping, and it was decided to end excavations there and move its well points to TU 5. Cultural stratification was expectably compressed (on the slope) in comparison with that at TU 5, so that

Table 2. Fauna recovered from Van Horn Creek and Sam's Cutoff shell mounds, 1987-93.

TAXON	COMMON NAME	VAN HORN, FT. WALTON/ MIXED	VAN HORN, LATE ARCHAIC	SAM'S CUTOFF, LATE ARCHAIC
VERTEBRATES				
Odocoileus virginianus	white-tailed deer	X	X	X
Sylvilagus spp.	rabbit	X		X
Sigmodon hispidus	hispid cotton rat	X		
Neofiber alleni	round-tailed muskrat	X		
Rodentia	rodents	X		X
Cricetidae	mice	X		
Procyon lotor	raccoon			X
Anatidae	duck	X		
Chen caerulescens	snow goose		X	
Kinosternidae	musk/mud turtle	X	X	X
Terrapene carolina	box turtle	X	X	
Pseudemys floridana	Florida cooter turtle		X	
Emydidae	water turtle	X	X	X
Pseudemys scripta	pond slider turtle	X		
Trionyx ferox	softshell turtle	X	X	
Crotalus spp.	rattlesnake	X		
Colubridae	colubrid snakes			X
Serpentes	snakes	X		X
Alligator mississippiensis	alligator	X	X	X
Carcharhinidae	requiem sharks	X		
Lepisosteus spp.	gar fish	X	X	X
Brevoortia sp.	menhaden	X		
Elops saurus	ladyfish	X	X	
Amia calva	bowfin	X		
Arius felis	hardhead catfish	X	X	X
Bagre marinus	gafftopsail catfish	X	X	X
Leiostomus xanthurus	spot		X	
Lepomis sp.	sunfish	X		
Caranx hippos	crevalle jack	X	X	X
Cynoscion nebulosus	spotted seatrout		X	
Archosargus probatocephalus	sheepshead	X	X	X
Lutjanus sp.	snapper	X		
Micropogonias undulatus	Atlantic croaker	X	X	X
Pogonias cromis	black drum	X	X	
Sciaenops ocellatus	red drum	X	X	X
Mugil sp.	mullet	X	X	
Sparidae/Sciaenidae	porgy/drum	X	X	
Osteichthyes	bony fish	X	X	X
Perciformes	perch-likes		X	
Pristis sp.	sawfish			X

the Late Archaic deposits were reached by the beginning of Level 4. In addition there was possibly a bit more mixing; in Level 8, 2 tiny sand-tempered sherds occurred among the solid oyster and fiber-tempered pottery (these sherd crumbs may just be broken off bits of fiber-tempered vessels too small to show the distinctive fiber lines). A flotation sample of 9 liters was taken from the inundated zone below (and labeled Level 9). It contained no artifacts, only faunal remains; this may be a result of the small sample size. Lithic artifacts occurred throughout the deposits, but Levels 3-6 had very few artifacts, similar to the situation in TU 5.

Materials Recovered

Table 1 lists all artifacts recovered in 1993, also giving soil volume of the level. The mixing of Late Archaic deposits

Table 2, continued. Fauna recovered from Van Horn Creek and Sam's Cutoff shell mounds, 1987-93.

TAXON	COMMON NAME	VAN HORN, FT. WALTON/ MIXED	VAN HORN, LATE ARCHAIC	SAM'S CUTOFF, LATE ARCHAIC
INVERTEBRATES				
Balanidae	barnacle (M)		X	X
Phalium granulatum	Scotch bonnet shell		X	
Ischadium recurvum	hooked mussel (M)		X	X
Crassostrea virginica	oyster (M)	X	X	X
Rangia cuneata	marsh clam (F)	X	X	X
Polymesoda caroliniana	Carolina marsh clam (F)	X	X	X
Mytilidae	mussels (M)		X	X
Mercenaria sp.*	quahog clam (M)		X	
Melongena corona	crown conch (M)		X	
Macrocallista nimbosa	sunray venus clam (M)	X		X
Neritina reclivata	olive nerite (F, M)	X	X	X
*Busycon contrarium**	lightning whelk (M)	X	X	X
*Pleuroploca gigantea**	Florida horse conch (M)		X	
Pholadidae	piddocks (M)			X
Martesia striata	striate piddock (M)		X	X
Columbellidae	dovesnails (M)			X
Ellobiidae	melampus (M)			X
Oligyra orbiculata	globular drop (T)	X	X	X
Hydrobiidae	dusky cavesnail (F)		X	X
Nassarius acutus	sharp nassa (M)		X	X
Odostomia impressa	impressed odostome (M)		X	X
Detracia sp.	melampus (M)		X	X
Gastrocopta pellucida	slim snaggletooth (T)		X	X
Strobilops aeneus	bronze pinecone (T)			X
Pupillidae	snaggletooth (T)		X	
Euglandina rosea	rosy wolfsnail (T)	X	X	X
Physella sp.	physa (F)		X	X
Melampus bidentatus	eastern melampus (M)			X
Helicodiscus inermis	oldfield coil (T)		X	X
Helicodiscus parallelus	compound coil (T)		X	X
Euconulus chersinus	wild hive (T)		X	
Glyphyalinia indentata	glyph (T)	X	X	X
Nesovitrea dalliana	depressed glass (T)		X	X
Striatura meridionalis	striate (T)			X
Hawaiia miniscula	minute gem (T)		X	X
Zonitoides arboreus	quick gloss (T)	X	X	
Polygyra cereolus	southern flatcoil (T)		X	X
Polygyra pustula	grooved liptooth (T)	X		
Pomacea paludosa	Florida apple snail (F)	X	X	

(M) = marine; F= freshwater; T= terrestrial

* very few specimens; probably all artifacts or debitage

above Level 6 in TU5 is apparent. By Level 6, the volume excavated was 3 times less than when excavations began because the unit size was reduced from 3 x 3 to 1 x 3 m, and for Level 10 it was reduced to 1 x 1 m, 9 times less. Level 11 was further reduced because only 13 of the 15 cm could be excavated before the water poured in. For TU 6, similar mixing is apparent above Level 4. It is interesting to compare the materials from the 1993 work, which opened 11 m^2, with those of the 1987 work, which opened 7 m^2. In 1987 I did not have access to waterscreen equipment, so all excavated materials were sorted on a large wooden board. Waterscreening itself, as well as use of the 1/8" mesh, produced, for example, 4.6 times more ceramic specimens (from sherds to clay lumps; 2.4 times more by weight) in 1993 than were

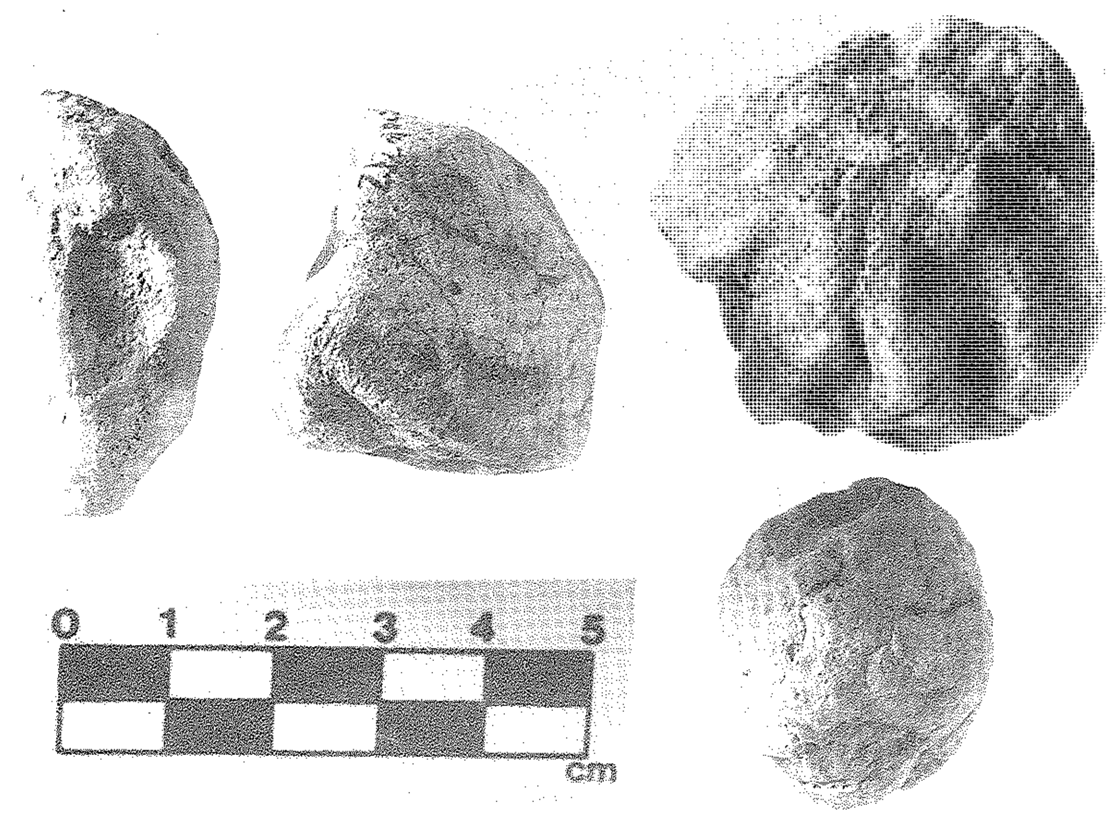

Figure 4. Clay balls or Poverty Point-type objects from Van Horn Creek shell mound: *top left*) wedge from TU5ECen, L2; *right*) two grooved fragments from TU6, L8; *bottom*) ball from TU5SW, L8.

obtained in 1987, even though only 1.6 times more area was excavated (White 1994a:59).

Ceramics. During 1993 a total of 2885 sherds (nearly 9 kg) was recovered from Van Horn Creek shell mound (Tables 1,2). Types discussed here are the standard ones (Willey 1949, White 1982). The Fort Walton component is characterized by Fort Walton Incised, Lake Jackson (Plain and Incised, with ticked and notched rims), with occasional sherds of the slightly less common Marsh Island Incised and Cool Branch Incised. There is a small amount of shell-tempered plain (1.2% by count, 1.3% by weight) and 2 sherds of shell-tempered Pensacola Incised, consistent with typical Fort Walton assemblages in this valley. Limestone-tempered plain, also part of typical Fort Walton here, occurs in higher percentages than I have seen before (10% by count, 14.4% by weight). There are several examples of Point Washington Incised or Marsh Island Incised (types with no punctations, as compared with Fort Walton Incised) made on limestone-tempered paste. The greater frequency of grit tempering in the plain ceramics of the upper levels is consistent with Fort Walton assemblages also; there is often a mixture of the grit with some grog and/or shell or limestone.

