

Tar Kilns of Goose Creek State Park: History and Preservation

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Tar kilns are found throughout the Coastal Plain of North and South Carolina, remnants of a flourishing and important industry that exported tar across the Atlantic world. Tar production is the extraction of terpene from resinous trees by burning. In North Carolina, this was accomplished by burning or heavily resinous longleaf pine, also known as lightwood, in earthen kilns. The colonists encountered a unique forest suited to this purpose. This thesis explores the background of tar production in North Carolina through the context of the ecology of the longleaf forest, describes kiln preservation criteria, and makes the case that the kilns found in Goose Creek State Park form an important historical site as the vestiges of the plantation of Thomas Boyd, member of the Proprietor administration and Solicitor-General of the colony.

Tar Kilns of Goose Creek State Park: History and Preservation

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by

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Figures

Figure 1: Savannah, Ga. (Source: Toronto Library)	7
Figure 2: Longleaf forest (Source:USDA).....	10
Figure 3- Massive Kiln in South Carolina (Source: S.C. Forestry Commission)	21
Figure 4- North Kiln, Goose Creek State Park (Source:Harrup)	22
Figure 5 - North Kiln, Goose Creek State Park (Source: Harrup)	23
Figure 6: John Lawson's Map (Source: UNC).....	33
Figure 7: Sauthier's map of Bath, (Source:University of North Carolina State Archives).....	44
Figure 8: Sauthier's map of Edenton(Source:NC Archives).....	45
Figure 9: Sauthier's map of New Bern. (Source:NC Archives).....	46
Figure 10: Sauthier's map of Beaufort. (Source:NC Archives).....	47
Figure 11: Sauthier's map of Wilmington (Source:NC Archives).....	48
Figure 12: Sauthier's map of Cross Creek (Fayetteville). (Source:NC Archives).	49
Figure 13: Sauthier's map of Halifax.(Source:NC Archives).	50
Figure 14: Sauthier's map of Hillsborough.(Source:NC Archives).....	51
Figure 15: Sauthier's map of Brunswick	52
Figure 16: Edward Moseley's map (Source: ECU Special Collections).....	56
Figure 17: Carolina Tar Kiln (Source: Hardison and Snedeker).....	74
Figure 18: Schematic Drawing of Tar Kiln Elements (Source: Hardison and Snedeker).....	80
Figure 19: Boyd's land on Moseley Map (Source: East Carolina University Special Collections)	84
Figure 20: Map of Goose Creek State Park (Source: North Carolina State Parks).....	85
Figure 21: Boyd Plantation after 1774 survey (Source: Hargrave).....	86
Figure 22- Terrestrial Laser capture of North Tar Kiln (Source:Harrup)	88
Figure 23-Digital Elevation Model of North Tar Kiln (Source:Harrup).....	89
Figure 24- DEM of North Tar Kiln (Source:Harrup).....	90
Figure 25 (Source:Harrup).....	91

Table of Contents

Title.....	i
Copyright.....	ii
Signature.....	iii
Acknowledgments.....	v
Figures.....	vi
Introduction.....	1
Chapter One: The Longleaf Forest.....	9
Chapter Two: Early Descriptions.....	12
Chapter Three: Native Americans, Fire, and the Longleaf.....	26
Chapter Four: Fate of the Longleaf Savanna.....	31
Chapter Five: Foundation of the Tar Industry.....	35
Chapter Six: Edward Moseley.....	57
Chapter Seven: Inherited Lightwood.....	62
Chapter Eight: Regulations.....	64
Chapter Nine: Construction.....	76
Chapter Ten: Carolina Kilns of Goose Creek.....	85
Chapter Eleven: National Register Criteria.....	90
Conclusion.....	92
Works Cited.....	100

Introduction

Four and a half miles west of Bath, North Carolina, along the north shore of the Tar-Pamlico River and behind a ribbon of sand long known as Ragged Point, lie the remains of a dozen or more tar kilns. Humble raised earthen mounds, kilns are scattered throughout the forests and farms of Eastern North Carolina, simple epitaphs for an industry that once sustained the colony. The kilns behind Ragged Point are within the boundaries of Goose Creek State Park, likely one of the most important and oldest sites of tar production in North Carolina.

The kilns at Goose Creek represent the vestiges of this industry, which provided so much to Eastern North Carolina. Carolina kilns¹ have been overlooked by historians and archeologists for several reasons. Tar production doesn't receive the recognition it should as the lifeblood of the early colonists. Kilns are easily overlooked; usually all that can be seen is a raised circular mound in the forest. Carolina kilns aren't glamorous, and yield little in terms of artifacts. But they can shed light on many facets of colonial life, especially commercial activities. Finally, tar production is often discussed as part of naval store production, further obscuring its significance.

Perhaps most importantly, tar kilns are the physical remains of the longleaf savanna. Regardless of the information that may be gleaned from them, we can be sure that if there are tar kilns the longleaf grew nearby. This logic establishes that many maps depicting the extent of the longleaf forest are incorrect, and a more comprehensive idea of kiln locations would be useful.

¹The term "Carolina Kilns" is used in this paper to distinguish from more elaborate, stone-constructed "Swedish" kilns used in Scandinavia. Swedish kilns produced a higher-grade, cleaner tar favored by the Royal Navy.

Covered in virgin longleaf pine forest, colonial eastern North Carolina was the pumping heart of tar production for the British Empire for half a century. From the sixteenth century, Scandinavia and the Baltic region were suppliers of high-quality tar made from Scots pine to the navies and merchants of the Atlantic world, including the English, Dutch, and Spanish. War and shifting loyalties constantly threatened this source. Sweden and Russia manipulated tar prices, making the Royal Navy vulnerable and causing more money to flow out of the British Empire, at odds with English mercantile policy. This policy also sought to advance certain types of manufacturing throughout the empire that did not compete with domestic production, and to that end developed a system of bounties, tariffs and enumerated commodities designed to stimulate production of specific goods in specific places.

Originally intended to spur naval store production in the American northeast, these manipulations failed. The northern colonists had more profitable and desirable options, and their pines were not nearly as productive as the longleaf. Virginia and South Carolina produced their share of naval stores, but they too had more profitable options like tobacco and indigo and never pursued tar production on the scale North Carolina did.

After fifty years of prodding and tweaking the system, the Royal Navy was desperate. They were at the mercy of the Swedes, and Russia wasn't the source of naval stores they had envisioned. In 1705 the English placed a bounty on tar production, originally 10 shillings a barrel, which stayed in place except for a brief lapse and several fluctuations until the Revolution. Because of the War of Spanish Succession, this barely covered shipping costs and the aggressive Tuscarora made Eastern North Carolina colonists reconsider spending long periods in the great forest. By 1720 the war was over, the Tuscarora were no longer a threat, and labor was increasing in the colony. Until the English defeat at the hands of the colonists, the

Carolinas supplied most of the tar to the English, even beyond their needs. By some estimates, 90% of tar produced in the English Empire during this period was from North Carolina. So much tar, pitch and turpentine was manufactured that production was already moving out of the area by the beginning of the nineteenth century, pushing westward and southward. Tar would continue to be produced in the area until the Civil War, but on a far smaller scale.

Tar was once one of the most ubiquitous substances in the maritime world. Extracted from dead pine trees through a slow cooking process, tar was used for thousands of years to protect rigging and cordage and keep hemp from rotting. Pitch, used to waterproof the outside of wooden ships, is simply tar that has been further reduced. A third relative of this process is turpentine, manufactured by distilling the rosin that seeps out of wounds inflicted into live pines.

Dead longleaf pine branches and knots were known to the English as “lightwood,” a term still used today. Areas containing stands of longleaf were designated Lightwood Lands, the dead and live trees considered the only thing of value as the land was usually sandy and barren. Longleaf became known as lightwood because of its use as a torch and fire-starter rather than its weight – it’s heavier than other pines from of its abundance of terpene, the chemical extracted in making tar. Knots and parts of branches where there were heavier concentrations of terpene, such as the “v,” became known as fat lightwood and considered even more valuable.

In colonial North Carolina, and the rest of the south, tar was produced in a most simple fashion. Lightwood was gathered from the forest floor, or dead trees were split, often into small sections a few inches around and several feet long. A kiln was dug, usually on an upland sand ridge, especially if there was a layer of clay beneath the sandy surface that could be packed - this would allow the tar to run and not pick up as much sand. An average kiln was circular, around

twenty feet across, with higher sides and a narrow, shallow trench ringing the kiln. This formed a massive earthen doughnut, opening with a pipe or hollow log that allowed the tar to flow into a smaller hole used as a catch basin, or into a barrel.

The lightwood would then be stacked 10-12 feet high, sometimes forming an inverted cone, and covered with pine needles and turf with an opening at the top to light it. After lighting, care had to be taken to regulate the fire so it didn't burn too fast or slow, and openings would be made into the side of the turf-covered mound to allow oxygen in. The process might take a few days to over a week, depending on the size of the kiln and the construction. A large kiln might produce in excess of 100 barrels (32 gallon) and consume 6 cords of wood- over 32,000 pounds of lightwood.

Lightwood burns slow, hot, and evenly, a quality that made it desirable well into the twentieth century. Sources of lightwood (i.e. heavily resinous stumps, knots and limbs of longleaf pine) were known to locals and highly prized. Moonshiners in the Croatan forest of Carteret County desired the lightwood's ability to maintain a regular and controllable fire and paid for its collection. Farmers used it in particular to scald hogs.² Throughout the South, lightwood's properties were valued over other pine species.³

Tar could be transported to large kettles and set on fire, reducing it by a third or half to produce pitch, easier to transport because of its near-solid state at ambient temperature. Often just as likely it was poured into a hole in the ground near the kiln and burned on site.

² D.R. Hill, interview by author, Newport, NC, May 1, 2012.

³ Rev. J.L. Harrup, interview by author, Kansas City, MO, June 17, 2012.

This crude process was a source of consternation for the English administration and London businessmen who tried unsuccessfully for the entire duration of the colony to regulate tar and pitch production methods. Tar could be produced anywhere there were longleaf pines, and illegal production was rampant. There was no way to keep the colonists off the land, and certainly no way of stopping them from burning dead branches in holes in the ground. Colonists routinely engaged in fraudulent land claims by squatting on unregistered land, using fictitious names to register for Lightwood Land, or burning off the lightwood on legal claims and abandoning the parcel without paying quitrents. They habitually swindled the English who inspected the tar by weight, dropping rocks and sand into the barrels. Inspectors were accused of being accomplices, since they were appointed by magistrates who were tar burners themselves.

The English wanted tar produced by Swedish methods, a time-consuming and laborious process that required years of preparation and elaborate stone kilns but resulted in high-quality, clean tar. What they received was tar full of sand, dirt and water in shoddily-made, leaking barrels, which they bought nonetheless. What they really wanted was Swedish tar, and that was generally the only type the Royal Navy would accept if available. American tar was used for merchant ships and periods of desperation.

The bounty placed on tar created a measure of economic stability. During the colonial period, tar was accepted as currency and a form of debt payment, and its price regulated by the Board of Trade. In addition, colonists knew that naval store production was important to the English Crown, and often appealed to mercantilist policy when requesting land or other benefits. A strange economic model took shape: colonists could apply for land warrants, burn dead tree limbs for payment, and acquire slaves and more land. Impossible to regulate (though the English

tried vigorously), consistently fraudulent and easily done, tar production was completely decentralized.

The preservation of Carolina kilns is relatively new, and without a universal set of guidelines to indicate their importance. As in all preservation activities, there should be some sort of hierarchy. Some characteristics that have been proposed by archeologists and scholars to determine valuation will be discussed at the end of this thesis. The kilns at Goose Creek meet many of these, and the historical record points to the likelihood of it being a site of early production. The majority of preservation activities have been through the voluntary and noble efforts of foresters and farmers who recognize what the kilns represent. Large corporations such as Weyerhaeuser, who own enormous tracts of private land, have begun to engage in forms of research and preservation on their own initiative. Not all Carolina kilns need to be saved, but a way to determine their significance is necessary. This thesis will explore preservation efforts and current criteria for inclusion on the National Register of Historic Places.

It is not possible to separate naval store production from the unique characteristics of the longleaf savanna. The story of how colonists were able to gather lightwood from the forest floor and turn it into currency, food, land and slaves begins with the intricate requirements of the longleaf pine.

Chap 1: The Longleaf Forest

“Ye finest lofty pines I ever saw” – John Bartram, 1765¹

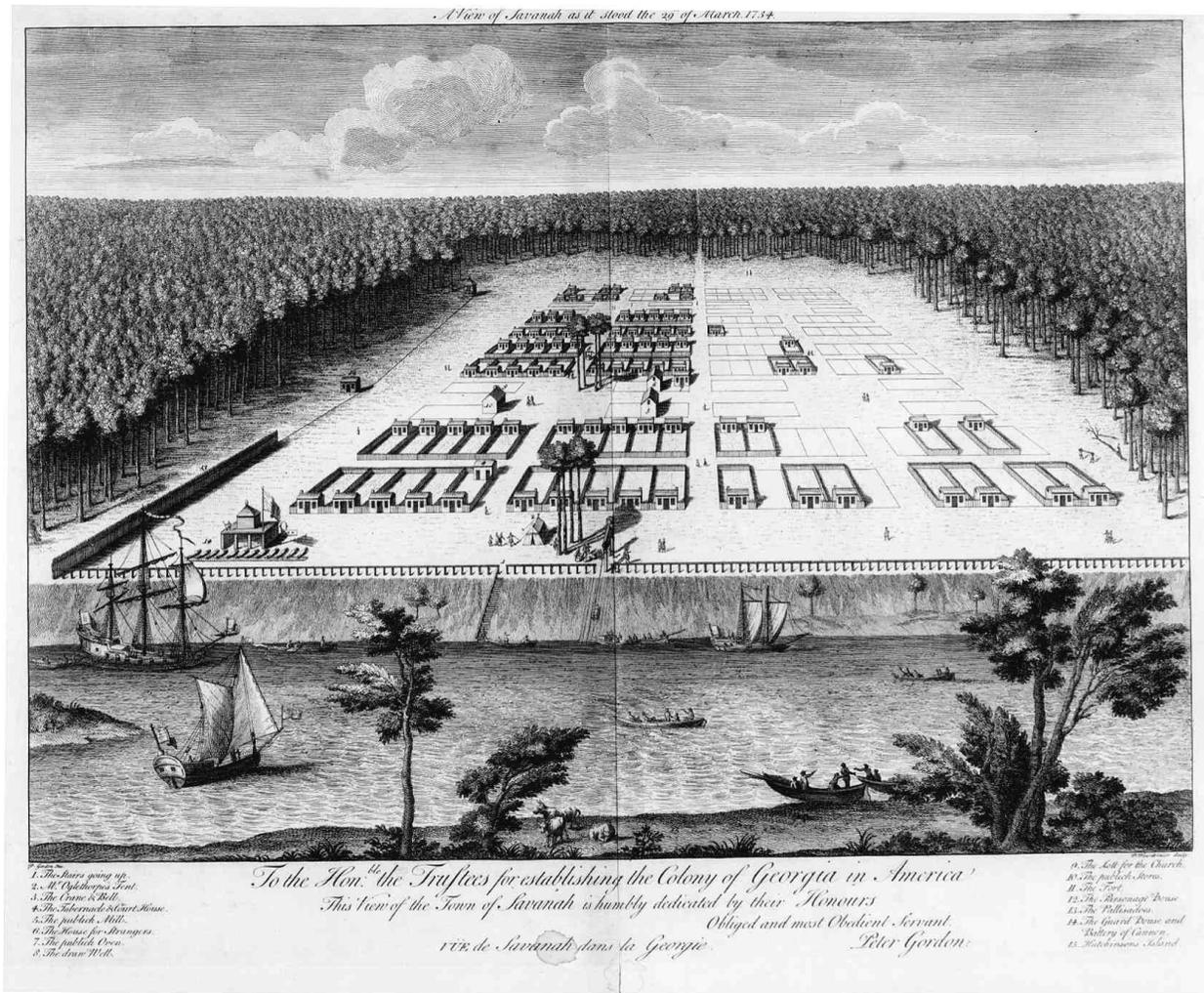


Figure 1: Note the regularity, spacing and form of the longleaves, especially the ones in the front of the town along the wharf, in contrast to the trees in the immediate foreground. (Source: Toronto Library)

¹John Bartram and Francis Harper, "Diary of a Journey through the Carolinas, Georgia and Florida from July 1, 1765 to April 10, 1766," *Transactions of the American Philosophical Society*, No.1 (1766): 17.