No diagnostic Deptford or Late Woodland sherds were recovered. Check-stamped pottery still occurred deeper than the diagnostic Fort Walton types. Much of the check-stamped was grog-tempered, and a few sherds were limestone-tempered, casting doubt upon the existence of an Early Woodland component since limestone is so far associated with Fort Walton in this valley.

The fiber-tempered pottery was plain-surfaced except for a single sherd from TU6, disturbed Level 1, with some irregular impressions that appear to be a production flaw. Additional bits of Archaic ceramic evidence (Figures 4 and 5) were the amorphous, blocky clay chunks and a few fragments of typical Poverty Point type clay balls; all but one of the latter are grooved along the sides. Earlier I have labeled the chunks as daub fragments (White 1994a:73-74). This is possible, and occasionally they have stick or cane impressions that would confirm this function. However, many of these are hypothesized to be for cooking during the Late Archaic, just as the clay balls are. Experimental studies suggest they were used either for dry roasting (Hunter 1975), steaming, or boiling (McGee 1995, Wheeler and McGee 1994). Other, very tiny clay lumps of more rounded, irregular form (and unknown function) were found in consistent numbers throughout the entire midden, concentrating in the Late Archaic deposits. Both the rounded and blocky clay fragments are included on the tables as clay lumps.

Lithic materials. Even from the earlier and mixed levels, lithic specimens are mostly from a microtool industry (Figure

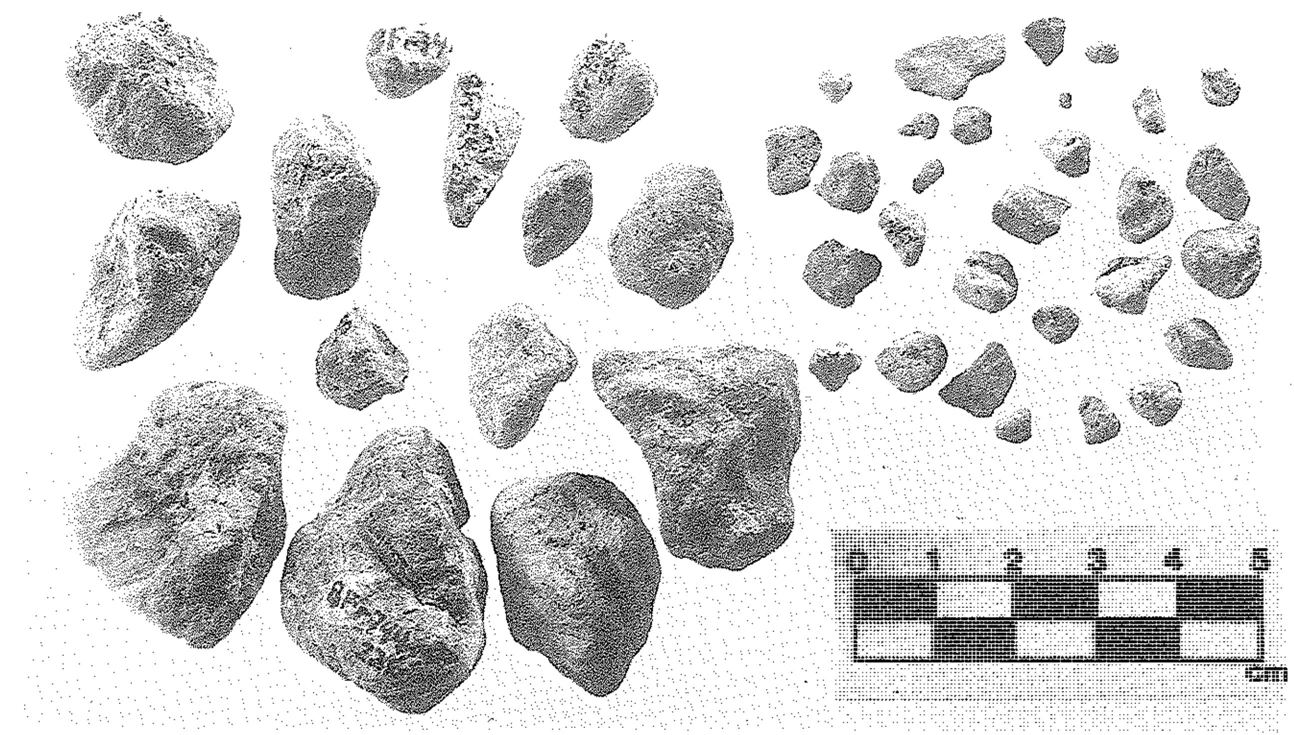

Figure 5. Complete assemblage of large to small clay lumps from Van Horn Creek shell mound, TU5SW, L 5 (a 15-cm level within the 1-x-1-m southwestern sub-unit).

6). Test Unit 5 produced 8 microtools and 8 cores/core fragments; TU 6 had 6 microtools and 14 cores. The microtools are all long, narrow side scrapers with intensive damage from use wear on one or both sides and/or the tip. The other end was not utilized, and often retains cortex from the original nodule. None of these tools has an expanding base like typical Jaketown perforators found at other shell mounds in the region (White and Estabrook 1994); perhaps their function was different from that of the perforators. The cores show signs of being worked until nearly exhausted, with flake (blade) scars running from both ends. Other tools recovered are a few unifacial and bifacial items or fragments, and small, long, thin blades that clearly came off the typical microcore and were not yet retouched or utilized as tools. Some blade fragments had broken on hinge fractures and may have been manufacture rejects; some cores also demonstrate hinge fractures.

The remainder of the lithic assemblage consists of primary and secondary debitage, a small amount of it thermally altered, that is consistent with core production. There is so little of it that it suggests bringing prized and relatively rare (on the coast) lithic raw material to the site in the form of worked--down nodules. All the material is chert that was probably obtained at least 150 km (80 river miles) to the north; there is no agatized coral from beach rock. The whole assemblage is consistent with the Late Archaic cultural affiliation, and with the long-observed fact that Fort Walton components in this valley manifest a striking absence of lithic remains (this of course leaves no stone tool industry to the hypothesized Woodland people who possibly lived here too, so it is easier to interpret if instead they are just the very earliest Fort Walton folks). Other rock recovered included a quartzite fragment possibly for grinding, and sandstone and limestone pieces that may have been natural inclusions.

Worked shell. This category, comprising 16 specimens in 1993, includes *Busycon sinistrum* (lightning whelk) columellae and cut fragments similar to those obtained in 1987, and 3 tiny disc beads, from Levels 4 and 5 of TU5 and L 8 of TU6. Another item is a quahog (*Mercenaria*) clam fragment, rare in northwestern Florida sites. Combined with the 11 specimens found in 1987, this assemblage indicates a minor shellworking industry. However, there are too few items to support the idea that the microtools were for working shell. Furthermore, it is not certain which component(s) the worked shell might be associated with; it is certainly well distributed vertically. The cut *Busycon* from TU5, L10 is clearly Late Archaic, and probably the disc bead from TU6 L8, since it is associated mostly with fiber-tempered pottery, a microtool and core, and only the two tiny sand-tempered sherd crumbs. Probably people from all time periods made shell tools, though in far smaller numbers than in southern Florida,

Figure 6. Microliths from Van Horn Creek shell mound. Proveniences: *l-r, top*) TU6 L5 (tiniest one); TU5WCen L7; TU5SW L5 (broken midsection); surface, SW area of site, TU6 L1; *middle*) TU5 NW L2; TU5WCen L3; TU5SW L3; TU5Cen L1; *bottom*) TU5SW L10 (utilized blade); TU5NCen L3.

where stone is less available. Other than the beads, all the shell artifacts appear to be expedient tools. Further research on shell tool industries of northwestern Florida is underway in the USF archaeology lab.

Zooarchaeological Remains. All excavation levels produced faunal remains. Small samples, recovered by both waterscreening and flotation, from Test Unit 6, Levels 1, 3, 5, 7, and 9, were analyzed (Fradkin 1994). A summary of fauna present is given for both the earlier and later components in Table 2 (including also the species identified during the 1987 work), and Fradkin's excellent detail work for the analyzed proveniences is given in Appendices A-E. Most of the fauna are fish and turtles, in addition to the shellfish. Fradkin was impressed by the numbers and diversity of species of small gastropods present in all levels and went to great pains to identify the 13 species of terrestrial snails and 4 freshwater and 3 marine snails. Explaining their presence in the midden is difficult, and their stratigraphic frequency distributions are hard to interpret. Terrestrial snails may have been commensals, that is, they either slithered in or were obtained by people in the process of procuring something else; similar to our ideas about barnacles and other such species, they are not expected to have been eaten. Some of the mussels might have been clinging to oyster shells. Many of these types of tiny shelled

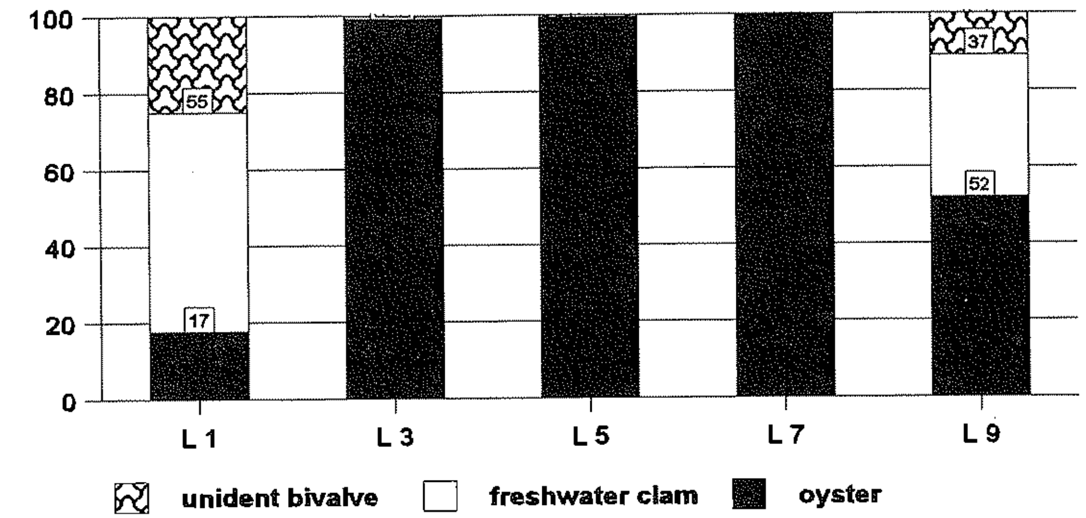

Figure 7. Oyster and clam percentages by weight by level at Van Horn Creek shell mound, Test Unit 6, suggesting changes through time in use of fresh and saltwater environments.

creatures might not be efficient to obtain or process, unless they were thrown into the cooking pot just to add a dash more protein (or flavor?). The snails may be important environmental indicators. Further research on these species is clearly needed.