Explorers and colonists of the American south encountered a spectacular, majestic and inviting forest. Often described as a savanna, open and park-like, the longleaf forest was different from any forest in the United States today. Beginning in southern Virginia, the forest covered the Coastal Plains and Sandhill regions, stretched past Wilmington, Charleston and Savannah, wrapped around the tip of the Appalachians, and continued along the Gulf Coast before finally giving way to the aridity of east Texas. Most modern estimates place the total acreage of the longleaf forest at 100 million, less than three percent of which remains today.

The forest was noted for its distinct lack of undergrowth, and some colonists claimed they could see deer at a distance of half a mile through the trees. While its form was consistent and regular, leading to its description as a savanna, it contained wide variations in growth. Other pine species and mixed hardwoods grow more easily in wetter areas like pocosins or Carolina bays, and small shifts in geography or more consistent habitation by Native Americans could produce stretches of grasslands. The description of the longleaf forest as a savanna is serviceable, but creates confusion because early explorers and cartographers sometimes referred to areas that contained few trees as savannas.

The exploitation and mechanical removal of the longleaf picked up steam in the early part of the nineteenth century. But the requirements for regeneration were unknown, and it was assumed that it would regenerate as readily as other pines. It was not until the majority of the forest had been decimated in the late nineteenth century that warnings from foresters and governments officials began to sound. The forest wasn't coming back, a devastating realization that would determine the future of the South for decades. Great stretches of land were barren and agriculturally poor, families that had produced naval stores for generations were left without a livelihood, and their land was impoverished. For colonial North Carolinians, however, the

infinite forest was a source of food, industry, and wonder, producing unlimited shingles and lumber, along with tar, pitch and turpentine.

It is useful to visualize the 100 million acre longleaf forest as a garden, for its requirements were exacting and specific. It needed consistent care, mainly in the form of fire. The Native Americans were the keepers of this garden for millennia, and it repaid their care. Native American habits met and shaped the needs of the longleaf, in a remarkable symbiosis that spread across tribal lines and great geographic distances.

The longleaf forest took thousands of years to attain the form encountered by the colonists. While naval store production lasted for over three hundred years, the turpentine boom and the advancing railroads that opened forests for lumbering demolished forever the Native Americans' longleaf garden in less than a century. Although tar production was not the mechanical destructive force that turpentine and logging were, it had its role in removing huge amounts of ground litter from the forest floor. The removal of the Native Americans was even more devastating.



A well-stocked, second-growth longleaf pine stand, 70 years old, on a farm in Tattnall County, Ga. The trees average about 70 feet in height and range up to 15 inches in diameter; they contain a total of about 30,000 board feet per acre of saw timber. The present owner grew up on the farm and remembers the trees when they were saplings about 10 years old. The location is within a few miles of the railroad, and attractive offers have repeatedly been made to the owner for the timber to be used as piling and lumber and for turpentine. Fires have largely been kept out.

Figure 2: Longleaf forest- The caption is misleading; the absence of understory indicates fire activity (Source:USDA)

Francois Andre Michaux, travelling through the Southeast in 1802 and 1806 on an expedition to study the nature of American woodlands (published under the title *North American Sylva*, in 1819) described the longleaf pine forest:

Toward the North the long-leaved pine first makes its appearance near Norfolk, in Virginia, where the pine barrens begin. It seems to be especially assigned to dry, sandy soils and it is found almost without exception in the lower parts of the Carolinas, Georgia and the Florida, over a tract more than six hundred miles long, from northeast to southwest, and more than one hundred miles broad, from the sea toward the mountains of the Carolinas and Georgia. I have ascertained three points, about one hundred miles apart, where it does not grow, the first, eight miles from the River Nuse, in North Carolina, on the road from Louisburg to Raleigh; the second, between Chester and Winesborough in South Carolina; and the third, twelve miles north Augusta in Georgia...but immediately beyond Raleigh it holds almost exclusive possession of the soilWith this exception the long-leaved pine forms the unbroken mass of woods which cover the extensive country.

The mean stature of the long-leaved pine is sixty or seventy feet, with a uniform diameter of fifteen to eighteen inches for two-thirds its height...the bark is somewhat furrowed...the leaves are about a foot long of a beautiful, brilliant green, united to the number of three in the same sheath, and collected in bunches at the extremity of the branches. ¹

Michaux had not travelled the entire length of the forest that began in Virginia, for large parts were not yet open.

One hundred and eighty years earlier, in 1622, John Pory, travelling through eastern Carolina (Gates and Chowan counties), described a “great forest of pynes 15 or 16 myles broad and 60 miles long which will serve for pitch and tarre, when we shall come to extend our plantations to these borders”. Pory was travelling from Virginia, and was riding along the northern edge of a forest that spread below him much farther than sixty miles. But his

¹Andre Francois Michaux, "Pine Trees of the South and Their Products," in Thomas Gamble, ed., *Naval Stores:History, Production, Distrubution and Consumption*, (Savannah: Review Publishing and Printing Co., 1921), 9-16.

observation was astute - the great forest of pines would serve for the production of pitch and tar, already underway in Virginia. In fact, the establishment of Jamestown in 1607 in southeastern Virginia was a peculiar geographic choice, as the James River is often designated as the northernmost border of the longleaf savanna.

Captain John Smith set about making tar soon after his arrival, ultimately giving up because of the lack of longleafs near the settlement, the length of time and amount of labor needed and poor results. He was able to export a few barrels-the beginning of naval store production in the South- and documented his efforts in *First Tryalls of Pitche and Tarre*. The following year, however, a team of eight men was dispatched from England with tar-making skills.²

To the north of their settlement the English found a more familiar environment, the mixed-hardwoods forest with its thicker underbrush and a more seasonal climate. The James River was not the beginning or end of the longleaf's existence, for stands of longleaf pines have been found as far north as the upper waters of the Potomac River.³ The James was where the uniformity came to an end. The forest to the south was something different. The trees were widely spaced, easily wide enough for a horse or cart, and there was relatively no undergrowth, instead the trees growing straight up, eighty to a hundred feet with barely a branch or curve

² Thomas Gamble, "Early History of the Naval Stores Industry in North America" In Gamble, ed., *Naval Stores*, 16-23.

³ Cecil Frost, "Four Centuries of Changing Landscape Patterns in the Longleaf Pine Ecosystems," *Proceedings of the Tall Timber Fire Ecology Conference*, No 18:, *The Longleaf Pine Ecosystem:Ecology, Restoration and Management* (Tallahassee: Tall Timbers Research Station, 1993) 17-42.

before the canopy. It was a two-story, or bi-layer, environment: wiregrass and herb layer below and canopy high above.⁴

The settlements in Virginia and North Carolina were commercial ventures, and the English were looking for easily exploitable resources, like gold or silver, and failing that the colonists were to extract whatever was close at hand. The English were certainly aware of the commercial possibilities of the forest, as Sir Walter Raleigh's first report of exploration included a description of "the great forests of pine species unknown to Europe." His report of the second journey was more specific: "the trees that yielded pitch, tar, rosin, and turpentine in great store."⁵ Thomas Harriot recorded a description of the forest as early as 1587 in his *Brief and True Report of the New Found Land of Virginia*.⁶

Aside from the commercial possibilities, the colonists were acutely aware of two related characteristics of this forest: it was unusually open, and the Indians set fire to it with regularity. The absence of thick underbrush, shrubs, vines, and small trees made travel much easier. Captain Smith reported "neither grow they thicke together by half, and much good ground between them without shrubs."⁷ He recognized that the openness had some relation to the fire setting: "Near their habitations is but little small wood, or old trees on the ground, by reason of

⁴ Alan W. Hodges, "The Naval Stores Industry," in Jose Shibu, Eric J. Jokela, & Deborah L. Miller, eds., *The Long-Leaf Pine Ecosystem: Ecology, Silviculture and Restoration* (New York: Springer Science+Media LLC, 2006), 43-51.

⁵ Jay Ward, "Naval Stores: The Industry," "Yearbook of Agriculture" (Washington, D.C.: USDA, 1949)286-291, <http://naldc.nal.usda.gov/download/IND43895050/PDF> (accessed 12/26/2012).

⁶ Thomas R. Cox, Robert S. Maxwell, Phillip Thomas Drennon, and Joseph J. Malone, *This Well-Wooded Land: Americans and Their Forests from Colonial Times to the Present* (Lincoln: University of Nebraska Press, 1985), 10-39.

⁷ Phillip Bruce, *Economic History of Virginia in the Seventeenth Century; An Inquiry into the Material Condition of the People, Based on Original and Rontemporaneous Records* (New York: P. Smith, 1935), 88.

their burning them for fire. So that a man may gallop a horse amongst these woods any waie, but where the creeks or Rivers shall hinder.”⁸

This vast burning forest was often sensed by earlier explorers of the South before they had even reached land. Verrazzano, off the Carolina coast in 1524, watched Indians purposefully burning the woods and reported that he smelled “the sweet fragrance a hundred leagues away.”⁹ Captains Amadas and Barlowe described approaching the North Carolina’s coast and “a smell so sweet and strong as if we had bene in the midst of some delicate garden abounding with all kinds of odoriferous flowers, by which they were assured that the land could not be farre distance.”¹⁰

Strachey commented that “before we come in sight of it thirty leagues, we smell a sweet savour as is usually off Cape Vincent, the South Cape of Spayne, if the wind come from the shore.”¹¹

Captain DeVries, in his 1630 *Voyages from Holland to America* also reports (modern translation by compiling editor): “This comes from the Indians setting fires at this time of year [December] to the woods and thickets, in order to hunt, and the land is full of sweet smelling herbs as sassafras, which has a sweet smell. When the wind blows out of the north and west, and the smoke too is driven to the sea, it happens that the land is smelt before it is seen.”¹²

The records of the explorers, settlers, and travelers are consistent in their descriptions of the Native Americans regularly firing the woods. Smith’s interrogation of a Native American

⁸ Timothy Silver, *A New Face on the Countryside: Indians, Colonists and Slaves in South Atlantic Forests, 1500-1800* (Cambridge: Cambridge University Press, 1990), 59.

⁹ *Ibid.*

¹⁰ Bruce, *Economic History of Virginia*, 88.

¹¹ *Ibid.*

¹² *Ibid.*

concerning the geography of the unexplored land beyond the Blue Ridge indicates that burning the forest might have been a cultural divide among tribes, for the Native American replied that he knew only the sun lived there, since no inhabitants burned their forests. Smith records the Native American practice of using fire for hunting “Having found the Deer they environ them with many fires and betwixt the fires and their voices the chase them so long within that circle, many time they kill 6, 8, 10 or 15 at hunting.” He reported an “abundance of fire all over the woods” near the Chickahominy River.¹³

George Percy, exploring the Chesapeake Bay in 1607, observed smoke in the woods and upon landing found “the savages had been burning down the grass. William de Brahm warned future settlers of the Native American practices: “The burning of the Grass and Underwoods in the Forests...an ancient custom of the Indians...Persons who are not acquainted with the Nature of burning the Woods in America...might suppose that the trees are liable to be set a burning.”¹⁴The Native American habit of firing the woods and savannah was so well known that it gave John Lawson hope of encountering some inhabitants as his supplies dwindled while travelling through the Carolinas, noting “the Woods newly burnt, and on fire in many places.”¹⁵

William Byrd mentions encountering newly burnt areas or evidence of recent fires on several occasions. In one instance he gives a clue to the Native American relationship to burning the woods: “The Woods are not burnt there every year, as they generally are amongst the Inhabitants. But the Dead leaves and trash of many years are heapt up together, which being at

¹³ *Silver New Face*, 59.

¹⁴ *Ibid.*

¹⁵ *Ibid.*

length kindled by the Indians that happen to pass that way, furnish fuel for a conflagration that carries all before it.”¹⁶

This report is unusual for it describes a “conflagration.” Other reports of fire setting are consistent in their descriptions of slow ground fires that burn the undergrowth and rarely damage the trees. It’s also notable for its description of burning forests away from where they lived, while passing through. It implies a confidence that the fires wouldn’t become raging affairs that would cause harm, but remain limited. Regular burnings reduced available fuel, and the topography of the Coastal Plain generally limited the extent a fire might reach, and the longleaf’s natural fire resistance and high canopy limited the damage as well.¹⁷

The fire-setting produced a hierarchy of effects: Consistent repetitive burning eliminated the understory leaving the forest “park-like.” Hot fires in dry locations killed off seedlings leaving mature trees. When the mature trees eventually died, a grassland or prairie remained. Repetitive fire eventually eliminated the less-fire resistant species, and more tolerant species took over, becoming dominant.¹⁸

While the fire produced a great many of these effects, the longleaf forest’s existence was somewhat more complex. As it evolved in an environment that included low-frequency fires, it acquired characteristics needed for survival. These adaptations include a thicker bark, heavy seeds, a long, early developing taproot and long needles.¹⁹

¹⁶ Silver, *New Face*, 18-19.

¹⁷ *Ibid.*

¹⁸ Michael Williams, *Americans and Their Forests: A Historical Geography* (Cambridge: Cambridge University Press, 1989) 22-49.

¹⁹ Dale Brockway, Kenneth W. Boyer, and William D. Outcalt, "Longleaf Pine Regeneration Ecology and Methods" in Jose Shibu, Jokela, & Miller, *The Longleaf Pine Ecosystem* (New York: Springer Media Services, 2006) 95-127.

The adaptation to fire came with a price tag: difficulty in regenerating itself. Longleafs don't produce a lot of seeds compared to other species. Good seed crops may only appear once every six to eight years.²⁰ But the longleaf's seeds are the heaviest of the southern pines, and over seventy percent fall within 20 meters of the tree.²¹

Longleafs also have trouble with competition, even intraspecies competition. They have difficulty growing near adults because of competition for resources.²² "The greater forest floor thickness, increased root competition and reduced rainfall from crown interception all combine to substantially lower the probability of longleaf pine seedling survival near adult overstory." The survival rate near oaks and hardwoods is even lower because of exponentially increased competition.²³

The surface fires also burn hotter near adult longleafs because of the build-up of needles and litter, and while very young the seedlings are at great risk from the fires. Seedling mortality from fire in the first two years can reach ninety percent. Simply put, the longleaf produces a relatively small amount of heavy seeds that have difficulty travelling outside of the most competitive area. Seeds rarely germinate close to adults and regeneration occurs almost exclusively in canopy gaps. Some studies have shown a "seedling exclusionary zone" of twelve to sixteen meters.²⁴ The result is part of the openness and "park-like" descriptions of the savanna.

²⁰ Jose Shibu, "Introduction," in Jose Shibu, Jokela, & Miller, *The Longleaf Pine Ecosystem* (New York: Springer Media Services, 2006) 1-7.

²¹ Brockway, Boyer, and Outcalt, "Longleaf Pine Regeneration," 95-135.

²² Shibu, "Introduction," 1-7

²³ Brockway, Boyer, and Outcalt, "Longleaf Pine Regeneration," 95-127.

²⁴ *Ibid.*

Seedlings are also susceptible to drought, especially in the Sandhills region where the spring drought can cause fifty percent mortality among new seedlings.²⁵

To germinate, longleaf pine seeds need a seedbed of exposed mineral soil, devoid of surface litter.²⁶ A surface fire can readily accomplish this. “A suitably prepared seedbed can be created by a prescribed fire conducted within 1 year prior to seedfall. Such a fire will remove enough forest litter to double the rate of longleaf pine seedling establishment compared to unburned sites.”²⁷

If the longleaf seed is able to get far enough away and reach a properly prepared, exposed mineral soil, it’s still not out of the woods so to speak. It’s susceptible to fire until it reaches a height of 1 meter and passes through several stages of vulnerability. After germination, the seedling first passes through the grass stage, which may last two to twenty-five years depending on environmental conditions, during which the seedlings devote much of their energy to root production. A typical 1-year old seedling has a taproot sixty to seventy centimeters long and lateral root growth of fifty to sixty centimeters in the upper layer.²⁸

These seedlings have some protection against fire. Although seedlings are susceptible to fire, once they attain a root-collar dimension of 1.3 cm, they become fire-resistant. Such larger grass stage seedlings have thicker bark and a large tuft of needles that protect the central meristem. Additionally, if the longleaf pine seedlings suffer topkill by fire they have the ability to re-sprout.

²⁵ *Ibid.*

²⁶ Shibu, “Introduction,” 1-7.

²⁷ Brockway, Boyer, and Outcalt, “Longleaf Pine Regeneration,” 95-135.

²⁸ *Ibid.*

Once the seedlings reach a root-collar of 2.5 centimeters, they enter into the bolting stage where they are again vulnerable to fire, though for a brief period. Having gathered sufficient starches in the root system, they can grow from thirty to ninety centimeters in one season, ostensibly achieving the fire-safe height.

Brockway and Outcalt list the obstacles to self-regeneration by the longleaf: Not enough seed trees, irregular seed crops, insect infestation of the cone, inadequate seed dispersal distance because of their weight, surface litter above mineral soil, temperature extremes, brown-spot fungus growth, ill-timed fires, and fire exclusion which can favor other species.²⁹

The origins of the longleaf forest can be traced through the paleo-zoologic record and its evolution as pyrophytic vegetation and a subclimax forest. Analysis of lake sediments in Florida show that pine and oak pollen alternated dominance for forty thousand years, and about eight thousand years ago pine pollen became singularly dominant. While arguments have been made that climate change could have caused this shift, Bruce Means notes the coincidence of pine pollen becoming dominant with the extinction of the mega fauna. He traces the beginnings of the forest that the colonists encountered with a description of its inhabitants:

A large vertebrate fauna of at least 212 extant species plus an extinct component of possibly 49 mega fauna mammals, 3 giant tortoises and turtle, and between 9-17 birds evolved with the vegetation of the longleaf pine savannas. Not only did the extinct fauna influence the characteristics and distribution of the Longleaf pine savanna plants in the late Pleistocene, but an even greater effect might have been imposed on these plants the means of ecological release following the demise of the animals.³⁰

Evidence suggests that lightning alone could have caused the evolution of pyrophytic vegetation, and lightning in the coastal plain far outdated the arrival of the Paleo-Indian, but their arrival in the Southeast during the Wisconsin glaciation twelve thousand years ago coincided

²⁹*Ibid.*

³⁰ Hodges, "Naval Stores Industry," 43-51.

with the extinction of the mega fauna and the rise of the dominant longleaf, marking the beginning of the relationship between the Native Americans and the longleaf savannah. Robert Outland, in *Tapping the Pines*, suggests that this may be the precise reason Native Americans began burning the forests. They relied on grazing animals as a source of protein, and burning the undergrowth encouraged grasses and shrubs to grow. Outland notes that this is a common practice in pastoral and farming cultures.³¹

Whether the Paleo-Indian directly influenced the origination of the longleaf forest or the same environmental forces that caused them to appear in the Southeast also caused the extinction of the mega fauna is inconclusive. What is evident is that the forest was dependent on regular fire over millions of acres and this cycle has been perpetrating for thousands of years and heavily influenced by the Native American inhabitants.

The relationship between the longleaf and fire is complex, and the role of the Native Americans significant. Regular fire kept competition at bay, prepared the soil for germination, reduced blight, and kept fuel to a minimum. The characteristic openness of the longleaf forest was a result of both fire and the longleaf's own requirements. And while the Native American's fire-setting habits were crucial, they were timely as well. The longleaf produces seeds in the fall, which are dispersed by the wind in a two to three week period from late November to early December. Many colonists reported the Indians burning the woods during fall hunting season.³²

³¹ Robert J. Outland III, *Tapping the Pines: The Naval Stores Industry in the American South* (Baton Rouge: Louisiana State University Press, 2004), 16.

³² Brockway, Boyer, and Outcalt, "Longleaf Pine Regeneration," 95-135.



Figure 3- Massive Kiln in South Carolina (Source: S.C. Forestry Commission)



Figure 4- North Kiln, Goose Creek State Park (Source:Harrup)



Figure 5 - North Kiln, Goose Creek State Park (Source: Harrup)

Chap 3: Native Americans, Fire, and the Longleaf

How much Native American fire-setting practices influenced the formation of the forest that the Europeans encountered is a subject of debate, as is how much fire was necessary to produce and maintain the forest. Most likely Native Americans complemented the effects of lightning on large open areas by burning smaller, topographically irregular areas. Cecil Frost acknowledges studies suggesting that longleaf lands experienced fire from lightning at an average of every two to three years over millions of acres. In the Pamlico terrace, and other terraces, there were numerous tracts of land from several hundred to over a thousand square kilometers in size without a natural firebreak. Twentieth-century fire watching produced reports of ninety-nine wildfires ignited in a single day in Florida, all by lightning, and according to Frost one ignition could burn a thousand square kilometers in the Pamlico terrace.¹

Geographic variations played a role in the influence of Native American fires. The Outer Coastal Plain experiences regular summer fires, so much of the fuel would have been already eliminated, lessening the direct effectiveness on the longleaf. On upland areas with natural firebreaks or peninsulas, the fires would have been more necessary. In the Piedmont and other inland areas, Native American fire setting may have served areas missed by lightning fires, creating more collective fire coverage.²

Timothy Silver's *A New Face on the Countryside* gives a slightly different description. He suggests that lightning-set fires were accompanied by rain or drizzle, and kept the forest floor damp, keeping conflagrations to a minimum. He also describes slow-burning and creeping fires,

¹ Cecil Frost, "History and Future of the Longleaf Pine Ecosystem" in Shibu, Jokela, & Miller, *The Longleaf Pine Ecosystem*, 9-43.

² *Ibid.*

though he gives little indication that purposeful burning of the forest by Native Americans created much change, attributing it to lightning.

Instead, he suggests, “under the right conditions, pine or mixed pine-hardwood forests could become quite littered with debris...which Indian women could easily gather and carry to villages....Removing fallen wood created open forest in areas that otherwise would have appeared darker and more foreboding to early colonists.” His premise that the gathering of wood by Indian women somehow made the forest appear friendlier is difficult to accept. It’s likely a misinterpretation of John Smith’s description of Native American practices in *Map of Virginia*: “Neare their habitations is but little small wood or old trees on the ground, by reason of their burning them for fire.”³ Smith was referring to the Native Americans’ proclivity for setting the woods on fire, rather than the gathering of wood by women for fire within the village.

Gathering wood by hand over 100 million acres is implausible at best.

Michael Williams suggests that the Native Americans were a far greater force in the existence of the longleaf:

But, speculation aside, the Indians were a potent, if not crucial ecological factor in the distribution and composition of the forest. Their activities through millennia make the concept of “natural vegetation” a difficult one to uphold. This does not mean that there was no untouched forest, or even fluctuations of climate, but the ideas of the forest as being in some pristine state of equilibrium with nature, awaiting the arrival of the transforming hand of the Europeans, has been all too readily accepted as a comforting generalization and as a benchmark against which to measure all subsequent change.⁴

Outland proposes the same magnitude of influence, and suggests that Native Americans were responsible for most fires in the southeastern forests and lightning was only a secondary source. He calls Stephen J. Pyne the historian of fire in America and relays his statement: “It

³ Silver, *New Face*, 59.

⁴ Williams, *Americans*, 22-49.

was in a large measure owing to the Indian and his Grandfather Fire that the forest primeval had already been widely cleared, converted and otherwise managed.” Outland reiterates that regular burning ensured a form of fire control and that southeastern Indians fired the Coastal Plain sometimes twice a year.⁵

In *Americans and Their Forests*, Williams examines the accounts of colonists and explorers and concludes that while the Native Americans modified the forest and cleared it for cultivation, fire was their most effective tool. “Far from being incapable of modifying his environment, the Indian created it, gradually replacing dense forest with thinner forest, thinner forest with grassland, and changing the composition of the forest.”⁶

Thomas Hansbrough, in *Southern Forests* echoes Williams. He determines that fire-setting was a universal practice among southern Native Americans, a primitive way of managing resources and kept an ecological balance that favored their lifestyle.⁷

The abandonment of these habitual burnings in the early part of the twentieth century would assist in the near-extirpation of the longleaf forest.⁸ Fire was universally viewed as being destructive and the enemy of the foresters. But the habit had taken root in the practices of the colonists, such that North Carolina had a law as early as 1731 requiring the burning of pastures and rangelands every tenth of March. Hansbrough suggests that fire-setting passed from the Native Americans to the colonists, had social and economic roots and became a part of southern culture. Regarding fire-setting as deviant behavior is a fairly recent idea.⁹

⁵ Outland, *Tapping the Pines*, 16.

⁶ Williams, *Americans*, 22-49.

⁷ Thomas Hansbrough, "Human Behavior and Forest Fires," *12th Annual Forestry Symposium: Southern Forests and Southern People* (Baton Rouge: Louisiana State University Press, 1963), 22-36.

⁸ Frost, *Four Centuries*, 17-42.

⁹ Hansbrough, *Human Behavior*, 43.

Fire was symbiotic - the Native Americans used it for their purposes, and the longleaf required it for survival. Williams lists reasons the Native Americans burned the forests: cooking, heating, opening forests for cultivation, providing fertilizer, maintaining and extending grassland for game, promoting fresh grass growth, hunting, encouraging rain, driving off mosquitoes and fleas, and as a means of defense.

Brockway and Outcalt list the benefits of fire to the longleaf forest: maintaining the character of longleaf ecosystems by excluding invasive plants that are ill-adapted to fire, preparing a favorable seedbed, reducing the density of understory vegetation, releasing nutrients for recycling to infertile soil, improving forage for grazing, enhancing wildlife habitat, controlling harmful insects and pathogens, and reducing fuel levels and wildfire hazards.¹⁰

All of this natural and artificial fire-setting over thousands of years produced a forest remarkably uniform in appearance, but much more complex and diverse in make-up. The longleaf is not alone in its fire-adaptations (making its dominance all the more fragile), and various mixed stands occurred throughout the savanna as the topography and climate shifted incrementally. Mixed pyrophytic types were natural stands of shortleaf pine, loblolly pine, post oak, white oak, southern red oak, hickories and various scrub oaks, forming bi-layered communities as well.¹¹ This tree canopy and understory repetition contributed to the overall sense of uniformity.

The bi-layer arrangement of the savanna belies the diversity of life found within the longleaf ecosystem. Robert Peet states that six thousand vascular plant taxa occur on the

¹⁰ Brockway, Boyer, and Outcalt, "Longleaf Pine Regeneration," 95-135.

¹¹ Frost, *Four Centuries*, 17-42.

Southeastern Coastal Plain, nearly one-quarter of all plant species that occur in North America north of Mexico, with 1630 endemic species.

At a within-community scale, longleaf vegetation can be among the most diverse in North America with some examples having 40 or species of higher plants per square meter. But even more impressive is the diversity reflected in the change in composition of longleaf vegetation with subtle changes in environmental conditions, or with geographic distance. This diversity is particularly conspicuous in the floristic richness and endemism of the region...which qualifies as one of the top 25 biodiversity hotspots on the globe...What remains of the original longleaf ecosystem is a small and biased example of what was once one of the extensive and diverse biomes of North America. ¹²

¹² Robert Peet, "Ecology of the Longleaf," in *The Longleaf Pine Ecosystem*, in Shibu, Jokela, & Miller, 51-95.

Chap. 4: Fate of the Longleaf Pine Savanna

“The spectacular failure of the primeval longleaf pine forest to reproduce itself after exploitation is a milestone event in the natural history of the United States.”- Cecil Frost

Just as the appearance and maintenance of this vast and important forest was based on a number of complex factors- the specific environmental requirements of the fire-dependent species plus the cultural fire-producing habits of the earliest residents - its disappearance was a result of human intervention in a set of inter-related events. Frost’s study of the near-extirmination of longleaf pines places the blame on three general factors: the failure of the longleaf to regenerate, the introduction of feral hogs, and elimination of habitat through fire suppression.

In other words, the longleaf pine forest was bled and cut down for naval stores, any attempts by the pine to regenerate seedlings were eaten by hogs, and the essential fire was put out. It should be noted that these are reasons for the longleaf’s inability to survive massive physical removal, rather than for its initial disappearance. Frost’s earlier study of the near-extirmination of the longleaf in Virginia gives a more specific set of events, and is more closely related to the longleaf’s experience in eastern North Carolina. To those factors listed above, he adds the small-scale removal of vegetation all through the colonial era, destruction of mature trees for turpentine, and removal of trees for lumber. Added to this should be the disappearance of the Native American inhabitants, given the longleaf’s dependence on them as agents of fire.

Feral hogs, however, are a much clearer reason for the longleaf's demise. The introduction of hogs began with DeSoto in 1539 and as starter livestock in the English settlements, and was introduced throughout the South and Gulf region as settlement progressed. The ability of hogs to expand their populations is astounding. Hogs can increase from a few starter groups to thousands without any human assistance in the forests and open ranges, and likely reached saturation density (10.3 acres per hog) in lower Virginia and northeastern North Carolina before 1733, in the coastal region of Alabama by 1840 and the interior of Alabama by 1850. Given that the interior region of Alabama was open to settlement in 1821, this indicates that hogs may be able to reach saturation density in less than two decades.¹

Feral hogs can consume incredible quantities of longleaf pine seedlings, attracted to the starches in the root, which has been shown to have comparable nutritional qualities to that of corn. The reports and results of experiments with hogs demonstrate the havoc they can wreak on a landscape. In two experimental growing tracts in Louisiana that had been protected from hogs there were nearly 6500 longleaf saplings per acre after five years, compared to unprotected tracts with only eight longleaf saplings per acre. Other reports indicate an ability to uproot 200-1000 seedlings per day by a single hog. Frost's general description of 10,000 to 40,000 of hogs on the open range in every settled county within the longleaf region (1840-1900) makes the possibility of regeneration under the best conditions seems tenuous.²

While tar production is not singled out as a reason for the inability of the longleaf pine forest to survive these comprehensive events, it may have played a significant role, especially in the early-settled regions of Virginia and the Carolinas, and in particular along navigable routes. The concentration of fuel into the kilns rather than dispersed among the forest would have

¹ Frost, *Four Centuries*, 17-42. Frost, "History and Future," 9-43.

² Frost, "History and Future," 9-43.

changed the nature of the regular slow-burning, creeping fires. Though it prevented the large build-up of debris in those areas, it would have been difficult to burn those areas for insect control or hunting, thereby leaving a buildup of hummus on the forest floor, detrimental to longleaf production.