Fradkin identified 70 taxa of animals from the Van Horn Creek samples, adding 40 taxa to those identified by Karen Walker in 1987 (Walker 1994), and including many turtle species; fish such as bowfin, hardhead and gafftopsail catfish, and jack crevalle; muskrat; rattlesnake; snow goose; and the many snails. The goose is interesting because 1) it is in a Late Archaic context; 2) it is present in winter in both freshwater and salt marsh environments, giving one of the few seasonal indicators known from area shell middens; and 3) birds are generally rare (for unknown reasons) in area shell midden faunal assemblages. Future work should involve calculation of comparative meat weights for the different species and reconstruction of their estimated proportions of the diet. For now, based on minimum numbers of individual animals in the representative samples from flotation, shellfish make up over 95% of the assemblage, with the next-largest component being saltwater fish, then turtles.

Concerning the hypothesis that more saltwater species were used earlier in time, the data are more complex than the1987 results. Comparison of oyster, a more saltwater species, with freshwater clams in the representative samples obtained by flotation from TU6 is useful (Figure 7). In Level 1, *Rangia* predominates, at 55% by weight, compared with 17% oyster (with another 24% of unidentified bivalve shell fragments). Level 1 also had only terrestrial snails in the flotation sample, and one freshwater snail in the waterscreened deposits. All this evidence suggests more use of freshwater environments during the Fort Walton occupation. In Level 3 the sample was 97.5% oyster by weight; in Level 5, 98%; in Level 7, 99%. These levels had only fiber-tempered pottery, if any, supporting the idea that the Late Archaic deposits represent species drawn from more saltwater environments. However other fauna from these levels are from both fresh and saltwater, and the marine, freshwater, and terrestrial snails also occur in no patterned frequencies, though terrestrial species predominate.

Below all this, the Level 9 sample (which had no artifacts) was only 52% by weight oyster compared with 37% clam (*Rangia* and a few *Polymesoda*, another freshwater species). By minimum numbers of individuals in Level 9 there were 51 oyster, 137 *Rangia*, and 11 *Polymesoda* in 9 liters of soil. Furthermore, it is easier to determine oyster than clam in small fragments, which means that the 11% of unidentified bivalves in the Level 9 sample are probably also clamshell fragments (see Figure 7). This Level 9 sample was the one taken below the water table from unexcavated deposits just before closing the unit, so it was less controlled and possibly less representative. But if it is a good sample, it may mean that earlier Late Archaic people still utilized more saltwater environments, but also fresh water zones nearly half the time. If the unstated assumption here is that people collect mostly from their local surroundings, the faunal sequence might be explained by fluctuating sea levels earlier in the Archaic.

One type of animal specimen that has been commonly recovered from Apalachicola delta shell middens is the pneumatized (puffed-up) fish bone, usually from a jack or other species. These have also been called hyperostoses or Tilly Bones, and their function in the fish is still unknown (Tiffany et al 1980). They are dense and resemble antler tips at first glance, and the first impression is that they are some kind of tool. Our zooarchaeologists indicated that they were simply another, perhaps more preservable part of the fish carcass, but they are so common and useful looking that they must have been collected for something. This could be said about any frequently occurring faunal remains, but at Van Horn we finally recovered some of these specimens with cut

Figure 8. Pneumatized fish (crevalle jack?) bones from Van Horn Creek shell mound, showing human modification: *top*) from TU5SW, L5, with cut or worn notch; *bottom*) from TU5NCen, L2, with both ends cut off.

marks on them that looked like more than butchering marks (Figure 8).

Ethnobotanical Remains. A sample consisting of charred floral remains from the same proveniences as those whose faunal materials were studied contained few surprises or distinctions by component . As with the 1987 work, most of the specimens were pine, hickory nutshell and acorn shell fragments, which could have been fuel as well as food. Species not previously known from the archaeological context of the site are represented by 3 seeds: hornbeam, blackgum, and possibly dogwood, all from Level 1. Other specimens include indeterminate seeds and other plant parts. The general environmental picture is one of mixed pine and hardwood forest. The presence of pine may indicate a drier forest during the Archaic from what exists today, where pine is rare and tupelo, gums, and other hardwoods and cypress dominate.

Radiocarbon Date. Very little charcoal suitable for dating was recovered from both seasons of excavations at Van Horn Creek. For the 1987 work less than one gram of charcoal from TU3, L6, thought to be undisturbed Late Archaic deposits, produced an AMS radiocarbon date of 1120±75 years (Beta 26897), cal A.D. 770-1030 (2-sigma or 95% probability range; Calib 4.3, Stuiver and Reimer 2000). Clearly this date is not Late Archaic. Consultation with the experts at Beta Analytic suggested the possibility that such a tiny piece of charcoal could have traveled downward through the spaces between the shells (those same spaces that were such trouble in the pumping out of the water). After the 1993 work, another date was desired but again little appropriate charred material was recovered, and the grant funds had to be spent before all materials were able to be processed. The goal was to obtain a date on the Late Archaic component from as deep as possible, so another sample was chosen from a 1987 unit, with better stratigraphic context and well-correlated with the 1993 work. Test Unit 3's stratification was similar to that of the 1993 TUs 5 and 6. In TU 3 Levels 6-9 produced no artifacts; then in Level 10, right at the water table 144 cm below surface, fiber-tempered ceramics were encountered in undisturbed Late Archaic context (White 1994a:65). From this deep level the <1 g of charcoal submitted for AMS dating is thought to be representative of the later Late Archaic. Of course, this bit of charcoal also may have traveled downward like the other one, but the date returned was very reasonable: 3170± 60 radiocarbon years (Beta-73523), cal. 1597-1314 B.C. Another date was obtained in 1998 from a similar small piece of charcoal from Level 11 just below the water table in TU3. The age returned was 3150±50 (Beta119067), cal. 1520-1313 B.C. (both dates calibrated at 2-sigma or 95% probability range using Calib 4.3, Stuiver and Reimer 2000).

Summary. The evidence at Van Horn Creek shell mound

suggests that the Late Archaic occupation, dated to about 1400 B.C., is represented by thick deposits from repeated use throughout years, decades, or even centuries. The absence of Late Archaic pottery in some levels and relatively high frequency of it in others, by contrast with the continued presence of clay lumps in all levels, tempts one to hypothesize different activities for different individual (seasonal?) occupations. Late Archaic groups probably initially settled there for a season of collecting because at the time it was a stream bank and/or bayshore locale which provided easy access to both terrestrial and aquatic species, freshwater, estuarine, and marine. Possibly at the time of first settlement the barrier islands had not even formed yet and the river was much farther west. The materials recovered during the 1993 operations provide additional support for a good-sized Woodland occupation (perhaps corresponding with the later radiocarbon date) during which people disturbed the top of the Late Archaic deposits, dug at least one large pit, and left a thinner stratum of cultural materials that consists of debris from similar repeated use. The Woodland deposits did not cover the Late Archaic shell midden uniformly either vertically or horizontally. They may be up to 30 cm thick, but could not be isolated completely due to mixing with earlier and later materials. Fort Walton people (perhaps culturally continuous with the Woodland people) then reutilized the site for one or several brief occasions, leaving an even thinner deposit that barely covered the earlier components and was similarly not of uniform thickness or horizontal extent. They too harvested some oysters and other saltwater species, but many more freshwater clams, suggesting the river had moved eastward and brought them closer. Noteworthy, perhaps, for social archaeology, is that, if the Fort Walton people were now of a more socially stratified and/or agricultural background, they left no recognizable evidence of this. Occupation for all three time periods shows identical subsistence on the rich wild bounty of the coastal wetlands.

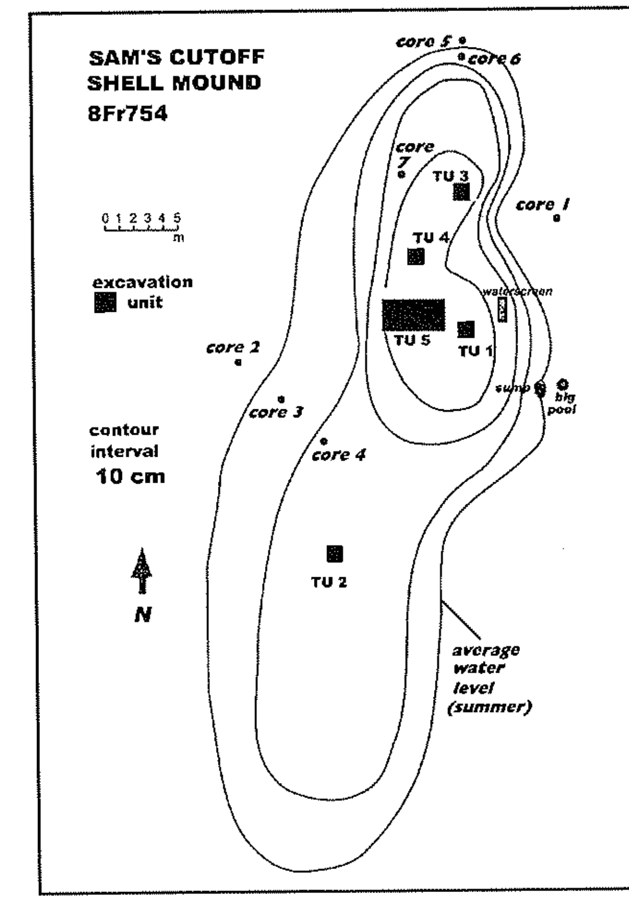

Figure 9. Sam's Cutoff shell midden, showing 1991 and 1993 excavations.

Sam's Cutoff Shell Mound

Logistics, Excavations, and Stratigraphy

To get to the second site tested, Sam's Cutoff shell mound (8FR754), was even more of an adventure. This small oyster mound rises <40 cm above the surrounding sawgrass marsh adjacent to East Bay, and is 155 m north of Sam's Cutoff (Figures 1, 9), a stream connecting East Bay and the East River. The portion of the site above water is heavily forested; it measures 56 m long and 16 m wide, and is oriented just about north-south. The site was first recorded in 1985 (Henefield and White 1986). Very brief testing in 1991 (White and Estabrook 1994) produced only 4 microtools and one fiber-tempered sherd, so we sought more and better evidence in 1993. Logistics here were even trickier; smaller pumps and pipes were hauled, bit by bit, onto and off our boats then through the half-hour of thigh-deep muck covered in sawgrass that reached over our heads. A friendly Coast Guard helicopter crew airlifted the big mud hog pump in and out (Figure 10). However, since the site is an island of tall palms, oaks, and cedars amid the sawgrass, the huge copter could not get too close for fear of hitting its rotor blades. So it dropped the mud hog into the marsh 50 m away. To move it that torturous 50 meters we hooked up an electric winch carried in from a boat trailer to the pump battery and wound the cable around a tree, then had to leapfrog with plywood sheets in front of the pump's tires to give it a flat surface to roll along as the winch slowly reeled it over the grass and cypress knees and up onto the site (Figure 11).