Some rough math suggests the possible contribution. Outland reports 135,000 barrels of tar being exported from the Carolinas from 1705-1718. An inefficient kiln could produce one barrel per cord of lightwood, so roughly 135,000 cords of lightwood were consumed. A cord of dry pine, much lighter than lightwood, weighs 4,000 pounds, meaning 540,000,000 pounds of lightwood were used in that brief period. Nearly all of the wood was accumulated ground litter or dead trees -fuel for fires in coming years. This would have affected not only the regeneration capability of the longleaf and the ability to set slow-burning fires, but also would have intensified the pressure on the Native American way of life, increasing negative interactions with the colonists, when considering the localized areas of tar production during that period along waterways.

Estimates of what remains of the longleaf forest generally concur that less than 3 percent of the original pre-settlement range of longleaf forest exist. In 1993 Frost estimated closer to two million acres, or 2 percent, with 29 percent of those stands in Florida. Many of the stands were being invaded by loblolly and hardwoods, and the shade produced by these aggressive species had eliminated the lower story. He estimates that less than one percent is being maintained by fire. Furthermore, Frost reports that nearly all longleaf populations have been exterminated from Virginia to and from North Carolina north of the Neuse River, the region where longleaf was first exploited for naval stores. Foresters and conservation agents have

reported longleaf populations in these regions recently, but no fire-maintained tracts of any significance.³

Although the inability of the longleaf forest to regenerate itself may have been a spectacular failure and scientifically correct, this seems misleading. The longleaf pine forest was a garden, needing specific and systematic intervention and care from humans, rather than a mature natural forest. The ability to regenerate itself would have been as difficult a proposition as a home garden remaining in an immaculate state without weeding and the injection of feral swine. The real failure is on the human side.

The earliest Europeans, the explorers, colonists and settlers, discovered an open, easily travelled savanna stretching the length of the entire Southeastern Coastal Plain. Its dominant tree was tall, straight, highly resinous, resistant to fire, rot, and insects, tightly-ringed and almost devoid of branch or curve for eighty feet. Burning the ground litter and deadfalls in a hole dug in the ground produced a valuable commodity.

Hodges reduces naval store production to its ecological core: “Naval stores production is based upon exploiting the terpene chemical defense system of the pine tree.”⁴

³ Frost, *Four Centuries*, 17-42.

⁴ Hodges, “Naval Stores,” 43-51.

Chap 5: Foundation of Tar Industry



Figure 6: John Lawson's Map (Source: UNC)

Tar production, as part of the resin trades, can be divided into three chronological parts: the Classical Era, the Middle Ages to about 1600, and from 1600 to the mid-eighteenth century, when non-vegetal tars began appearing. While the methods of production remained essentially

the same- burning wood to extract the tar- over time the process became simplified. Tar and pitch were initially two products that were produced independently. Pitch was collected from the sap of live trees and distilled, while tar was produced from dead trees. Tar that was produced in the colonies was “total tar, “an “emulsified, viscous substance sold by weight in standard barrels and used, like pitch, to protect hulls and hemp ropes against moisture and rot.”¹

Tar could be further distilled into a thicker substance which also became known as pitch, and the simplicity and cheapness of the product eventually led to its market dominance. For the purposes of this thesis, pitch is defined as the distillate of tar.

This shift in production was stimulated by the Dutch Hanseatic merchants in the mid-seventeenth century. Resin production had been relatively elaborate and small scale, with centers of production in France and the Mediterranean. The Hanseatic merchants encouraged a new method in the Baltic region, with its huge supplies of Scots Pine. This method consisted of killing the pine by scorching its base and allowing it to stand for a few years while the resin drained towards the lower trunk, and then burning the wood in a kiln, which became known as the “Swedish” method of production and produced total-tar.²

Tar production as encouraged by the Hansa merchants was tied to land clearing, and they introduced colonists for that purpose. Dutch merchants wanted the Baltic peasants to shift to an agricultural economy and grow wheat and flax they could export, and shift away from a forest-based economy. As they influenced greater regions of the Baltic, large forests were cleared in

¹ Brad Loewen, "Resinous Paying Materials in the French Atlantic, AD 1500-1800: History, Technology, Substances," *The International Journal of Nautical Archeology* (Blackwell Publishing Ltd, 2005), 238-252.

² *Ibid.*

Prussia, Sweden and Ostrobothnia (Finland), creating an abundance in cheap tar among other commodities.³

England became dependent on this source of cheap tar, and war with Holland exposed its precarious position and became the impetus for the introduction of “Swedish” tar technology into the colonies.⁴

In 1648 the Norrlandska TjSrkompagniet (The Wood Tar Company of North Sweden-The Swedish Tar Company) acquired a monopoly for exporting privileges from the Swedish Crown. Initially called “Peasant Tar,” or named after the district in which it was produced (Lulea Tar or Umea Tar), Swedish tar eventually became known as Stockholm tar and was considered superior to either Finnish or Russian tar. The English Royal Navy favored the Stockholm tar, and even when production began in the colonies continued to prefer it. Colonial tar was generally used on merchant ships.

The English were also concerned with the trade imbalance with the Baltic. Their textile exports to the region could not keep up with the imports of naval stores. This mercantilist policy would come to influence American tar production as well. The Stockholm Tar Company attempted their own mercantilist policy of keeping the quality of the tar high and the production low. During the Great Northern War (1700-1710) Sweden had difficulty exporting tar, the Russians destroyed much of the Finnish producing areas, and these areas became depopulated. The Russians appeared to be an alternative source of cheap tar, but they too capitalized on the

³ *Ibid.*

⁴ *Ibid.*

highly desired product and raised prices.⁵ Finally, during the War of the Spanish Succession Sweden raised the price of tar by 50 percent.⁶

The War of the Spanish Succession fueled a massive naval build-up and England was in the predicament of having achieved naval supremacy, and new colonies across the Atlantic, but not having a reliable source for the products she needed to keep her navy afloat. She was being held hostage by the Swedes who were manipulating prices. The solution seemed straightforward, as the southern colonies were being explored and available resources were categorized.

There was an unending pine forest suitable for making tar, wide open and accessible, with plenty of navigable waterways. It could end English reliance on imported Swedish tar and stimulate the colonial economy. But tar production was intertwined with English mercantilist policy, so no solution could be that straightforward. Exploiting the terpene within the longleaf would be part of an overarching system for controlling the colonies and enforcing English mercantilist policy.

England's concern over commercial activities in the colonies was in relation to the positive outcome in the mother country. England wanted certain products produced in certain places, and attempted to achieve some sort of balance. It was fairly simple in theory: England wanted to export more than it imported, and since its economy did not consist of wood products

⁵ Outland, *Tapping the Pines*, 13-32.

⁶ Mikko Airaksinen, "Tar Production in Colonial North America," *Environment and History*, Vol 2, No.1, Lammi Symposium Issue (February 1996):115-127, <http://www.jstor.org/stable/20723001> (accessed 05 23, 2012).

to a meaningful degree, but was centered on textile production, it was sensitive to competition, especially from New England. Charles II wanted the Virginia colonists to diversify, as her plantations were built “wholly on smoke,” and produce commodities more beneficial to the crown. Duties were lifted on naval stores in Virginia and Maryland between 1664 and 1669, and Palatinate Germans were sent to New York to establish production there-unsuccessfully. Tar and pitch, of the naval stores, were the first commodities to be considered by English mercantile groups.⁷

King James II instructed the Lords of Trade “to inform yourselves what Navall Stores may be furnished from Our plantation, and in what Quantities, and by what methods Our Royall purpose of having our Kingdom supplied with Navall Stores from thence may be practicable and promoted.”

But England wanted naval stores produced in New England to avoid competition with colonial commerce.

The American colonies were a source of trouble. They had a negative trade balance with the Mother Country. And certain of their industries, such as fishing, shipbuilding, and the manufacture of woolens-located largely in New England-competed with industries at home. Because the colonies did not produce and export enough, they could not import all they needed and were compelled to produce for themselves many things they could otherwise have imported from England.⁸

England and Sweden both encountered the realities of terpene ecology and extraction in their desire to manipulate tar production. There were requirements in extracting the tar that both countries failed to realize. Sandy soil grows more resinous trees, thereby making both extraction and kiln construction easier. Flat, navigable waterways make the transportation of the heavy finished product easier. Sweden tried to stimulate greater production in Finland, and found it

⁷ Williams, *Americans*, 28.

⁸ Airaksinen, “Tar Production,” 115-127.

increasing instead in Bothnia. England wanted the northern colonies to produce tar, but instead watched it flourish in the southern regions.⁹

Additionally, the cheap tar being produced by the Swedes made a profit seem unattainable, as Captain Smith noted after his production attempts at Jamestown.

England employed a system of restrictive policies to collect revenue and manipulate production of some commodities, and a system of bounties to stimulate production of others. The Navigation Act of 1660 contained an “enumeration clause.” Enumerated commodities had to be shipped to England (on English ships) first before transportation outside the empire, effectively obstructing their transport to continental Europe. Other colonies were considered part of England, so to circumvent export duties a product could be first shipped to New York or Boston and then exported to England. Initially, forest products were excluded from the list of enumerated commodities. This did not indicate an effort to stimulate their production in the colonies. England still had some domestic lumber production, and did not yet consider its reliance on Swedish naval stores to have reached a level of real vulnerability.¹⁰

The War of the Spanish Succession and higher prices forced the English to change policy. In 1704 a “Report concerning naval stores trade in the colonies” was made with “Considerations humbly offered, why naval stores cannot be brought in great quantity’s from her majesties plantations, unless assistance be given by the government.” This report states that “Planters, proprietors, or trading people will not make it their business to provide such goods, nor bring them in the usual way” unless they can be assured of a profit. It wasn’t a new problem, but there had arisen a sense of urgency:

⁹ Airaksinen, “Tar Production,” 115-127.

¹⁰ Williams, *Americans*, 28. Outland, *Tapping the Pines*, 9-10.

This is verified by what has past in relation to Naval Stores from the plantations, several have offer'd to bring them upon a contract made, or Charter granted or other advantages, but few or none have been brought as other Commodities to be sold at a Comon Markett Tho it was foreseen above 50 Yeares Since; that it would be dangerous to depend entirely upon the Northern Crownes, for Naval Stores, and was then taken into Consideration Now to be supplied from the Plantations, yet few have been brought, tho these parts there is great plenty Timber for building Ships, and also to produce Pitch, Tarr and Rozin, and a Soil capable to afford hempe.¹¹

The report states also that naval stores are too expensive to make in the colonies because of the high cost of labor, cheap Baltic tar, and the high shipping freights. It asks the government to provide some sort of financial incentive, either free of shipping charges or some sort of bonus per ton that would equal the shipping charges. It concludes with a direct appeal to English mercantile policy:

The Naval Stores from the North will always hinder their being brought from the Plantations, as Comodities in the way of Trade, which can only cause a large importation of them for the use of our Navigation in General, hinder the Exportation of our Coyne to the North and prevent the inconveniences that may happen, by our dependence upon these Crownes.¹²

The result was The Naval Stores Act of 1705, which placed a bounty on tar production, and in 1706 naval stores were included as enumerated commodities. The combination of these acts stimulated tar production and dictated its destination.

England's reasons for wanting to promote tar production were therefore complex. Outland suggests that it was a combination of the Scandinavian Tar monopoly, Whiggish mercantilist support, and the threat of developing colonial manufacturing. Airaksinen agrees, and adds that the Naval Stores Act was also an effort to keep the colonies in line. The results were

¹¹ No Author, "Report Concerning Naval Stores Trade in Colonies," *Documenting the American South: Colonial and State Records of North Carolina*. May 19, 1704, <http://docsouth.unc.edu/csr/index.html/document/csr01-0304>, (accessed 01 05, 2013).

¹²*Ibid.*

mixed: England was successful in developing naval store production in the colonies, though not in New England, and she was able to break the Swedish monopoly but still left it powerful.¹³

The bounty on tar was effective, but its effect wasn't felt right away since the War of the Spanish Succession caused inflated shipping rates. Shipping a barrel of tar to England cost Swedish merchants 5 shillings, but Carolinians paid over a pound. To ship from New England was 18 shillings, cheaper than from Carolina but still over three times the rate from Sweden. The bounty began to take effect as the eighteenth century progressed. In 1701 less than one percent of tar imports came from the colonies, by 1714 it was 25 percent, by 1715 it was almost fifty percent, and by 1720, 90 percent of tar was imported from the colonies. From 1714-1726 England imported an average of 61,488 barrels of tar and pitch from the colonies against 12,849 from the Baltic, consequently lowering the price of Baltic tar.¹⁴

The War of the Spanish of Spanish Succession and its end were not the only contributing factors in the delay of the bounty's effectiveness. With tar production centered in eastern North Carolina, the Tuscarora Indian War, which didn't completely end until 1715, would have discouraged many colonists from spending several days isolated in the forests, far from any safe retreat. It's possible that the removal of the Tuscarora had another effect other than the reduced threat of violence. Had they continued their habits of regularly firing the woods, there would have been much less fuel on the ground to burn in the kilns.

Nevertheless, after 1715 tar production flourished dramatically. The tar industry had become the most vital element in the life of North Carolina. Naval store production grew

¹³ Airaksinen, "Tar Production," 115-127.

¹⁴ Outland, *Tapping the Pines*, 11-23.

quickly, and naval stores became the largest export by weight until 1720. From 1705-1718, Carolina exported nearly 135,000 barrels of tar and pitch.¹⁵

The success of the bounty was used as a basis to request subsidies for other commodities as well. John Rutherford, in his petition *The Importance of the Colonies to Great Britain* (1761), wrote

...lest we should happen to labour under the same necessity as in 1703, for pitch, tar, and turpentine, when the government of Sweden absolutely refused to let us have them for our ready money, otherwise than in their bottoms, at their own prices, and in such quantities as they please....This behavior of the Swedish tar company so raised upon us the price of naval stores, as reduced us to the greatest distress, and induced the English Parliament to grant bounties on naval stores imported from our own colonies, which has been the means of lowering the price thereof to less than one third of what we formerly paid the Swedes....The granting a bounty on naval stores has already had its full effect with regard to pitch, tar and turpentine.¹⁶

The bounty on tar production was a success, and England became a net exporter of tar, although it never really changed English preference for Swedish tar. Airaksinen suggests that it was simply a matter of the Royal Navy not wanting to break off from the long-time producers in the Baltic which also supplied iron, timber and hemp. He concludes that the tar bounty was allowed because it served English colonial policy, economic interests, and served woolen manufactures, shipwrights, and other interests. The quality of tar produced in the colonies must be taken into consideration. Complaints about the quality of both tar and shipping barrels remained consistent during the colonial era.

During the colonial period, tar was produced in large quantities in really only one area: North Carolina. Virginia never pursued tar making, despite the efforts of colonial administrators.

¹⁵ *Ibid.*

¹⁶ John Rutherford, "The Importance of the Colonies to Great Britain," in William K. Boyd, *Some Eighteenth Century Tracts Concerning North Carolina* (Spartanburg: The Reprint Company, 1761), 1101-130.

A large part of the reason is certainly the high profits from growing tobacco, and by the time the bounties were in full effect, Virginia had already developed other commerce. Perhaps more importantly, the longleaf only grows in southern Virginia, and a large part of that area is the Great Dismal Swamp. Cecil Frost suggests that nearly one million acres of longleaf may have been lost in the colonial era in Virginia through clearing for agriculture.

South Carolina pursued naval store production and kept up a regular output of tar, but never to the extent of North Carolina. Though she had the environmental pre-requisites - longleaf pine in abundance, navigable waterways, and had slave labor, South Carolina pursued other crops as it had accessible fertile soil and could grow rice in particular.¹⁷

Factors in South Carolina's reluctance to produce tar on a large scale may have been the threat of slave rebellion and the nature of tar production, which required long stays in the vast forest. A 1731 report suggested that too many slaves were being imported, and blamed tar and pitch production. It put the number of inhabitants of South Carolina at 12000 with 9000 blacks, and advises importing more white servants to decrease the risk of rebellion.¹⁸

North Carolina's circumstances dictated that she would become the foremost producer of tar. She had plenty of readily available longleaf, easily navigable inland waterways, by 1715 a reasonably safe environment, and a lack of specie or money. She also had few other options, as there had been no great agricultural developments yet. Tar could be made relatively easily, especially with a few slaves; turning dead wood into currency by burning it in a hole is difficult to pass up.

¹⁷ Gamble, *Early History*, 77-82; Outland, *Tapping the Pines*, 11-23.

¹⁸ Abel Kelby and Joseph Boone, "Petition from inhabitants of Carolina and merchants trading with Carolina concerning military aid for the colony," *Documenting the American South: Colonial and State Records of North Carolina*, 07, 18, 1715, <http://docsouth.unc.edu/index.html/document/csr02-0098#p2-198> (accessed 01 05, 2013).

The English efforts to stimulate the manufacture of naval stores, break the Swedish monopoly, manipulate areas of industry and protect England's interests served to fuel the economy of one small region - eastern North Carolina. While Wilmington was destined to take the lead and become one of the world's largest exporters of naval stores in the antebellum period, eastern North Carolina was the seat of the colonial industry. From 1700 to 1720, most production came from the southern part of the Carolinas.¹⁹ This may have been because of the relatively few inhabitants and fewer slaves in Eastern North Carolina. A 1721 report from the Board of Trade lists the number of tythables in North Carolina as barely over 1600, with one third being black, and that only a little tar and pitch was being manufactured and shipped through New England.²⁰

Naval store production and the exploitation of the longleaf pine quickly became the lifeblood of the early colony. Until the conversion of mobile whiskey stills into turpentine distilleries, tar remained the object of production. Lumbering was taking place, but as an addition to tar production.²¹ But tar was not simply a manufactured product, it was a form of debt payment, and its unique characteristics of having a bounty and a stable price combined to make its production highly desirable - the purpose of English mercantile policy.

While tar was produced in the Albemarle region, the difficulty of exporting goods from that region limited output, as did the irregularity of the existence of lightwood lands because of a greater area of swamps, pocosins, and deeper rivers. The Tar-Pamlico is a shallow, slow moving river ideally suited to flat-bottomed boats that could transport tar to the port at Bath.

¹⁹ Outland, *Tapping the Pines*, 11-23.

²⁰ Board of Trade, "Report by the Board of Trade of Great Britain concerning general conditions in North Carolina," *Documenting the American South: Colonial and State Records of North Carolina*. 09 11, 1721, <http://docsouth.unc.edu/csr/index.html>/ document/csr02-418 (accessed 01 05, 2013).

²¹ Williams, *Americans*, 43-49.

In 1716 the Lords Proprietors established a port at the town of Bath as:

the most proper place in the Province for ships to take in masts, pitch, tar, turpentine and other naval stores for the use of his Majesty's Fleet... We therefore (being desirous to render the Province of Carolina as useful as may be to this his Majesty's Kingdom of Great Britain, and also considering what great Tracts of Land lye contiguous to said Bath Town which may afford great quantities of Naval Stores.²²



Figure 7: Sauthier's map of Bath, which was established on an oldfield- a site previously cleared by Native Americans. Note vegetation difference along water's edge, in contrast to surrounding longleaf. (Source:University of North Carolina State Archives).

²² Lords Proprietors, "Proclamation by the Lords Proprietors of Carolina concerning a seaport at Bath Carolina," *Documenting the American South: Colonial and State Records of North Carolina*. 08 01, 1716, <http://docsouth.unc.edu/csr/index.html/document/csr02-0120#p2-237> (accessed 01 05, 2013).

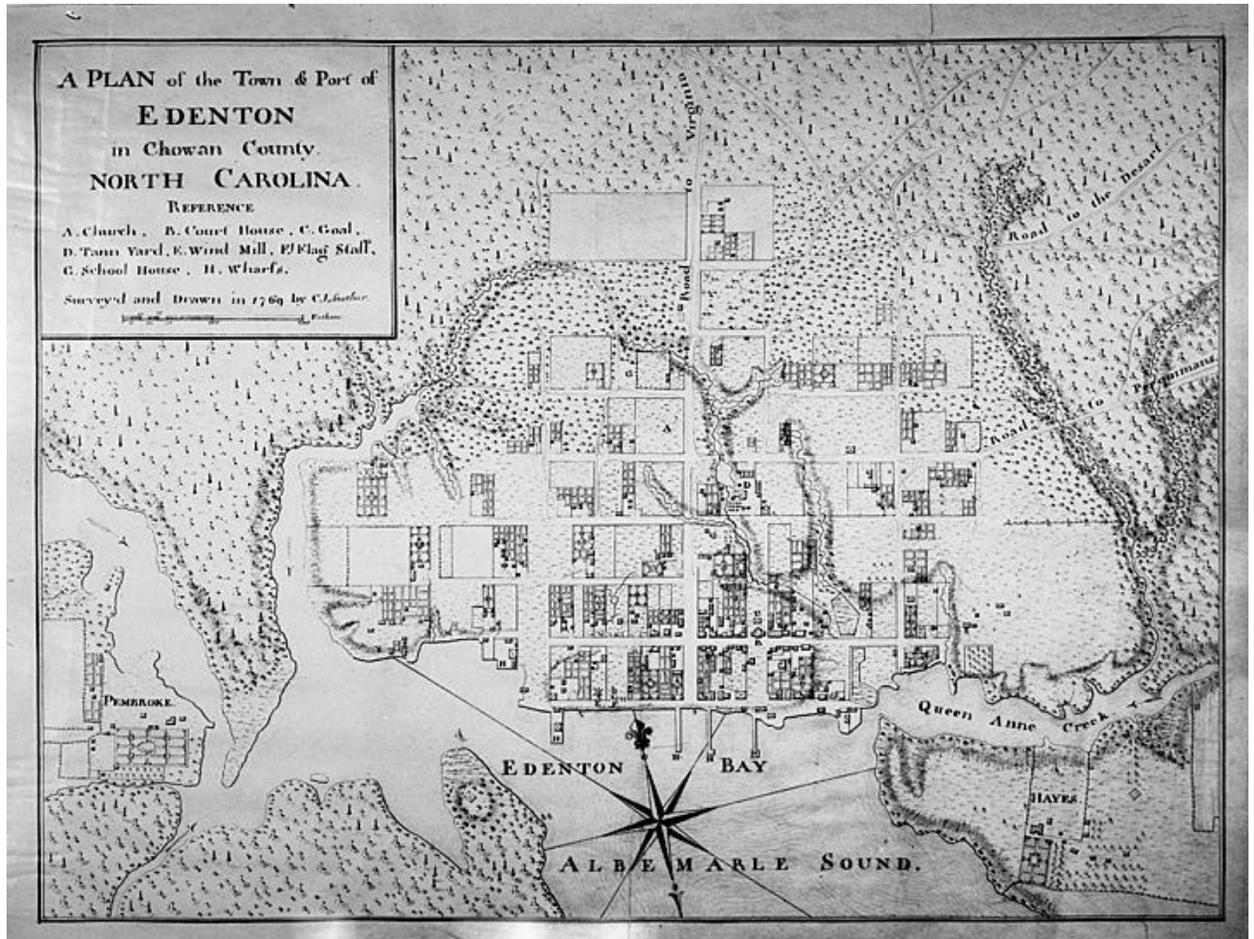


Figure 8: Sauthier's map of Edenton(Source:NC Archives).

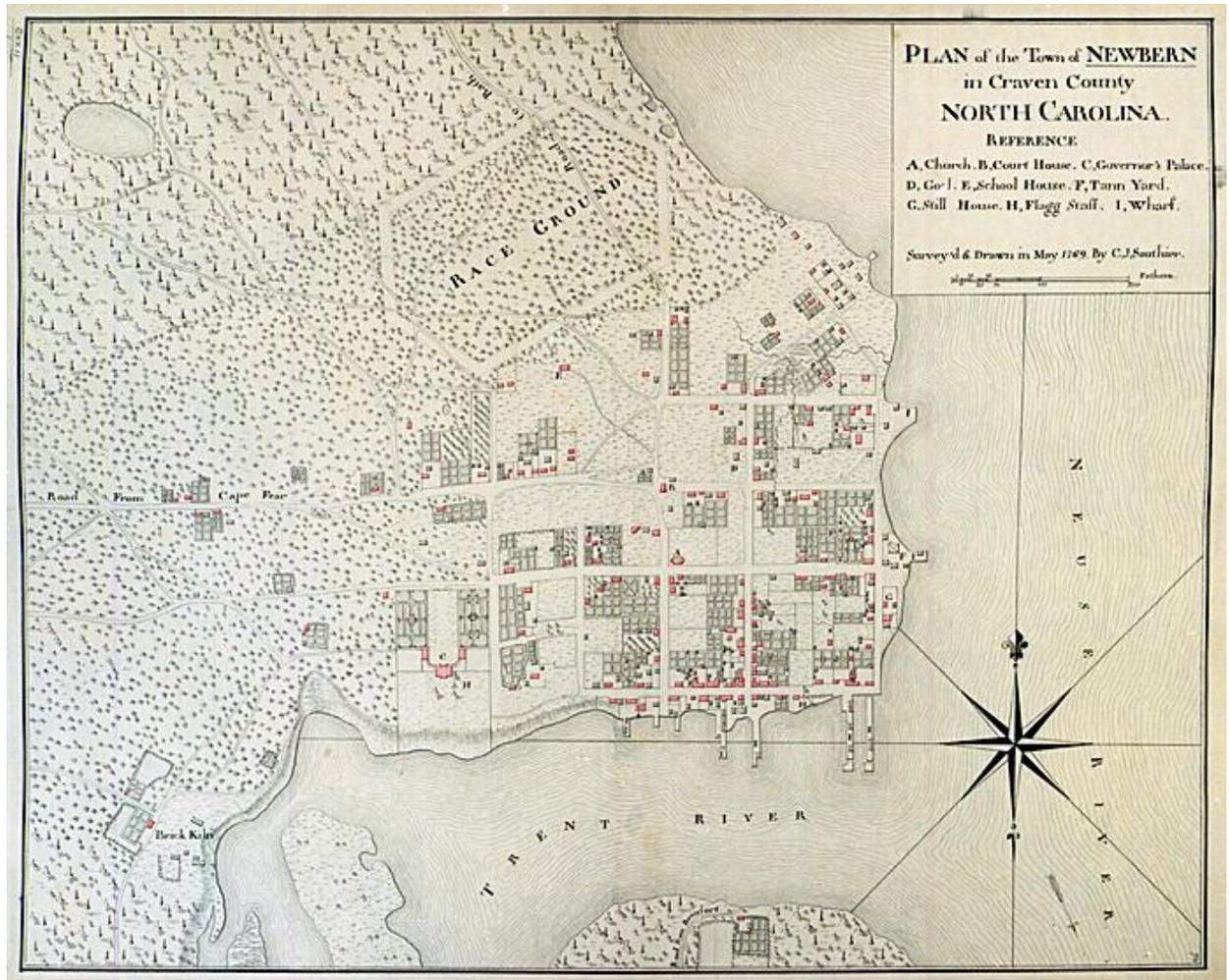


Figure 9: Sauthier's map of New Bern. Boundary of Savanna to the northwest and southwest. (Source:NC Archives).

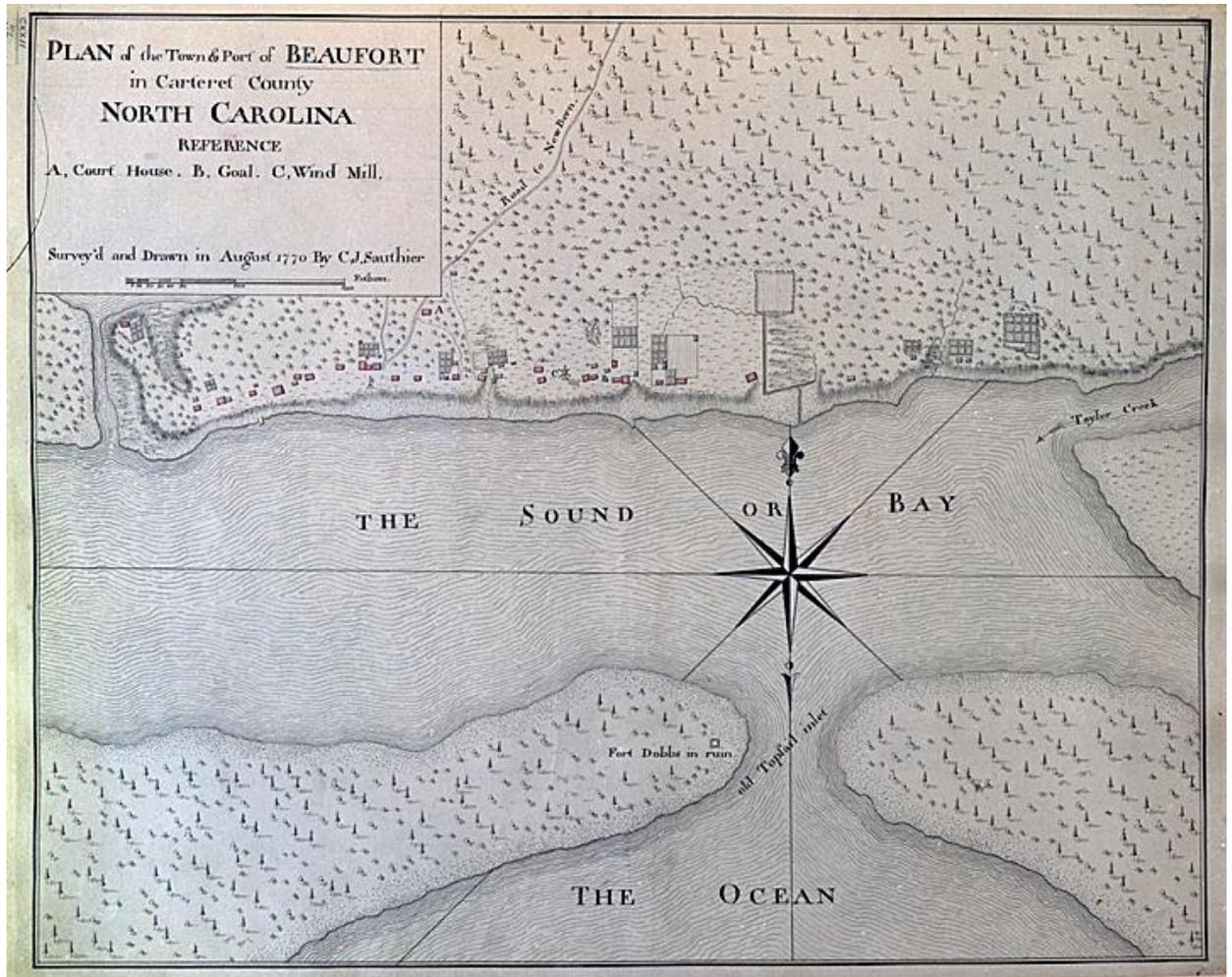


Figure 10: Sauthier's map of Beaufort. (Source:NC Archives).