Despite the site's being surrounded by water, our 1991 dilemma had been the lack of water concentrated in one place for waterscreening. At that time we dug a small sump hole off the side of the site and let it sit until the mud cleared and it became a continually filling pool. We used it again in 1993, to establish an even more reliable, bigger pool for pumping water to jet in the well points and for the big pump to empty into. The big pool (affectionately called the swimming pool; Figure 12) was made as a 3-m diameter circle of chicken wire lined with roofing insulation covered by plastic sheeting, held together, as was most of the whole project, with duct tape.

Jetting in the well points (and later coring) was made easier at this site by excavating the first meter of each hole with a posthole digger into the hard-packed oyster shells (material from these holes was carefully screened). As the big

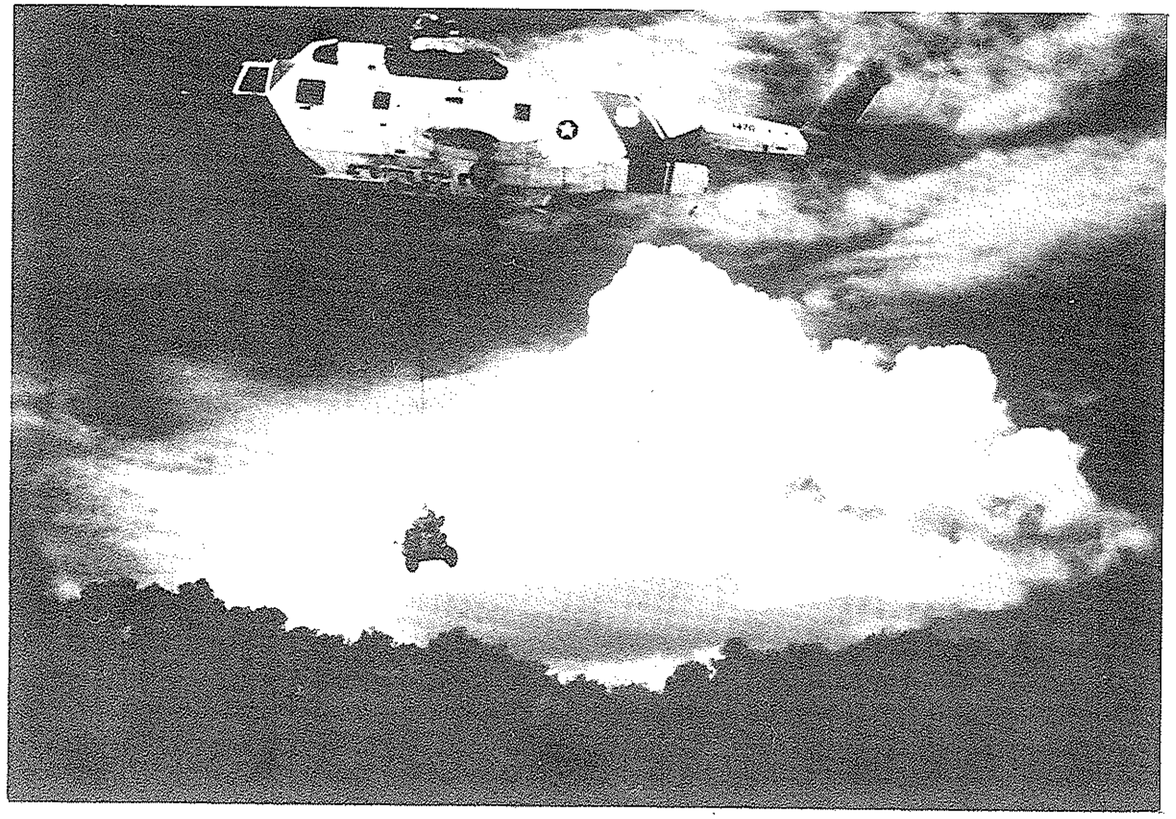

Figure 10. Helicopter transporting mud hog pump to Sam's Cutoff shell mound.

pump filled the big pool from the well points, a small pump drew water from it back out again for waterscreening. The big pool provided an effective reservoir, and was (surprisingly) stable enough to produce an intrusive, blooming purple water hyacinth. Two 3-hp pumps were needed for waterscreening because, amid the constant flow of water everywhere, their spark plugs kept getting wet. This, despite several varieties of creatively designed shields, using bountiful quantities of plastic sheeting, which sometimes melted when it brushed the hot engines (apparently the design engineering of the standard water pump fails to consider its use in the presence of a spray of water).

One 2 x 4 m unit was opened, surrounded by the seven well points, and named Test Unit 5, continuing the sequence from 1991. It was less than a meter northwest of TU 1, in which we had excavated the deepest in 1991, hitting water at 33 cm. Excavation was again in 15 cm arbitrary levels within eight 1 x 1-m squares. In two squares of this unit we again had only modest success, reaching depths of just over 60 cm before the water came rushing in despite the pumping. Late Archaic microtools, cores, clay chunks, and more fiber-tempered pottery were recovered, but excavation was considerably slowed when we encountered, at only 4 cm depth, in the four center 1 x 1-m squares of the unit, an unexpected human skeleton.

Lack of any modern or historic evidence from the site as well as skeletal characteristics were evidence that it could only be a Late Archaic burial. In consultation with the State Archaeologist, and considering the burial's shallowness and exposure, permission was given to continue excavation. Because of the care needed in recovering the burial, excavation of the central 4 squares (out of the eight 1 x 1 units in TU 5) was not extended below Level 1. In the NW and SW squares Level 2 was reached and in the NE and SE, Level 4. No artifacts were recovered in Level 4; however a few artifacts from this depth came from well points and cores.

In TU 5, unlike in the units excavated in 1991, there was oyster shell mixed in with the black sandy humus of the topsoil that overlies the top of the shell midden. This humus layer is 15 - 20 cm deep, and in the other units it was more distinguishable from the slightly browner, deeper matrix containing the shell. Apparently the shell occurred higher up in TU 5 because it had been disturbed to inter the burial. Beyond the change from black to very dark brown there was no other recognizable stratification in the 60 cm excavated. A core into the NE square of TU 5, as well as 7 other cores around the mound, showed the shell midden bottom to be at 177 cm below summit ground surface, making the midden thickness to be approximately 1.5 m. Only cores 3, 4, and 7 contained shell, in a matrix of dark clay. The other cores contained the same clay, which smelled of sulphur, but no shell. Geologist Joe Donoghue of Florida State University examined the mineral content of this clay and determined that it did not have a marine origin. A summary of the soil stratification on the summit of the mounded midden, as reconstructed from the levels and the cores is as follows:

Figure 11. Winching the mud hog pump through the sawgrass toward Sam's Cutoff shell mound (an island of palms and cedars in the grassy marsh), pulling the wheels over plywood.

I. 0-15 cm, black (10YR2/1) sand/forest humus without shell except where disturbed
II. 15-75 cm, very dark brown/dark brown (10YR2/2 to 3/2) sand packed with shell
III. 75-100 cm, dark gray (10YR4/1) sand packed with less shell
IV. 100-130 cm, bluish/greenish gray (10YR5/1) sand with less shell
V. 130-177 cm, black (2.5Y2/0) clayey sand with less shell, much crushed
VI. 177 cm and below, bluish gray clayey sand, no shell

Materials Recovered

Artifacts and Radiocarbon Date. The small artifact assemblage from Sam's Cutoff (Table 3) nicely augments the even smaller volume of remains recovered earlier (White and Estabrook 1994). Only one ceramic sherd was recovered during 1993, but since the 1991 work also produced only one sherd, this increases the sample size by 100%. Interestingly this plain fiber-tempered sherd is unlike the 1991 sherd in being rough and thick, similar to most of the fiber-tempered wares in this valley. The 1991 sherd was very smooth-surfaced and hardly appeared fiber-tempered at first glance (White and Estabrook 1994: Figure 2). In fact, that is why we

Table 3. Cultural materials recovered from Sam's Cutoff shell mound, 1993, Test Unit 5, by counts and weights (grams).

	TU5 L1	TU5 L2	TU5 L3	Core	Well points	TOTALS
SOIL VOLUMES	1.06 m^3	.6 m^3	.3 m^3	.02 m^3	est. .14 m^3	2.12 m^3
fiber-t pl sherd	1(11)					1 (11)
clay lump		10 (21)				10 (21)
clay ball		1 (16)		1 (.2)	1 (5)	3 (21)
microtool	2 (2)	2 (2)	4 (71)	1 (11)	2 (1)	11 (87)
primary decort* flake	2 (3)			2 (44)	1 (6)	5 (53)
2ndary decort flake		5 (11)	1 (.1)	2 (2)	1 (8)	9 (21)
2ndary flake	6 (14)	5 (6)	1 (1)	2 (3)		14 (24)
core		1 (32)	1 (36)		2 (43)	4 (111)
block shatter		1 (2)			3 (4)	4 (6)
ground stone		3 (342)				3 (342)
Busycon frag		6 (19)		1 (1)		7 (20)
shell columella		7 (59)	1 (47)			8 (106)
Melongena		1 (19)				1 (19)
TOTALS	11 (30)	42 (529)	8 (155)	9 (61)	10 (67)	80 (842)

* primary decortication flake= over 50% cortex; secondary decortication flake = under 50% cortex; secondary flake = no cortex, secondary lithic reduction product.

broke off a corner to make sure. In doing so we exposed unburned, undecayed fiber (White and Estabrook 1994:Figure 9) that was definitively identified as Spanish moss, *Tillandsia usneoides*. That broken corner of the sherd was sacrificed to be ground up for an AMS radiocarbon date, which was returned at 3630 +/- 60 B.P., with a C13-adjusted age of 3720 +/- 60 years (Beta 68513, CAMS 10472), cal. 2292-1942 B.C. (2-sigma or 95% probability range; Calib 4.3, Stuiver and Reimer 2000), respectably early for fiber-tempered pottery in this region. Other ceramic materials were clay chunks and clay ball fragments, as at Van Horn Creek, though far fewer in number. Also dissimilar to the material record at Van Horn Creek was the discontinuous distribution of clay lumps, which only occurred in Level 2; this distribution may be an artifact of the small sample size and shallow depths reached.

In 1991, four microtools were obtained; in 1993, 11 microtools, as well as more cores and debitage. The microtools are all sidescrapers or long thin needles. As at Van Horn Creek there are no classic Jaketown perforators, though two were recovered in the 1991 excavations at Sam's Cutoff. Eight *Busycon* columellae and other worked shell pieces, as well as a *Melongena corona* (crown conch) shell also were recovered, testifying to a limited shellworking industry similar to that at Van Horn Creek. This considerably expands the worked shell inventory from the site, as only one columella fragment had been recovered in 1991.