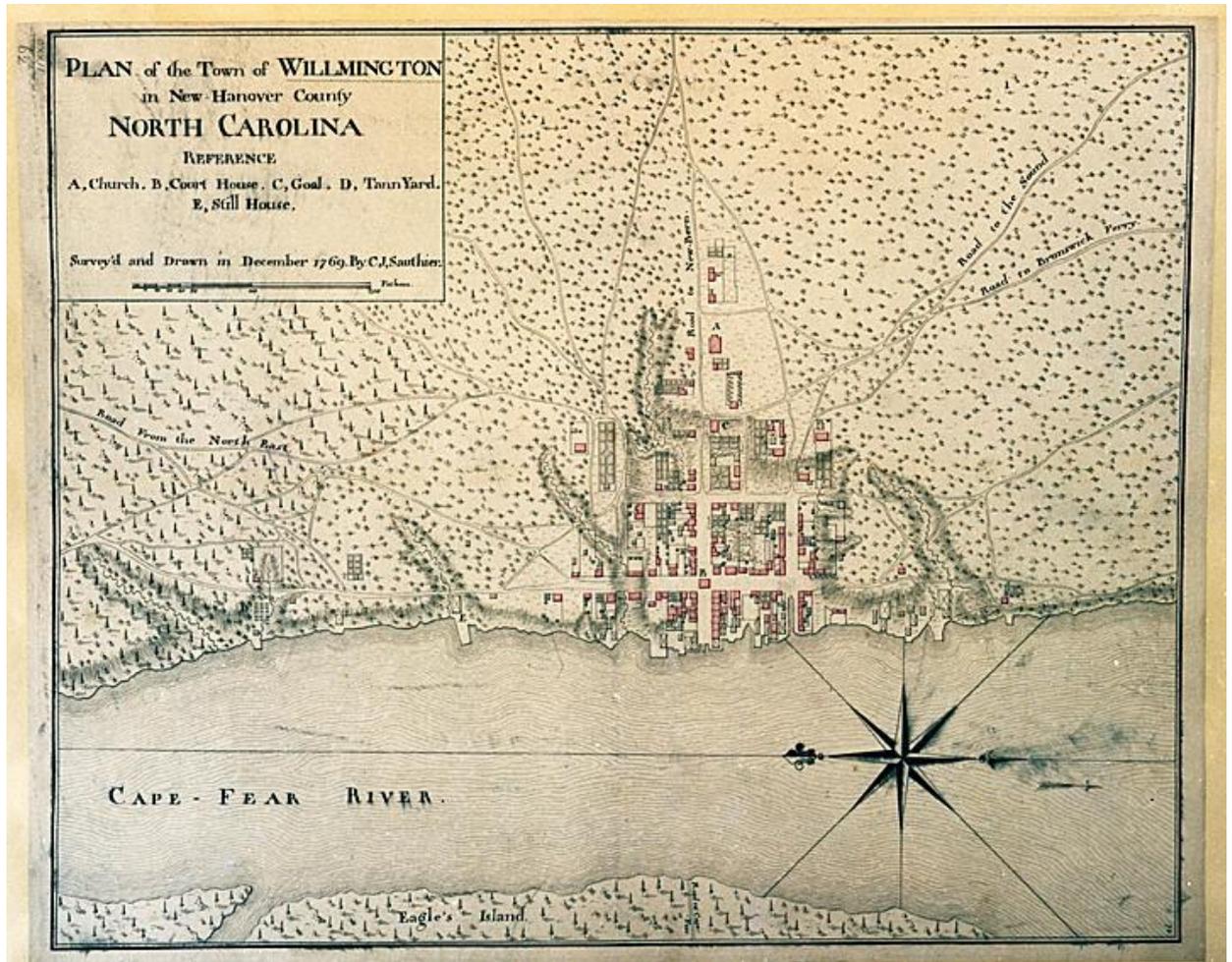


Figure 11: Sauthier's map of Wilmington . The Longleaf appears to have been cut in much of the surrounding areas except to the southwest and on Eagle's Island. (Source:NC Archives).

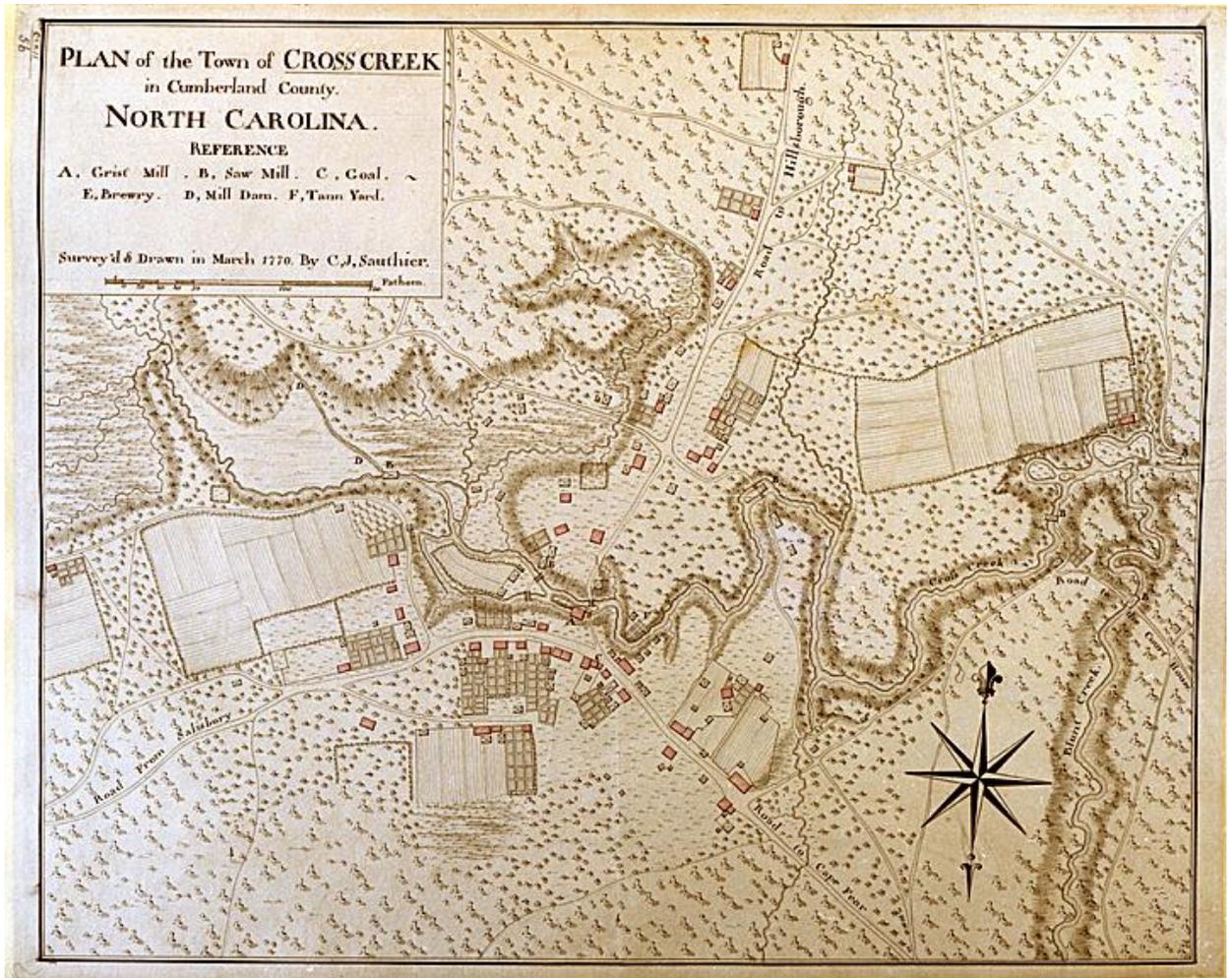


Figure 12: Sauthier's map of Cross Creek (Fayetteville). (Source:NC Archives).

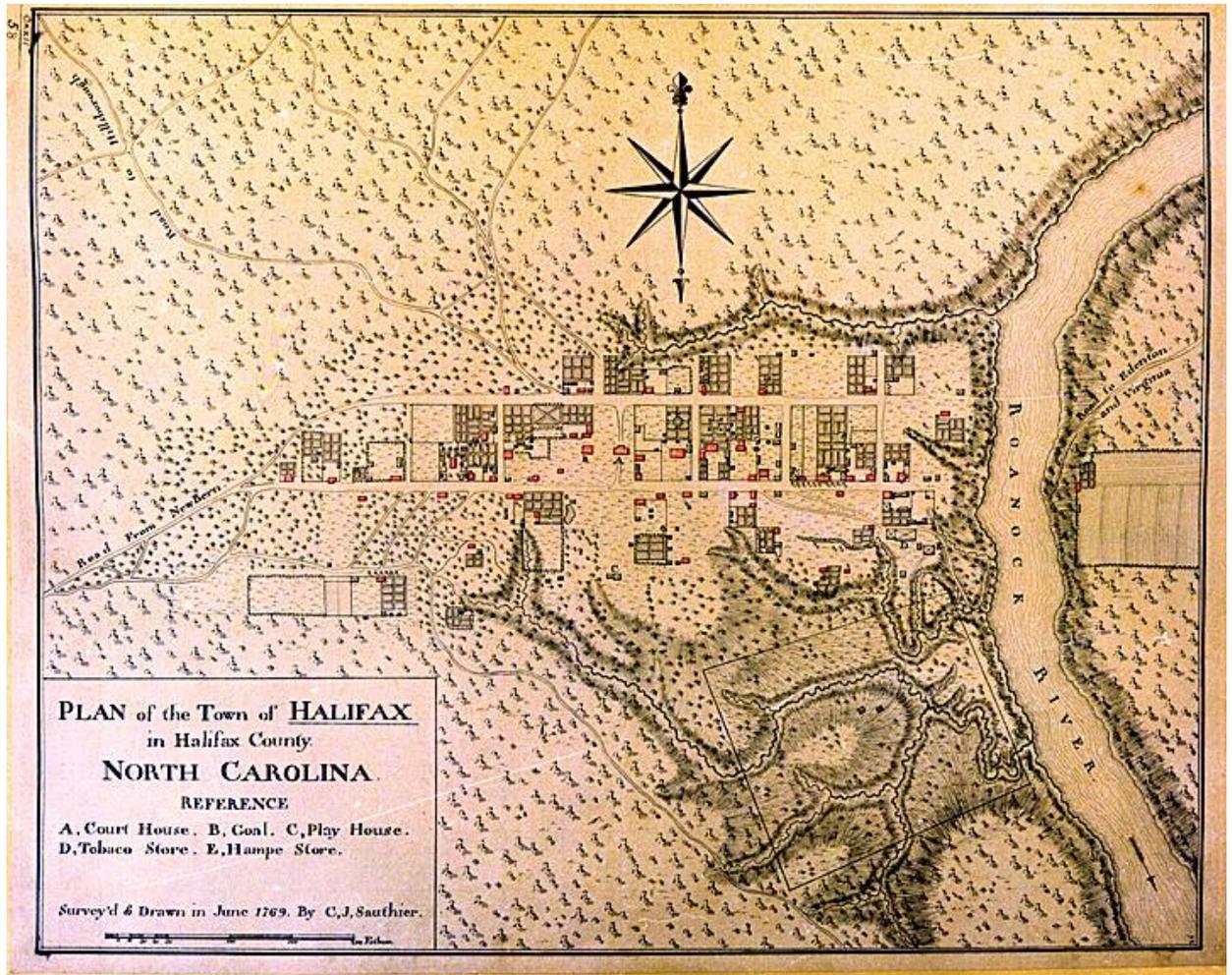


Figure 13: Sauthier's map of Halifax.(Source:NC Archives).

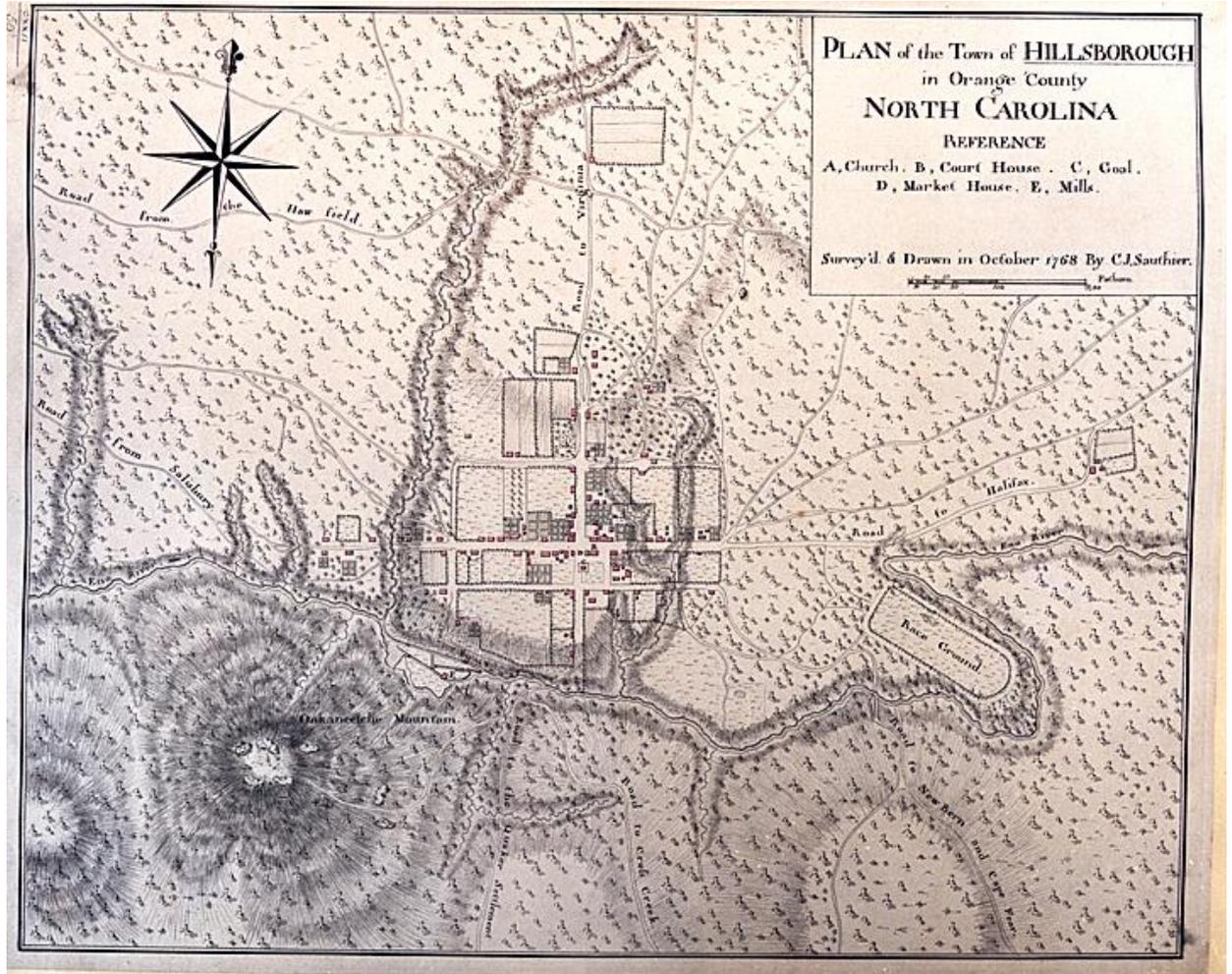


Figure 14: Wide spacing of trees still evident as far east as Hillsborough.(Source:NC Archives).