Biotic Remains. Faunal remains analyzed (Fradkin 1994) consisted of samples recovered from both 1991 and 1993 investigations at Sam's Cutoff (no previous professional faunal identifications had been done for this site) by waterscreen and flotation from Test Units 1, 3, and 5 (NE and SE 1-m squares). Table 2 shows species identified and Appendices F-H give detailed quantifications. Fradkin identified 62 taxa including rabbit, racoon, deer, rodent, many turtles, snake, alligator, a dozen fish, and 29 taxa of invertebrates, including many shellfish, and again several species of terrestrial, marine, and freshwater snails. More of the species were saltwater types, to be expected in this mound of nearly all oyster. Predominant fish species were marine catfish, sheepshead, crevalle jack, and croaker. Oyster was so dominant that only 19 *Rangia* shells appeared in the sample analyzed. Even the assemblage of tiny snails, while again predominantly terrestrial species, contained more marine species than freshwater. This assemblage is consistent with the prediction that Sam's Cutoff, farther east than Van Horn, was even farther away from fresh water during the Late Archaic. Ethnobotanical remains identified from the same proveniences included mostly pine and oak charcoal, acorn and hickory nutshells, and a few seeds, including grape. These are similar to those from Van Horn and other Apalachicola shell mounds (White 1994a).

Human Burial. The human burial at Sam's Cutoff lay between only 2 and 20 cm deep. The skeleton was tightly flexed, with the head to the east, knees pointing northeast and face to the southwest. There were no grave goods. Burial excavation consumed the largest part of our time at the site, taking away from the effort to get older and deeper evidence but adding the kind of data on human individuals that is equally rare and valuable. Osteological analyses done by graduate student Lorna Weill (Weill and White 1994) are detailed in the original field report (White 1994b). Dental attributes such as attrition observed on the molars suggests a diet of gritty, hard foods (Molnar 1972). The interesting incisors are shovel-shaped on both the labial and lingual surfaces, and a mandibular torus is present. Shovel-shaped front teeth are common in Native American (and north Asian and other) populations (Mizoguchi 1985). As has been documented for typical pre-agricultural populations in North America (Larsen 1980), there is no evidence of cavities. The postcranial skeleton shows a heavy reliance upon upper body strength. Striations run laterally along the left humerus, and the distal end of the left ulna is remodeled to support increased musculature. The sex of the individual was originally reported as indeterminate due to the fragmentary nature of the pelvic bones. But during a visit to USF, forensic anthropologist Stanley Rhine determined from the shallow sciatic notches that it was female, though the chin exhibits a strong, square, more male-looking shape (Bass 1971:73, Brothwell 1982:61). The femoral circumference of 79 mm is marginally within the female range, but the more reliable femoral length is 370 mm,

Figure 12. The mud hog pump and the big pool, which stored water for jetting in well points and for waterscreening.

well within the zone for females (Black1978, İşcan and Miller-Shavitz 1983:56).

The age of the young woman buried at Sam's Cutoff was hard to determine; the pubic symphysis, a good indicator, was unavailable. Attrition on the first molars suggests a range of 25 -35 years, but ossification of the long bone epiphyses to their respective shafts, usually complete by age 19 (Bass 1971:166), had not been achieved. The head of the right femur was not attached to the shaft but lay in the ground close to the hip joint; other long bones were similarly unfused. The third molars (wisdom teeth) had not erupted, and the degree of development of the roots (Ubelaker 1989:72), along with all the other clues, suggest the girl was approximately 16 years old. Her stature, based on femoral length (Bass 1971) was estimated to have been 142.5 cm or 4'7".

The skeleton looked fairly healthy. There is some enamel hypoplasia, dental evidence of nutritional stress, and evidence of an infection in the right lower canine and first premolar teeth. According to Rhine, the gums were also infected and receding (Stanley Rhine, personal communication, 1997). The right mandibular second molar exhibits a wide and flattened root with a protruding deformation at the base, and there also is a groove which extends up into the root from the base but which does not appear to have reached the pulp. Mechanical stress is suggested in a lower lumbar vertebra in which a lesion has extended throughout most of the centrum. Deep striations along the shaft of the humerus where the muscles attach, and an osseous growth on the distal end of a metacarpal, confirm the association with the physical activity involved in a fishing, hunting, and gathering subsistence (Larsen and Ruff 1991).

Also of interest is the broken condition of the legs, which may indicate a post-mortem or possibly shortly pre-mortem process. The left and right femora are broken in half at midshaft with suspiciously straight, clean edges. Similar breaks have been reported at the midshaft of humeri as a result of the weight of overlying soils or trampling of the ground surface in skeletons which have lost their organic component (Brett Waddell, personal communication to C. Wienker, 1994). On the other hand, Curtis Wienker, forensic physical anthropologist at USF, who reviewed this analysis, reports a similar clean break in forearm bones as a typical "parry fracture" suffered when warding off a blow to the head (he had firsthand evidence from being mugged one night in Tampa).

Interpretation of this burial is speculative. Based on the flexed position and articulated nature of the skeleton, it appears to be a deliberate burial, not someone who fell and died alone in the forest, though the thin soil barely covered it. The shells occurred higher up in the root mat than in areas away from the burial, suggesting some minimal disturbance to the ground for interment; there is no evidence of animal gnawing that might have taken place if it were not buried. More puzzling is the body's orientation. It was clearly flexed and lying on the right side, but the face was turned away toward the left and at least one hand was underneath. Was this girl thrown down, hands perhaps tied behind her back, legs whacked to break them in place, and quickly buried? Or is this far too melodramatic a scenario to explain what is more likely the result of natural processes over 4 millennia?

Other Late Archaic burials of this type do occur. A flexed skeleton at Yellow Houseboat shell mound on the west side of the Apalachicola delta is probably of this age (White 1994a:88-114), and others are known from shell middens throughout Florida. But more research is needed on them. We expect that Late Archaic society was mostly egalitarian, but by this time they are burying the dead in cemeteries, for example, in Kentucky at Indian Knoll (Webb 1946). Though there are no grave goods at such cemeteries, they imply more of a connection or special dealing with death than sticking someone in the pile of shell and fish bone garbage before you leave camp forever.

Summary. Evidence recovered in 1993 at Sam's Cutoff shell mound supports earlier conclusions that the site is a single component Late Archaic settlement and that it was in more of a saltwater environment than was Van Horn Creek and other Archaic shell middens to the west. A very small amount of faunal remains from the core into the bottom of TU5 are the same species as the rest of the samples, suggesting continuity of adaptation. The radiocarbon date obtained places the latest occupation at around 4000 years ago, about 2100 B.C. Possibly the mound was built up by many successive short-term occupations, perhaps in seasonal fashion, though there is so far no determination of seasonality. The inhabitants left a burial of one teenage girl at the end of the site's period of use.

Delta Lobes and Fishes

Environment and subsistence during the Late Archaic are well documented with the data from this project, which lend further support to the hypothesis that the fresh water of the river was farther to the west prior to 4000 years ago, then moved eastward. The fluvial history is tied with sea level rise at the end of the Pleistocene. The Apalachicola and its distributaries formed various delta lobes as alluvium built up at the mouth. Paleo-channels have been documented farther west; today's Lake Wimico and other streams are former segments of the river's main channel, and evidence of formation of earlier delta lobes is present north and west of the modern delta. Rising sea level may have drawn the river channel eastward, abandoning those earlier lobes (Donoghue and White 1994). Fish and shellfish collected by Late Archaic populations at Sam's Cutoff and Van Horn Creek included more oysters and other saltwater species than their contemporaries on the west side of the delta.

Sam's Cutoff is the only shell mound so far known in the Apalachicola delta to have no cultural deposits later than the Late Archaic. This may be because its original low elevation and proximity to the bay resulted in its near inundation through the centuries, making it lower, less attractive, and less visible to later populations. At Van Horn Creek the original hypothesis was that the later cultural component(s) are associated with more freshwater species. The 1993 work supports this view but shows evidence of both freshwater and marine environments earlier in the Late Archaic, suggesting possible fluctuation in both the river's movement eastward and the sea levels. Future work will emphasize better dating of these subsistence shifts and correlations with what is known about sea level changes.

The picture of estuarine subsistence during the Late Archaic is greatly enhanced by the new data from 1993. Several animal species have been added to the list of taxa for Van Horn Creek and an assemblage of fauna for Sam's Creek is described for the first time. Probably more important as food than all the shellfish, several fish species seem to have been the most desirable, especially marine catfish. There also is a high frequency of gar fish remains, as at other delta shell middens, possibly because they are so easy to catch. The assemblages of plant remains indicate use of pine and hardwoods for fuel, utilization of nuts and fruits such as grape, but little indication of seasonality or much of the vegetable diet. It is possible that the prehistoric people ate mostly meat, predominantly fish and turtle and lesser amounts of shellfish. More likely, the kinds of wetland and other plants utilized, from swamp cabbage (palm hearts) to smilax root, left no preservable parts. Future research should certainly involve examination of saturated deposits for pollen and other less obvious evidence. It was hoped that excavation of wet deposits would produce more perishable artifacts and biotic remains. Clearly these shell middens were deposited on dry land. Rising and fluctuating water, from daily tides to larger-scale sea level changes, later partially inundated the sites.

The enormously rich river swamp/estuarine environment, even if drier during the Late Archaic, provided a bounty of species useful for food, tools, and other functions. Several studies suggest prehistoric shell middens were occupied during specific seasons only (e.g., Claassen 1986), but most species utilized at the Apalachicola shell mounds were available year-round (though the snow goose from Van Horn Creek suggests winter occupation). The most notable aspect of subsistence is the *lack* of significant change through time. The later components at Van Horn Creek present a very similar record of fishing, shellfishing, and hunting, from the Late Archaic through Fort Walton times, some 4000 years. Though the species may vary somewhat due to different local aquatic regimes (saltwater or fresh), the pattern is the same.

External Connections

The Late Archaic material culture at both sites is easily consistent with the range encompassed by the Poverty Point Complex first defined in Louisiana and recognized all along the northern Gulf Coast (Broyles and Webb 1970, Gibson 2000, Webb 1977, Webb and Gibson 1991, Byrd 1991). This includes Florida, where the Elliott's Point Complex was the name Lazarus (1958) gave to the contemporaneous adaptation along the northwestern coast that had Poverty Point clay objects, apparently using the separate term because the materials were in Florida, not Louisiana. Dating of Elliott's Point materials is unclear; Fairbanks (1959:98) notes that Lazarus's lack of dates, then as now, showed only that the materials were earlier than Deptford. The concept of Elliott's Point as a localized adaptation on Choctawhatchee Bay (Thomas and Campbell 1991) is now clearly inappropriate, as the materials occur all along the Florida northwest coast, and items such as clay balls and other Poverty Point-related artifacts have come from the Atlantic coastal area and also farther down the Gulf near Tampa. Another unclear aspect of this time period is the relationship of clay balls and fiber-tempered ceramics, which overlap, but inconsistently.