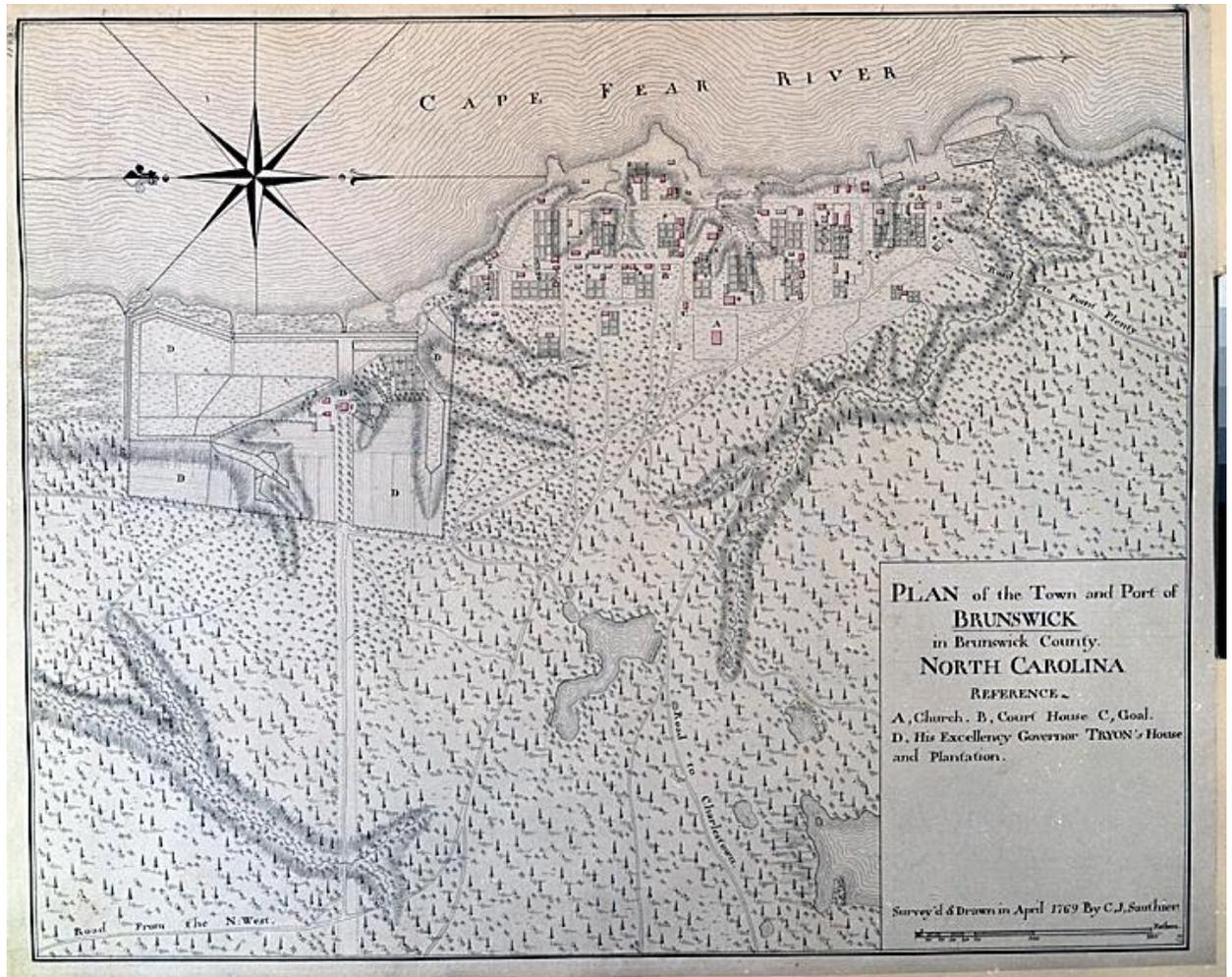


Figure 15: Sauthier's map of Brunswick, early naval store port.

Naval stores production grew increasingly important in the area west of the Pamlico Sound, which by the end of the eighteenth century represented the heart of North American naval stores manufacturing. From the mid-eighteenth century to the Revolution, the naval stores industry spread into the Washington and New Bern areas, and slowly migrated up the Tar and Neuse Rivers.²³

²³ Outland, *Tapping the Pines*, 11-23.

Tar production began to seep into all facets of colonial life. It was not just the English merchants and settlers who engaged in the manufacture and trade, but also Native Americans, the Episcopal Church, Palatinates and Huguenots. John Lawson, surveyor-general, explorer and founder of Bath, was well-suited to take advantage of his knowledge of the area and its sources of lightwood. In April of 1708 he purchased 480 acres on the north side of the Pamlico, beginning at a pine in the marsh, running over Mallard Creek to a gum at the marsh at Ragged Point. This was likely the site of Goose Creek State Park, or the boundary closest to Bath, approximately 4.5 miles away.

Lawson was well-versed in the uses of the longleaf. In his introduction to *New Voyage to Carolina*, he describes the possibilities of the longleaf “As for Pitch and Tar, none of the Plantations are comparable for affording the vast Quantities of Naval Stores, as this Place Does.”

Lawson, however, mis-labeled the pine he admired:

Of Pines, there are, in Carolina, at least, four sorts. The Pitch-Pine, growing to a great Bigness, most commonly has but a short Leaf. Its Wood (being replete with abundance of Bitumen) is so durable, that it seems to suffer no Decay, tho’ exposed to all Weathers, for many Ages; and is used in several Domestick and Plantation Uses. This Tree affords the four great Necessaries, Pitch, Tar, Rozin, and Turpentine; which two last are extracted by tapping, and the Heat of the Sun, the other two by the Heat of the Fire.²⁴

Lawson’s activities as surveyor and laying out the towns of Bath and New Bern may have been his undoing. Lefler writes that his death at the hands of the Tuscarora “not surprising” and he may have met a grisly death tinged in irony. While De Graffenreid wrote that he wasn’t certain of the manner of Lawson’s death, Christopher Gale described it as a not-uncommon form

²⁴ John Lawson, *A New Voyage to Carolina*, ed. Hugh Talmage Lefler (Chapel Hill: University of North Carolina Press, 1967), 15.

of torture practiced by those Indians (and also described by Lawson himself) that is, being stuck full of lightwood splinters “as hog bristles” and set on fire.²⁵

²⁵ The petitioners from Charleston were afraid of suffering the same fate or worse “and being massacred by Savages and perhaps of being roasted in slow Fires scalp’d stuck with Lightwood and other inexpressible Tortures (Kelbey and Boone, “Petition”).

Chap 6: Edward Moseley

Lawson's eventual successor, noted early colonist Edward Moseley was also engaged in tar production, though likely on a larger scale. Moseley accumulated a large amount of land, and was repeatedly accused of fraud by the English and linked to a several lawsuits over the practice of using blank patents. This entailed having patents signed and then filling out the forms later, after land had been surveyed, a useful practice in such vast territory. Moseley and his deputies were accused of also filing false surveys, by which they would only see part of a piece of property and guess at what the rest would look like. A third accusation concerned his giving assurances to colonists that the quitrents were too high, and not to pay them because they would surely be changed.

In 1733 Moseley produced a map that has been noted for its accuracy, and was the source for later maps of the colonial era. The same year he petitioned the Executive Council for land he felt he had a right to, especially since he was ready to pay all fees associated with the property. He had been turned down by the governor because of the land fraud accusations, so he appealed on the basis that he was advancing English interests: "That your petitioner having a considerable number of Slaves, and no Lightwood Land for his Slaves to make Tar He applied himself to the Secretary's office...." Moseley claimed that he had a right to the land because of his family, and was very much "injured" that the Governor would not grant his request despite Moseley representing his "great want of Lightwood Land."¹

¹ Edward Moseley, "Petition from Edward Moseley concerning a land grant, including related correspondence between Moseley and Ayliffe Williams and certification from Nathaniel Rice and John Baptiste Ashe," *Documenting the American South: Colonial and State Records of North Carolina*, 1733, <http://www.docsouth.unc.edu/csr/index.html/csr03-0161#p3-471> (accessed 01 05, 2013).



Figure 16: Edward Moseley's map. Note overall context of longleaf forest (Source: ECU Special Collections).

Moseley's complaint illuminates several features of early colonial tar production. It's clear that Moseley had planned on burning tar, and had made preparations. He had slaves ready to work, and felt he had a right to the land, and not just any land, but specifically land with longleaf pines. It reflects a form of negotiation that appears in other records, that of appealing to

the authorities because of the importance of producing tar or naval stores outside their commercial value, as if the colonists are performing a service for the Crown. Moseley used this tactic to induce pressure. There was a bounty on tar production because it was necessary for English interests, Moseley was ready to make tar, and so not granting this land would in fact be disservice to the Crown.

This tactic was common when making requests of the various levels of colonial administrations. As early as 1705 a petition was sent to the Society for the Propagation of the Gospel - the missionary wing of the Church of England - on behalf of “most distressed subjects inhabiting near Pampticoe River in the County of Bath.” These may have been Huguenot settlers, and the petition expressed their great desire for a priest as they had children not baptized. They deserved a priest be sent to them because through their hard labour had supplied “majesties ships” with “great Quantities of Victualling Stores and Pitch and Tar.”²

The Palatinate settlers of New Bern complained to Governor Johnson in 1749 about Thomas Pollock (Jr.) taking their land other abuses, and attempted to prove their worth by the same tactic:

“Now we have considering the same, as also the Hardships which the said Petitioners who are represented to Us to be a laborious people and to have been many years settled in our said province, and to have been employed Manufacturing Pitch and Tar, and other useful commodities.”³

Petitioners from Charleston during the Yamasee War made the same invocation:

But when we reflect upon the Ruine of so flourishing so hopeful a province that has for many years taken off so much of our English Manufactures, and brought such a large Revenue to the Crown by the Dutys upon Rice, Skins, pitch Tarr and other Naval

² Robert J. Cain, ed. *Colonial Records of North Carolina: The Church of England in North Carolina: Documents 1742-1763*, (Raleigh: Office of Archives and History: North Carolina Department of Cultural Resources, 2007).

³ Robert J. Cain, ed. *Records of the Executive Council 1664-1734*. Vol. VIII, (Raleigh: University Graphics, 1984).

Stores and commodities imported from thence, and yet from the first Settlement of it, not put the Crown to one penny expence.....”⁴

Moseley received his land, 3100 acres, but the governor tried to have the last say in the matter. Moseley requested several specific tracts in New Hanover County, probably land that he knew to be full of lightwood. Instead, Governor Burrington gave him property in Bladen County, near the Haw Old Fields, in the vicinity of modern day Burlington, not the Lightwood Lands near a port that he had picked out. Burrington declared Moseley’s original request void because he had use blank patents. While it’s possible this land contained some lightwood, it lay outside the lightwood forest, and the term “old fields” referred to land that had been previously cleared by Native Americans or colonists, empty areas that were mainly grass. Now Moseley was stuck with land on which he was required to pay quitrents, and without easy and quick source of revenue. Even if tar production was possible, it would require transporting slaves far into the interior, and shipping the tar back to a port. Perhaps coincidentally, Burrington’s own land is the only one depicted on Moseley’s map with specific acreage.

Moseley’s will divided a tremendous amount of land - 18,000 acres - among heirs, plus several other plantations, including one of 10,000 acres in Edgecombe County:

It is my will that no part of my stocks, household goods, slaves or other personal estate, be sold for payment of my debts; but that the same shall be paid out of the moneys arising by crops or other labour of my slaves; hereby Directing that what product of the labour of my slaves shall be in being at my decease, the same shall go towards payment of my debts, and that my slaves that work in the field or on Tarr Work &c, to be kept to labour in such manner, on all, or any of my lands as shall best serve, to raise most money for discharge of my debts. ⁵

⁴ Kelbey and Boone, “Petition” 2-198.

⁵ Bryan J. Grimes, ed. *North Carolina Wills and Inventories* (Raleigh: Edwards and Broughton Printing Company, 1912).

Moseley's instructions to pay his debts with produce and tar underscores the economic realities of the province. Tar, or any other goods, brought little on the open market when sold outright. Currency was almost non-existent, and the land had only been recently returned to Royal administration and was still in great distress from the mismanagement of the Lord Proprietors. On the other hand, tar's set price for paying debts made it much more valuable for land acquisition.

Moseley's map takes on a different dimension when studied from the vantage point of Lightwood Land acquisition. Moseley was a known tar-burner in search of Lightwood Land who amassed incredible amounts of acreage, and was accused of land fraud. He portrayed the longleaf forest in a much greater area than Lawson, but omitted details known to the colonists, especially the location of what Lawson termed "Savannas." Moseley's map is more correct than Lawson's in many ways, but some of the "Savannas" were familiar to the colonists and along major transportation routes.

A surveyor and cartographer of Moseley's importance omitting specific geographic landmarks is thought-provoking. Determining the reason for the omissions is outside the scope of this thesis, but it deserves noting that he was meticulous in other areas, specifically the location of colonists and the North Carolina boundary with Virginia.

Chap 7: Inherited Lightwood

Many other colonists left specific instructions in their wills to produce tar or divided lightwood among heirs. Sarah Allen's will directed her executors to sell her plantation's produce as well: "that is to say, all the produce of my plantation fit for sale, and all the produce of the labour of my negroes, such as tar, turpentine, corn and the like..."¹

Thomas Boyd's will is more explicit, and illuminates how lightwood could be turned into wealth. He differs from Moseley by going all in on tar production:

...And that all the moneys arising from the sale at vendue of all the personal estate which shall belong to my son (John Boyd)...after all my debts are paid, and legacies satisfied, be applied to buy slaves for my said son; and that the slaves so bought together with all those slaves I leave him be constantly kept at work on lightwood on my sons land, thereby to raise money to buy more slaves, with what convenient speed my exed. Can, and to educate and school my said son. Lastly I do hereby nominate and appoint my trusty and loving friends Coll. Edward Moseley, & Capt. Simon Alderson, my whole and sole Exec. Of this my last will to see the same performed.²

William Duckenfield left forty pounds a year to his brother, starting one year after his death, payable in Pork, Indian Corn, Pitch and Tarr.³ William Little left to his daughter Penelope his half of a mill at Hoskins Bridge near Edenton, and his half of three tracts of lightwood land.⁴

Patrick Maule ensured that his slaves' work in tar production would not be interrupted, and "I give to my loving ...the following negroes, vizt: Angus, Hannah, Affrica, Robin and London, to be delivered after the tar kilns are off and the crop finished...."⁵

John Peyton Porter covered his funeral expenses with tar and turpentine production:

¹ Grimes, *Wills*, 10.

² Grimes *Wills*, 86-87. Beaufort County, Hyde Precinct 1725

³ Grimes *Wills*, 161. Chowan Precinct, 1721, witnessed by Edward Moseley

⁴ Grimes *Wills*, 289. Edenton, 1734

⁵ Grimes *Wills*, 301. Beaufort Precinct, Bath County 1736-Maule owned large tracts of land on both sides of the river, on Blount's Creek and Tranter's Creek; "Maule's Point" is directly across from Goose Creek.