Calvin Jones (1993) identified some 90 sites with Elliott's Point components in the Florida panhandle, but the data remain unpublished. This paper describes the first in the Apalachicola valley to be investigated in such detail and radiocarbon-dated. Social and economic connections 3000-4000 years ago across the northern Gulf Coast could have been in the form of long distance exchange, but other systems are more likely. In the Apalachicola delta the characteristic status items known from Poverty Point, such as elaborate lapidary work or large earthworks, are nonexistent. Connections leading to the similarities in lithic industries and clay ball cooking were probably those of general domestic tasks done in a similar way in similar coastal wetland environments.

Continuing analysis will examine the role of these sites and the Apalachicola delta area within the network of Poverty Point-related cultures all along the northern Gulf Coast. The microtools newly recovered by this project expand the data set, providing enough specimens for future work on use wear and manufacturing trajectories. The Late Archaic burial additionally offers insights into the life of one person who lived during this time period. The fiber-tempered ceramics, extremely rare at Sam's Cutoff during the earlier Late Archaic and more numerous later in time at Van Horn Creek, are still the subject of debate concerning their role in Poverty Point-related material culture. The best interpretation here is that they emerged sometime before 2000 B.C., developed slowly and lasted well over 1000 years. A similar puzzle is the smooth or grooved clay balls, few in the Apalachicola shell mounds, but certainly present and consistent with Poverty Point material culture, and hypothesized to be for cooking. Far more numerous are the chunky fired clay lumps, also thought to be for cooking. Some are smoothed and others, rough. They could be from broken clay balls, but some look more like fragments of larger clay cooking surfaces that might have cracked into pieces. If they were for boiling, the smaller or smoother bits might be fragments sloughed off during use (McGee 1995; Wheeler and McGee 1994). All these clay items are more numerous in deeper levels at Van Horn, but not at Sam's Cutoff. The hypothesis that their use for cooking predates the emergence of pottery needs careful testing , as does the idea that ceramic vessels made them unnecessary for cooking and replaced them.

Radiocarbon dates are statistical entities and a single one from a site is insufficient for definitive statements, but comparison of the dates from this project is interesting. The calibrated ranges of the dates from Van Horn Creek and Sam's Cutoff are farther apart than the 2 standard deviation range that assures 95% probability of correctness (in fact, they are 2.3 sigmas or 550 years apart). Thus there is a high probability that the sites were occupied at two different times. The intercepts of the two dates with the calibration curve are at 1420 B.C. for Van Horn Creek and 2070 B.C. for Sam's Cutoff, a 650-year difference. As the Late Archaic component at Van Horn is more extensive, up to 3 m thick, it may indicate longer occupation than that at Sam's Cutoff, which is 1.75 m thick at most (and deeper deposits may be from even earlier Archaic times at both sites). The simplest explanation is that Sam's Cutoff was abandoned earlier during the Late Archaic, when they were just starting to make pottery, and Van Horn Creek was occupied later and possibly continually attractive because it was more visible, higher above water.

Reflections on Methods

Details of method are necessary to relate, not only because they may be useful in future research, but also because the manner in which the archaeological record is extracted is enormously important to understand for doing analysis and interpretation. I include the story of our fieldwork because knowing how archaeological knowledge is produced is crucial for anyone trying to evaluate it (and it was good adventure!). Usually archaeological excavation below the water table is easier. At sites in sandy lake bottoms or coquina shell middens, well points can be jetted in quickly, though wet site excavation is still more difficult and expensive than conventional digging (e.g., Doran 2002; McGee and Wheeler 1994; Purdy 1988). Oyster or clam shell deposits are not like peat or small coquina shells in sand. Apparently a larger volume of air is retained in the spaces around the big shells, so pumping may be less efficient, like sucking air when trying to drink through a perforated straw. Successful dewatering strategies in archaeology have dealt with problems through good engineering. For example, on the Florida east coast at Groves' Orange Midden, piston cores around the inundated midden of small shell, sand, and peat established depths of deposits, and shortening well points drained water trapped above deeper deposits (Wheeler and McGee 1994:333-338). At Windover, during draining of the pond and peat, sand was packed around the well points mostly to anchor them and filter the water at the intake point (Doran and Dickel 2002). In the estuarine Apalachicola wetlands, it was not possible to bring in heavy equipment (especially with our tiny budget), and the high pressure of our rented jet pump was nowhere near enough to jet in the well points without heavy physical labor of pounding them in. Coring by hand through the shell was similarly impossible at Van Horn Creek, and difficult at Sam's cutoff, though it was not difficult off the shell in the swamp muck. Pouring sand around the well points did not help, though it may not have been enough sand. Raising the well points may have helped if water was trapped above them. Other ways of increasing our success may have been pumping more steadily and longer, and using more well points.

Dewatering to excavate deep deposits on the Tennessee-Tombigbee Waterway in northeast Mississippi was done by machine excavation of drainage trenches surrounding a block of earth, then pumping water from the trenches and isolating this dry block for excavation units (White 1983:205-207). While this is a successful method, it goes to the extreme in one of the negative aspects of dewatering: there is always damage from less-controlled excavation of a portion of the archaeological deposits in order to get the machinery and equipment installed. At the shell middens of northwest Florida we tried to do as little damage as possible, but the nature of the shells themselves may have been the biggest problem. *Rangia* shell mounds in low estuarine settings along the Gulf Coast have never been easy to investigate. In the Mobile delta Trickey and Holmes (1971:117) found earthen dikes to be only partially effective. In Louisiana excavation far below the water table at *Rangia* mounds was done with elaborate engineering and expensive tools such as helicopters and large cofferdams provided by oil companies (Neuman 1976). We expected the Apalachicola project to be difficult, but gained valuable knowledge for tackling wet deposits in the future. We also had great luck: If this project had been attempted during the summer of 1994 instead of 1993, the two tropical storms and record 100- to 500-year flood that raised the water level two meters would have made it impossible; the entire lower delta, shell mounds and all, was submerged.

Acknowledgments

I thank the USF 1993 summer field school crew and many people of Apalachicola and Franklin County, especially Apalachicola National Estuarine Research Reserve director Woody Miley, education coordinator Erik Lovestrand, and staff members Dora McCarthy (who videotaped the helicopter), Steve Travis (who designed our pumping logistics) and Pat Millender and Jimmy Moses (who slogged through the swamps all summer with us, fixed balky equipment, and kept laughing). The Florida Division of Historical Resources provided a Historic Preservation grant, and grants specialist Robert Taylor cheerfully waded through the muck to visit. Student Lorna Weill did the skeletal analysis with advice from USF physical anthropologists Lorena Madrigal and Curtis Wienker. Florida State University geologist Joe Donoghue and his graduate student studied soils and helped haul out 15-foot pipes and 60-lb pumps. Zooarchaeologist Arlene Fradkin, then at the Florida Museum of Natural History, analyzed the faunal remains, and ethnobotanist Elisabeth Sheldon of SITE, Inc., in Montgomery, Alabama, did the flora. Archaeologist Karen Walker did the original analysis of Van Horn Creek fauna that suggested major environmental change after the Late Archaic. Ryan Wheeler, Ken Sassaman, and other reviewers provided great ideas and references. I also appreciate the U.S. Coast Guard helicopter, and the support of the Friends of the Reserve. Finally, I owe great thanks for the field lodging donated in 1993 by Bob and Edda Allen at their East Point establishment, Sportsman's Lodge, "the fishing capital of the world."

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Appendix A. Faunal remains from Van Horn Creek shell mound, Test Unit 6, Level1, Fort Walton component (with some mixed materials from earlier deposits; weights in grams).

TAXON	Waterscreen (1x2x.15m= 300 liters of soil)			Flotation (9 liters of soil)				
	NISP*	MNI**	Weight	NISP*	MNI**	%	Weight	%
Sylvilagus spp.	4	1	1.2					
Sigmodon hispidus	1	1	0.2	8	1	0.6	0.6	
Neofiber alleni	9	1	1.1					
Rodentia	5		0.4	6	1	0.6	0.4	
Odocoileus virginianus	1	1	0.7					
Small Mammalia	1		0.1					
Large Mammalia	7		8.7					
Kinosternidae	1	1	0.1					
Cf. Terrapene carolina	1	1	0.6					
Emydidae	21	1	37.6					
Trionyx ferox	1	1	0.7					
Testudines	38		8.29	2	1	0.6	0.3	
Crotalus spp.	9	1	11.1					
Serpentes	2		0.2					
Alligator mississippiensis	24	2	21.6	1	1	0.6	4.2	0.2
Tetrapoda	4		0.1	3			0.2	
Lepisosteus spp.	40	2	8.7	22	1	0.6	0.7	
Amia calva	1	1	0.2					
Elops Saurus	2	1	0.1					
Arius felis	4	1	1.2					
Bagre marinus	1	1	0.1					
Ariidae	10	1	1.6	1	1	0.6	<.1	
Cf. Ariidae	1		0.2					
Caranx hippos	1	1	0.7					
Caranx sp.	1	1	0.2					
Archosargus probatocephalus	14	3	10.5	6	1	0.6	0.3	
Cf. Archosargus probatocephalus	2		1.1					
Pogonias cromis	1	1	0.1					
Sciaenops ocellatus	2	2	2					
Mugil sp.	1	1	0.2					
Sparidae/Sciaenidae				3			<.1	
Perciformes	16		9.2					
Osteichthyes	103		12.7	113			1.7	0.1
Vertebrata	168		33.6	326			6.8	0.3
TOTAL VERTEBRATA	497	27	174.7	491	7	4.1	15.2	0.6
Crassostrea virginica				frags	8	4.7	425.8	17
Rangia cuneata				296	115	67.7	1380	55.2
Polymesoda caroliniana				25	12	7.1	43	1.7
Bivalvia				frags			610	24.4
Oligyra orbiculata				11	11	6.5	0.2	
Euglandina rosea				8	2	1.2	1.3	0.1
Glyphyalinia indentata				1	1	0.6	<.1	
Zonitoides arboreus				10	10	5.9	0.1	
Polygyra pustula				4	4	2.4	0.1	
Pomacea paludosa	1	1	1.5					
Mollusca				frags			23.1	0.9
TOTAL INVERTEBRATA***	1	1	1.5		163	95.9	2483.6	99.4
TOTALS	498	28	176.2		170	100	2498.8	100

* Minimum number of individual specimens; ** Minimum number of individual animals; not included are higher level taxa (class, order, family) unless clearly representing additional individuals; also not included are barnacles; *** Most shells not saved from waterscreened levels; flotation samples give representative frequencies and percentages

Appendix B. Faunal remains from Van Horn Creek shell mound, Test Unit 6, Level 3, Late Archaic component (weights in grams).

Taxon	Waterscreen (1x2x.15m = 300 liters of soil)			Flotation (9 liters of soil)				
	NISP*	MNI**	Weight	NISP*	MNI**	%	Weight	%
Kinosternidae	2	1	0.4					
Terrapene carolina	1	1	1.9					
Trionyx ferox				1	1	0.3	0.4	
Pseudemys floridana	6	1	4.7					
Emydidae	1		0.5					
Lepisosteus spp.	16	2	2.4	6	1	0.3	0.4	
Elops saurus				1	1	0.3	0.1	
Arius felis	10	1	1.6	3	2	0.6	0.3	
Bagre marinus	1	1	0.2					
Ariidae	7	1	2.8	2			0.1	
Caranx hippos	1	1	0.6					
Carangidae	1		0.3					
Archosargus probatocephalus	5	3	1.5					
Sciaenops ocellatus				1	1	0.3	0.3	
Sparidae	2		0.4					
Perciformes	7		4	2	1	0.3	1.1	
Osteichthyes	38		6.5	87			3.6	0.1
Vertebrata	22		1.8	34			1.6	
TOTAL VERTEBRATA	120	12	29.5	137	7	2	7.8	0.2
Balanidae	1		4.7	274			13.6	0.4
Ischadium recurvum	2	1	0.1	629	7	2	26	0.7
Crassostrea virginica	2	1	12.9	frags	82	23.1	3605	97.5
Rangia cuneata				7	5	1.4	27.8	0.7
Bivàlvia	1		0.4	21			9.3	0.2
Oligyra orbiculata				167	162	45.6	6.6	0.2
Nassarius acutus				1	1	0.3	<.1	
Detracia sp.				1	1	0.3	<.1	
Gastrocopta pellucida				2	2	0.6	<.1	
Pupillidae				1	1	0.3	<.1	
Euglandina rosea				1	1	0.3	<.1	
Helicodiscus parallelus				38	38	10.7	0.2	
Glyphyalinia indentate				19	19	5.4	0.1	
Nesovitrea dalliana				2	2	0.6	<.1	
Zonitoides arboreus				2	2	0.6	<.1	
Polygyra cereolus				25	25	7	0.8	
TOTAL INVERTEBRATA***	6	2	18		348	98	3689.6	99.8
TOTALS	126	14	47.5		355	100	3697.3	100

* Minimum number of individual specimens
** Minimum number of individual animals; not included are higher level taxa (class, order, family) unless clearly representing additional individuals; also not included are barnacles
*** Most shells not saved from waterscreened levels; flotation samples give representative frequencies and percentages

Appendix C. Faunal remains from Van Horn Creek shell mound, Test Unit 6, Level 5, Late Archaic component (weights in grams).

Taxon	Waterscreen (1x2x.15m = 300 liters of soil)			Flotation (9 liters of soil)				
	NISP*	MNI**	Weight	NISP*	MNI**	%	Weight	%
Odocoileus virginianus	1	1	1.20					
Kinosternon sp.	1	1	0.44					
Kinosternidae	1		0.26					
Cf. Terrapene Carolina	1	1	0.77					
Lepisosteus spp.	9	1	1.05	16	1	0.7	0.5	
Arius felis	5	3	1.37	5	2	1.4	1.4	
Ariidae				3			0.3	
Bagre marinus	6	1	4.2					
Ariidae	2		0.3					
Archosargus probatocephalus	3	2	0.8	2	1	0.7	<.1	
Micropogonias undulates	2	1	0.3	2	2	1.4	0.5	
Mugil sp.	1	1	0.1	1	1	0.7	<.1	
Perciformes	2	1	1.2					
Osteichthyes	18		1.8	71			1.8	
Vertebrata	22		2.4	47			1.4	
TOTAL VERTEBRATA	74	13	16.1	147	7	4.9	6	0.1
Balanidae	1		0.1	204			6.1	0.1
Ischadium recurvum	3	1	0.8	414	15	10.4	15.6	0.4
Mytilidae				1			<.1	
Crassostrea virginica	2	1	6.9	frags	63	43.8	4180.1	98.3
Rangia cuneata				7	8	4.2	18.6	0.4
Polymesoda caroliniana				4	2	1.4	3.1	0.1
Martesia striata				9	7	4.9	0.1	
Bivalvia				44			23.1	0.5
Oligyra orbiculata				21	18	12.5	0.7	
Pomacea paludosa				1	1	0.7	0.8	
Euglandina rosea	1	1	<.1					
Physella sp.				1	1	0.7	<.1	
Helicodiscus inermis				2	2	1.4	<.1	
Helicodiscus parallelus				11	11	7.7	<.1	
Hawaiia miniscula				1	1	0.7	<.1	
Zonitoides arboreus				7	7	4.7	0.1	
Polygyra cereolus				3	3	2.1	0.1	
TOTAL INVERTEBRATA***	7	3	7.9		137	95.1	4248.3	99.9
TOTALS	81	16	23.99		144	100	4254.3	100

* Minimum number of individual specimens
** Minimum number of individual animals; not included are higher level taxa (class, order, family) unless clearly representing additional individuals; also not included are barnacles
*** Most shells not saved from waterscreened levels; flotation samples give representative frequencies and percentages

Appendix D. Faunal remains from Van Horn Creek shell mound, Test Unit 6, Level 7, Late Archaic component (weights in grams).

TAXON	Waterscreen (1x2x.15m= 300 liters of soil)			Flotation (9 liters of soil)				
	NISP*	MNI**	Weight	NISP*	MNI**	%	Weight	%
Large Mammalia	1	1	3.1					
Chen caerulescens	1	1	0.5					
Alligator mississippiensis	1	1	0.4					
Lepisosteus spp.	19	1	1.3	10	1	0.8	0.1	
Arius felis	3	2	0.9	2	1	0.8	0.2	
Bagre marinus	5	1	0.8					
Ariidae	11	1	1.1	1			0.1	
Archosargus probatocephalus				1	1	0.8	>.1	
Caranx hippos	1	1	19.9					
Cf. Caranx hippos	4		14.7					
Cynoscion nebulosus	1	1	0.4					
Cynoscion sp.	1		0.2					
Sciaenops ocellatus	1	1	0.1					
Sparidae/Sciaenidae	1		0.2					
Mugil spp.	2	2	0.3	1	1	0.8	0.1	
Perciformes	15		10.6					
Osteichthyes	111		7.9	105			1.5	
Vertebrata	136		7.3	50			1	
TOTAL VERTEBRATA	314	13	69.5	170	4	3.3	2.9	0.1
Balanidae				249			2.8	0.1
Ischadium recurvum	3	1	0.7	308	5	4.1	7.7	0.2
Mytilidae	3		0.1	3			0.1	
Crassostrea virginica	20	6	232.7	frags	51	42.5	3365	99.3
Rangia cuneata				1	1	0.8	8	0.2
Martesia striata				1	1	0.8	<.1	
Bivalvia	1		0.3	1			0.3	
Neritina reclivata	1	1	0.3					
Oligyra orbiculata	19	19	0.9	5	5	4.2	0.3	
Busycon contrarium (artifact?)	1	1	134.5					
Hydrobiidae				1	1	0.8	<.1	
Nassarius acutus				1	1	0.8	<.1	
Odostomia impressa				17	17	14.2	0.1	
Gastrocopta pellucida				1	1	0.8	<.1	
Helicodiscus intermis				4	4	3.3	<.1	
Helicodiscus parallelus				6	6	5	<.1	
Euconulus chersinus				1	1	0.8	<.1	
Glyphyalina indentata				5	5	4.2	<.1	
Glyphyalina spp.				2	2	1.7	<.1	
Hawaiia miniscula				11	11	9.2	<.1	
Zonitoides arboreus				3	3	2.5	<.1	
Euglandina rosea	1	1	0.3					
Polygyra cereolus	10	4	0.2	1	1	0.8	<.1	
Mollusca	2		0.1					
TOTAL INVERTEBRATA***	61	33	370.1	116	96	96	3384.3	99.9
TOTALS	375	46	439.5		120	100	3387.2	100

* Minimum number of individual specimens

** Minimum number of individual animals; not included are higher level taxa (class, order, family) unless clearly representing additional individuals; also not included are barnacles

*** Most shells not saved from waterscreened levels; flotation samples give representative frequencies and percentages

Appendix E. Faunal remains from Van Horn Creek shell mound,Test Unit 6, Level 9 (Preceramic?) Late Archaic component (flotation sample only, 9 liters of soil, below water table; weights in grams).

TAXON	NISP*	MNI**	%	Weight	%
Tetrapoda	2	1	0.4	0.2	
Lepisosteus spp.	27	1	0.4	0.4	
Arius felis	3	2	0.8	2.4	
Bagre marinus	2	1	0.4	0.2	
Ariidae	1			0.4	
Archosargus probatocephalus	8	1	0.4	1.5	
Pogonias cromis	1	1	0.4	0.1	
Sparidae/Sciaenidae	1			<.1	
Osteichthyes	349			4.4	0.1
Vertebrata	477			5.2	0.1
TOTAL VERTEBRATA	871	7	2.7	14.8	0.3
Balanidae	23			0.2	
Ischadium recurvum	16	1	0.4	0.4	
Crassostrea virginica	frags	51	20	2510	52
Rangia cuneata	264	137	53	1770	36
Polymesoda caroliniana	25	11	4.3	29.6	0.6
Mercenaria sp.	1	1	0.4	8.5	0.2
Bivalvia	frags			540	11
Neritina reclivata	1	1	0.4	<.1	
Oligyra orbiculata	19	14	5.4	0.3	
Odostomia impresssa	4	4	1.6	<.1	
Helicodiscus inermis	3	3	1.2	<.1	
Helicodiscus parallelus	5	5	1.9	<.1	
Glyphyalinia indentata	2	2	0.8	<.1	
Hawaiia minuscula	9	9	3.5	<.1	
Zonitoides arboreus	4	4	1.6	<.1	
Polygyra cereolus	14	8	3.1	0.2	
TOTAL INVERTEBRATA***		251	97	4859	100
TOTALS		258	100	4874	100

* Minimum number of individual specimens

** Minimum number of individual animals; not included are higher level taxa (class, order, family) unless clearly representing additional individuals; also not included are barnacles

*** Most shells not saved from waterscreened levels; flotation samples give representative frequencies and percentages

Appendix F. Faunal remains from Sam's Cutoff shell mound, Test Unit 1 (no flotation sample taken from Level 1; weights in grams).

	Level 1			Level 2								Level 3							
	Waterscreen (1x1x.15m			Waterscreen (1x1x.15m			Flotation (9 liters of soil)					Waterscreen (1x1x.15m			Flotation (9 liters of soil)				
TAXON	NISP*	MNI**	Wt.	NISP*	MNI**	Wt.	NISP	MNI**	%	Wt.	%	NISP	MNI**	Wt.	NIS	MNI**	%	Wt.	%
Rodentia							1	1	0.8	<.1									
Tetrapoda							7			0.2									
Serpentes												1	1	0.1					
Lepisosteus spp.				9	2	2.08	8	1	0.8	0.5		5	1	0.5	8	1	0.6	0.2	
Aridae															1	1	0.6	0.1	
Arius Felis												1	1	0.1					
Bagre marinus				1	1	0.71													
Archosargus							1	1	0.8	<.1									
Micropogonias undulatus															2	2	1.2	0.5	
Perciformes															1	1	0.6	0.9	
Vertebrata															24			0.7	
TOTAL VERTEBRATA				10	3	2.79	17	3	2.4	0.7		7	3	0.7	36	5	3.1	2.4	0.1
Balanidae	1		<.1				7			0.2					22			1.6	0.1
Ischadium recurvum	1	1	<.1	2	1	0.01	258	5	4	4.6	0.2	7	2	0.7	425	1	0.6	9.3	0.3
Mytilidae	2		<.1																
Crassostrea virginica	8	8	370.7	16	11	528.60	frags	68	54.8	2415	99.7	12	8	403.4	frag	95	57.9	3240	99.4
Rangia cuneata	1	1	4.6	1	1	5.97						6	5	76.4					
Polymesoda caroliniana												1	1	3.7	2	1	0.6	4.2	0.1
Pholadidae															1			<.1	
Martesia striata							2	1	0.8	<.1					1	1	0.6	<.1	
Bivalvia							2			1					2			2.5	0.1
Neritina reclivata				1	1	0.33													
Oligyra orbiculata				3	3	0.12	5	3	2.4	0.2					7	6	3.7	0.2	
Columbellidae															1	1	0.6	<.1	
Odostomia impressa							1	1	0.8	<.1					1	1	0.6	<.1	
Detracia floridana															1	1	0.6	<.1	
Melampus bidentatus							1	1	0.8	0.1					1	1	0.6	0.1	
Gastrocopta pellucida															2	2	1.2	<.1	
Helicodiscus parallelus							18	18	14.5	0.1					14	14	8.5	0.1	
Glyphyalinia spp.															2	2	1.2	<.1	
Hawaiia minuscula							9	9	7.3	<.1					15	15	9.2	<.1	
Nesovitrea dalliana															2	2	1.2	<.1	
Striatura meridionalis															1	1	0.6	<.1	
Polygyra cereolus				8	8	0.3	24	15	12.1	0.6					24	15	9.2	<.1	
Mollusca				1		0.15													
TOTAL INVERTEBRATA***	13	10	375.4	32	25	535.48		121	97.6	2421.8	99.9	26	16	484.2		159	96.9	3258.6	99.9
TOTALS	13	10	375.4	42	28	538.27		124	100	2422.6	100	33	19	484.9		164	100	3261	100

* Minimum number of individual specimens
** Minimum number of individual animals; not included are higher level taxa (class, order, family) unless clearly representing additional individuals; also not included are barnacles
*** Most shells not saved from waterscreened levels; flotation samples give representative frequencies and percentages

Appendix G. Faunal remains from Sam's Cutoff shell mound Test Unit 3 (no flotation sample taken from Level 1; weights in grams).

	Level 1			Level 2								Level 3							
	Waterscreen (1x1x.15m			Waterscreen			Flotation (9 liters of soil)					Waterscreen (1x1x.15m			Flotation (9 liters of soil)				
TAXON	NISP	MNI**	Wt.	NISP*	MNI**	Wt.	NISP	MNI**	%	Wt.	%	NISP	MNI**	Wt.	NISP	MNI**	%	Wt.	%
Odocoileus virginianus				1	1	0.3													
Kinosternon sp.				1	1	0.4													
Kinosternidae				2		0.4													
Testudines				2		0.6									1	1	0.4	0.1	
Lepisosteus spp.				10	1	0.6									11	1	0.4	0.3	
Aridae				4	3	1.9									1			0.1	
Arius felis							1	1	2	0.1		1	1	0.2	1	1	0.4	0.1	
Bagre marinus				8	1	3.4						2	1	1.1	2	1	0.4	0.2	
Archosargus																			
Micropogonias undulatus																			
Perciformes				3	1	0.8									2	1	0.4	0.4	
Osteichthyes				1		0.1									18			0.6	
Vertebrata				6		0.3									16			0.6	
TOTAL VERTEBRATA				38	8	8.6	1	1	2	0.1		3	2	1.3	52	5	2.1	2.2	
Balanidae				2		0.6	3			<.1					41			4	0.1
Ischadium recurvum	1	1	<.1	2	1	0.2	64	1	2	0.9	0.1	1	1	0.2	436	2	0.8	14.8	0.3
Mytilidae							8			0.1									
Crassostrea virginica	15	9	367.5	96	18	729.1	frags	35	68.6	895	99.7	7	5	158.8	frags	132	55.1	4710	99.3
Rangia cuneata	1	1	6.9	3	3	20.8						3	3	33.3	1	1	0.4	8.2	0.2
Polymesoda caroliniana				2	2	6.3													
Martesia striata							3	2	3.9	<.1									
Bivalvia	11		5.6	4		1.6	frags			1.2	0.1								
Neritina reclivata				3	3	2.4									3	3	1.2	1.3	
Oligyra orbiculata				3	3	0.2	3	1	2	<.1					15	13	5.4	0.6	
Nassarius acutus				1	1	0.1													
Odostomia impressa															5	5	2.1	<.1	
Melampus bidentatus				1	1	0.1	1	1	2	<.1					1	1	0.4	<.1	
Ellobiidae															1	1	0.4	<.1	
Physella sp.															1	1	0.4	<.1	
Gastrocopta pellucida															1	1	0.4	<.1	
Helicodiscus parallelus							5	5	9.8	0.1					21	21	8.6	0.1	
Hawaiia minuscula															29	29	11.9	0.1	
Nesovitrea dalliana															1	1	0.4	<.1	
Polygyra cereolus				10	10	0.3	10	5	9.8	0.1		2	2	0.1	38	25	10.3	1	
Mollusca				1		0.2										238	97.9	4740.1	99.9
TOTAL INVERTEBRATA***	28	11	380	128	42	761.9		50	98	897.6	99.9	13	11	192.4		243	100	4742.3	100
TOTALS	28	11	380	166	50	770.5		51	100	897.7	100	16	13	193.7					

* Minimum number of individual specimens
** Minimum number of individual animals; not included are higher level taxa (class, order, family) unless clearly representing additional individuals; also not included are barnacles
*** Most shells not saved from waterscreened levels; flotation samples give representative frequencies and percentages

Appendix H. Faunal remains from Sam's Cutoff shell mound, TU5, NE and SE 1 x 1 m squares (no flotation sample taken from Levels 3 and 4; weights in grams).

	Level 1								Level 2								Level 3			Level 4		
	Waterscreen(1x2x.15			Flotation (9 liters of soil)					Waterscreen(1x2x.15			Flotation (9 liters of soil)					Waterscreen (1x2x.15m			Waterscreen		
TAXON	NISP*	MNI**	Wt.	NIS	MNI**	%	Wt.	%	NIS	MNI**	Wt.	NIS	MNI*	%	Wt.	%	NISP*	MNI**	Wt.	NIS	MNI**	Wt.
Sylvilagus spp.									3	1	1.1											
Rodentia									1	1	0.1											
Procyon lotor	1	1	0.2						1	1	0.3	1	1	2	0.1							
Mammalia				1	1	17	<.1		4		2.7											
Kinosternidae									4	1	0.6											
Emydidae									1	1	0.3											
Testudines									10		2.2						1	1	0.3			
Tetrapoda												1			<.1		1		<.1			
Colubridae									1	1	0.1											
Serpentes									3	1	1.3						1	1	0.1			
Alligator mississippiensis									5	1	25.8						5	1	4.3			
Lepisosteus cf. oculatus									2	2	1											
Lepisosteus spp.	1	1	*0.1*	4	1	17	<.1	*0.1*	138		19.2	25	1	2.2	0.9	0.1	116	1	10.7			
Arius felis									10	2	1.9						5	1	0.9			
Ariidae									8	3	4.1						2		0.4			
Bagre marinus																				1	1	0.1
Caranx hippos									6	1	7.9						6	2	18.2	5	2	7.8
Cf. Caranx hippos									2		4.5						5		18.9			
Caranx sp.									1		0.5						1		0.8			
Cf. Carangidae									1		1.1						9		8.9	4		9
Archosargus probatocephalus				2	1	17	*0.1*	0.1	3	2	1.1	1	1	2.2	0.1		4	1	0.3	1	1	0.1
Cf. Archosargus									1		1											
Micropogonias undulatus																	1	1	0.2			
Sparidae/Scienidae												1			<.1							
Sciaenops ocellatus									2	1	0.3											
Perciformes	1	1	0.3						12		11.1						17		19.5	4		7.4
Osteichthyes									60		7.1	3			0.1		39		6.2	4		1.3
Pristis sp.																	1	1	<.1			
Vertebrata				9			0.1	0.1	108		15.2	23			0.5		91		7.1	7		2.3
TOTAL VERTEBRATA	3	3	0.6	16	3	50	0.2	0.3	387	19	110.4	55	3	6.7	1.6	0.1	305	10	96.8	26	4	28

Appendix H, continued.

	Waterscreen(1x2x.15			Flotation (9 liters of soil)					Waterscreen(1x2x.15			Flotation (9 liters of soil)					Waterscreen (1x2x.15m			Waterscreen		
TAXON	NISP*	MNI**	Wt.	NIS	MNI**	%	Wt.	%	NIS	MNI**	Wt.	NIS	MNI*	%	Wt.	%	NISP*	MNI**	Wt.	NISP*	MNI**	Wt.
Balanidae												9			0.1		1		1.8			
Ischadium recurvum									1	1	0.1	3	1	2.2	<.1					1	1	0.2
Crassostrea virginica	3	2	108.3	frags	3	50	55.3	99.7	50	19	726.2	frags	32	71.1	1175	99.8	13	4	40	9	7	242.5
Rangia cuneata																	1	1	12	2	2	38.3
Polymesoda caroliniana																	1	1	6.2			
Macrocallista nimbosa																	1	1	3.8			
Bivalvia																	1		0.2			
Martesia striata												2	2	4.4	<.1							
Neritina reclivata									3	3	2.6						5	5	5.4	1	1	0.4
Helicodiscus parallelus												2	2	4.4	<.1							
Hawaiia miniscula												2	2	4.4	<.1							
Oligyra orbiculata									1	1	0.1						2	2	0.1			
Busycon contrarium									1	1	8.8						1	1	46.8			
Melampus bidentatus									1	1	0.1						3	2	0.1			
Euglandina rosea									1	1	0.2											
Polygyra cereolus									16	15	0.5	3	3	6.7	<.1		20	17	0.5			
Gastropoda									1		1.1											
Mollusca									1		1.2						2		<.1			
TOTAL INVERTEBRATA***	3	2	108.3		3	50	55.3	99.7	76	42	740.8		42	100	1175.1	99.8	51	34	117	13	11	281.4
TOTALS	6	5	108.9		6	100	55.4	100	463	61	851.2		45	100	1176.7	100	356	44	214	39	15	309.35

* Minimum number of individual specimens
** Minimum number of individual animals; not included are higher level taxa (class, order, family) unless clearly representing additional individuals; also not included are barnacles
*** Most shells not saved from waterscreened levels; flotation samples give representative frequencies and percentages