“...They are to keep my negroes, or a suff’t number of them, on said tract to make Tar, Turpne: &c, in order to raise money to pay my funr’l charges and all other lawfull demands....”⁶

Edward Salter ordered his brigantine *Happy Luke* be loaded with tar that he was in possession of, and sent to Boston, and then to be sold in exchange for young slaves.⁷

Samuel Swann left what lightwood that could be picked up to his sons:

I give unto my said sones, Henrey and Thomas, all my lightwood, that is or shall be pick’t up on Grassy pt land, with reasonable assistance of my negroes to help burn ye same, also, the used of my pitch kettle (if nay shall come in) to boyle ye tarr. Allso, what Pitch, Tarr, as Mr. John Pottiver stands indebted to me by bill...It is my desire and I do earnestly recommend it to my said two sons, Henry and Thomas, that the produce of the lightwoods and goods, which I have given them, be employed in a joint stock for trade, as being the most likely course to thrive.⁸

Thomas Pollock Jr. owned large tracts of land given to him by his father, also one of the largest land holders in the Carolinas. Pollock Jr.’s involvement in the tar trade came at the instigation of his father, whose will⁹ left his son Cullen “The five back tracts of lightwood land between the frsd. lands and easternmost swamp of Samon Creek” and left his son Thomas 8900 acres on the west side of Salmon Creek, “reserving free liberty to my son George to make what Pitch and Tar he sees fitting on ye same, with his hands, for the space of three of four years after my death.”¹⁰

Pollock ordered that what was available at his death be split evenly “as to ye crop now on ye ground, and what pitch and tar ye hands in ye woods makes until ye first of aprill next,

⁶ Grimes, *Wills*, 353-355)

⁷ Grimes, *Wills*, 384-390) Bath Town, 1755-Edward Moseley, executor. Gamble notes that his descendants were compelled to free the descendants of these slaves a century later

⁸ Grimes, *Wills*, 427) Perquiman’s Precinct, 1708- witnessed by Edward Moseley

⁹ Chowan Precinct, 1721

¹⁰ Thomas Pollock, "Will of Thomas Pollock, including related certificates." *Documenting the American South: Colonial and State Records of North Carolina*. 08 08, 1721, <http://docsouth.unc.edu/csr/index.document.html/document/csr22-0066#p22-296> (accessed 01 05, 2013).

shall be equally divided amongst my three sons, Thomas, Cullen and George” and made his sons executors, adding that they pay all charges for “ye building of the house at Black Rock, to be paid out of ye Tar and Pitch, first made by ye hands.”¹¹

Despite the defeat of the Tuscarora and the encroachment on their lands, Native Americans also took part in the tar trade. Besides their proclivity for sticking their victims with lightwood splinters and setting them afire, there is no evidence of their actually burning tar.

During the Tuscarora War, lightwood was used as a military tactic against them. Thomas Pollock complained about Colonel Barnwell’s unwillingness to destroy the Tuscarora fort Nehorooka. Barnwell’s forces had dug trenches within eleven yards of the palisade, and collected “great amounts” of lightwood to fill the space between the trench and the palisade. The Tuscarora, realizing what was about to happen, began torturing white captives, some of whom were related to men in Barnwell’s forces. Their screams prompted Barnwell to forego lighting the bonfire.¹²

At a council meeting in July 1715 in the house of Captain Richard Sanderson, it was ordered that Dorteskite Indians appear before the next council, and that John Jones was not to burn any lightwood on their land until then. At the meeting in November were Governor Eden, Nathan Chevin, William Reed, Christopher Gale, Francis Foster and Tobias Knight, and an unusual petition was granted:

Upon Petition of the Dorteskite Indians Setting forth that they had Sold some small Tracts of their Land to Mr. John Jones Isaac jones and Captain Richard Sanderson

¹¹ Pollock, *Will*, 22-296.

¹² Thomas Pollock, "Letter from Thomas Pollock to the Lords Proprietors of Carolina," *Documenting the American South: Colonial and State Records of North Carolina*. 09 25, 1712, <http://docsouth.unc.edu/csr/index.html/document/csr01-0469> (accessed 01 05, 2013).

and also the Lightwood on their Land to Captain Sanderson and pray's that they may have Liberty to Confirm their Titles to the same Lands and Lightwood.

Ordered that the said Indians are hereby Impowered to make Good and Sufficient Titles to the aforesaid John Jones Isaac jones and Richard Sanderson for such Lands and lightwood as they have already Sold to them¹³

While it's unclear what the land was sold for, it probably seemed like a bargain as the Indians did not have property rights as formulated by the English, and they retained hunting rights. They would have most likely have burned the woods anyway. Selling the land and lightwood as separate transactions, and the intense legalism of the petition may indicate the Indians naivety in negotiations, their fundamental lack of understanding of property rights as conceived by the English, or their willingness to sell the land multiple times. By 1734, however, a group of Chowan Indians sold one hundred acres of land to William Hill for 60 barrels of tar.¹⁴ Instead of selling their lightwood, they were now purchasing tar.

¹³ North Carolina Governor's Council, "Minutes of the North Carolina Governor's Council," *Documenting the American South: Colonial and State Records of North Carolina*. 07 05-28, 1715, <http://docsouth.unc.edu/csr/index.html/document/csr02-0088> (accessed 01 05, 2013).

¹⁴ Robert J. Cain, ed *The Colonial Records of North Carolina:Records of the Executive Council 1735-1754*, Vol. VIII (Raleigh: North Carolina Department of Cultural Resources, 2001).

Chap 8: Regulations

The emergence of tar (and pitch) through English mercantilism brought with it the usual regulations and proclamations, and its status as an enumerated commodity with a bounty and a fixed price meant that attention to its production would be intense. The seemingly endless amount of lightwood land and the ability to turn the trees into money was irresistible. But enforcement was nearly impossible, and while regulations existed, actual prosecution was limited. A constant tension existed between the Royal Navy, Board of Trade, English merchants, and colonial manufacturers over the bounty payments. The Navy didn't want colonial tar because of its poor quality, but the Whiggish Board of Trade was influenced by the merchants' desire to continue production.

Burning tar on Crown property, or private property, was common, as was cheating, since tar was measured by weight. The temptation to burn someone else's dead tree limbs and throw some sand in the barrel must have been great. Regulations fell into two categories: lightwood acquisition and manufacturing processes. The value of the lightwood itself was valued more highly to the land on which the trees grew on.

In 1723 the North Carolina Assembly, in an effort to encourage commerce in the colony, passed an act rating various commodities that could be accepted as payment, including corn, deerskins, and whale oil. In 1725, the bounty was suspended. Tar production immediately fell off, and English imports from Russia and Sweden resumed. A compromise was reached by

1729, and the bounty was reinstated at lower rates until 1774. The bounty, however, was to be paid at the previously higher rates if made by the Swedish method.¹

In 1728, at the end of the Proprietor administration, the rate for pitch was one pound per barrel while tar was 12 shillings 6 pence per barrel, and turpentine 1 pound 5 shillings..² Cheap land was plentiful, and while quitrents were thought relatively high, they were rarely paid in currency. Land prices varied widely during this period, from 1 pound per 100 acres to as little as 6 pence. It's clear how profitable lightwood lands could be.

After the return of the province to Royal authority, efforts were made to determine the nature and extent of naval stores production. The crown wanted the output increased, but also the quality, and recognized the value of lightwood lands. Ratings for commodities were reconfigured in 1731, with tar worth 7 shillings, 6 pence per barrel, pitch at 12 shillings, 6 pence per barrel, and turpentine the same as pitch.³ Governor George Burrington made some progress, at least stopping the practice of blank patents, but he was letting land go for two shillings per 100 acres (besides the various fees for surveying etc., and quitrents were 6 pence per 100 acres.⁴

Moseley's map appeared in 1733, the same year as his appeal for more lightwood land on which to make tar. He told the council "I take this affair (tar production) to be of so great concern to his majesties colonies...." Half of the Executive Council were either known tar-burners or embroiled in lawsuits over tar and Lightwood Lands.

¹ Justin Williams, "English Mercantilism and Carolina Naval Stores, 1705-1776," *The Journal of Southern History*, Vol. 1, no. 2 (May 1935), 169-185, <http://www.jstor.org/stable/2191724> (accessed 26/01/2013).

² Gamble, *Early History*, 16-23.

³ North Carolina General Assembly, "A Bill for an Act Entitled An Act to Regulate and Ascertain the Payment of Quit Rents & Fees of the Officers of the Government," *Documenting the American South: Colonial and State Records of North Carolina*. University of North Carolina at Chapel Hill. 1731, <http://docsouth.unc.edu/csr/index.html/document/csr03-0077> (accessed 01 05, 2013).

⁴ George Burrington, "Letter from George Burrington to the Board of Trade of Great Britain," *Documenting the American South: Colonial and State Records of North Carolina*. 02,20, 1732. <http://docsouth.unc.edu/csr/index.html/document/csr03-0114> (accessed 01 05, 2013).

From 1734 to the Revolution, beginning with the administration of Governor Gabriel Johnson, regulations were increasingly strict but rarely enforced. Johnson sent a report to the Board of Trade that year with some recommendations for regulating production and resuming the bounty:

There is more pitch and tarre made in the two Carolinas than in all the other Provinces on the continent, and rather more in this one than in South Carolina, but their two commodities (tarr especially) bear so low a price in London that I find the Planters are resolved to make no more. I believe that it is principally owing to their own conduct that the tarr of this Country is of so small a value for in order to make a large Quantity they make so large and violent fires in their kilns as force all the coarce juices of the lightwood along with the tarr which gives it so hot a quality that masters of ships have said it frequently burns their ropes which makes them very shy of meddling with it. Now if by a gentle fire they would attempt to make nothing but cool tarr though the quantity would fall short by one third yet in Quality they all agree it would equal East Country Tarr if not exceed it, for their Materials for this Manufacture are excellent and in great quantity but as the loss of one third of a kiln would fall very heavily upon them they can't pretend to set about this method unless the Crown will be so good as to allow them the old bounty of 10s. per barrel. If your Lordships approve of this I humbly propose that the Planter in person be obliged to attend the kilns and see that it is cool drawn and to make oath before the Governor that it is so, with heavy penalties in case of frauds, and C. ⁵

Johnson's complaint that American tar was too hot and burned ropes and cordage had been taken up by others..⁶ While some scholars believe that it was because of the use of dead trees, which lost their protective capabilities and therefore left too much acidity in the tar, Airaksinen disagrees. "The 'heat' of tar does not refer to an acid-like quality. When rope was tarred, the tar was heated to be thin enough to penetrate into the rope. Bad tar was too thick. To make it thinner it had to be raised to a temperature which could actually burn the rope. So by calling the tar hot, the dockyard workers actually meant it was too thick."⁷

While Airaksinen may be correct in this description of 'hot tar', he attributes the overly thick quality of American tar to the "incorrect barking of trees." He attempts to weigh whether

⁵ Gamble, *Early History*, 16-23.

⁶ Airaksinen, "Tar Production," 115-127.

colonial tar-burners were lazy or stupid, and concludes neither, as creating a kiln took a lot of skill but barking a tree did not. “This was because the Americans tried to skip the most laborious part of the process, to keep down the labour costs. This is a logical explanation, since lack of labour was a typical problem in the colonies. There were enough raw materials, wood, and the colonists were anxious to use it as fast and as easily as possible.” Airaksinen also claims that colonists turned tar into pitch as a way of circumventing the poor quality of the tar, since the poor-quality tar could be refined into quality pitch.⁸

Airaksinen’s logic is faulty for several reasons. First, barking of trees was rarely attempted, and tar was usually made from collecting lightwood that was already dead. Second, the idea that poor tar burners or slave labor would emulate the meticulous years-long process of selecting and barking trees is difficult to accept. Tar was money, and there was precious few other ways to get it. Third, the longleafs were being exploited in other ways, such as lumbering.

All evidence suggests that tar production in the colonies was a labor-intensive, unskilled affair. Few kilns have been found that had anything other than a dirt or clay construction, and those were from a very late period. A wide array of people burned tar, from Palatinates to missionaries, so there could not have been a great learning curve. Additionally, memorialists and petitioners consistently wanted oversight from inspectors or planters themselves, suggesting that it was an almost totally decentralized process. The real problem was simple: in a colony with few options for manufacturing, without money, and without skilled labor, burning dead trees and limbs in an earthen ring could bring financial gain. It was the economic stimulus of its time. It would seem that the English made a crucial error in their evaluation of the tar-producing

⁸ Airaksinen, “Tar Production,” 115-127.

capabilities of the Carolinas. They failed to understand the differences between tar production in the Baltic and in North Carolina, especially the nature of procurement of resources.

Johnson also decided to crack down on squatters and illegal tar-burners. He issued a proclamation in 1734 offering amnesty and actual ownership to those who had taken up lands fraudulently if they came up with quitrents "from the time they first burned lightwood, and the said persons shall not be entitled to a grant of any lands whatsoever unless they take up such lands as they have burned lightwood on."⁹

Johnson went further in a 1735 proclamation, offering a reward of twenty pounds for information leading to the arrest and conviction of those burning tar or boxing trees (making turpentine) on the King's Lightwood Lands, and demanding the practice stopped. He ordered the Attorney General to prosecute offenders who had false warrants or patents, unless they came up paid for the land and quitrents. Johnson declared that illegal tar burning was causing people to not take out land grants since the lightwood was scavenged, thereby hurting Royal revenue streams, and made the offense retroactive to 1729, the year of the first lightwood regulations and the year after the reversion of Proprietary lands to the Crown.¹⁰ The intent of the proclamation was to collect quitrents on lands that had been obtained fraudulently, going back seven years. If the lightwood had already been burned, it was likely worthless. Johnson reported to the Board of Trade in 1736:

⁹ Gabriel Johnston, "Letter from Gabriel Johnston to the Board of Great Britain," *Documenting the American South: Colonial and State Records of North Carolina*. 12 04, 1734, <http://docsouth.unc.edu/csr/index.html/document/csr04-0005> (accessed 01 05, 2013).

¹⁰ North Carolina governor's Council, "North Carolina Council," *Documenting the American South: Colonial and State Records of North Carolina*. March 01-23, 1735., <http://www.docsouth.unc.edu/csr/index.html/document/cs04-0025> (accessed 01 05, 2013).

There is a practice of long standing in this colony which has been of immense prejudice to the revenues of the Lords Propers. Formerly and the Crown now, that is the boxing of Pine Trees for turpentine and burning the lightwood for Pitch and Tarr, without ever taking out Patten or paying quitrents for the lands, which has entirely prevented them being taken up by any person, they being generally of little value for any other purpose, and by this means in many parts of the country the lands are waste and not a house to be seen in traveling a great many mile together. ¹¹

Gamble suggests that Carolinians had already come to view tar burning as an inalienable right, and Henry McCullough wrote the Board of Trade to protest Johnson's oversight: "The Governor has been much censured for the preventing this, therefore it would be of use to him if their Lordships would write to him that they do not approve his conduct therein." The Board of Trade sided with the Governor and allowed the punishments. ¹²

Some of these regulations were new, and some had been in place but unenforced. Johnson was trying to organize the province that had been so chaotic and distressed under the Proprietors. The Board of Trade requested a report clarifying the situation in North Carolina, in particular the use of commodities as payment. Ryder and Strange reported in 1738 that tar was rated at 10 shillings and pitch at 1 pound, but none of it was binding since the laws hadn't been properly ratified. They relayed Johnson's conviction that the Proprietors hadn't accepted commodities as payment for commercial purposes, but because there wasn't any money in the province, and suggested that the practice continue for the more valuable commodities.

Orphans had their lightwood rights protected in 1755. An act by the North Carolina General Assembly made it illegal for guardians of orphans who held lands in their name to burn off the lightwood, except in order to clear debts. ¹³

¹¹ Gabriel Johnson, "Letter from Gabriel Johnston to the Board of Trade of Great Britain," *Documenting the American South: Colonial and State Records of North Carolina*. 11 29, 1736., <http://docsouth.unc.edu/csr/index.html/document/csr04-0067#p4-203> (accessed 01 05, 2013).

¹² Gamble, *Early History*, 16-23.

¹³ North Carolina General Assembly, "Acts of the North Carolina General Assembly," *Documenting the American South*:

A petition in 1758 asked inspectors to be more judicious and not count some water getting into the barrels as fraudulent, but a 1770 memorial to the Earl of Hillsborough from London merchants requested the opposite:

Whereas, it is necessary for the better making of cool and good tar fit for cordage in all the English plantations that the last half of every kiln of tar when drawn shall be made into pitch, free of drops, and the whole kiln of tar, or the value thereof, unless the said half part be so made into pitch, shall from and the 29th of September, 1729, be forfeited for the benefit of any person or persons shall sue for the same.

The petitioners then requested that the officers be appointed to attend the kiln burnings.

They described what they felt was the problem with tar from the colonies:

the manner the planters have constantly pursued in burning the tar kilns has been to run it off into open drains cut in the ground and exposed to the weather, by which means rain water often intermixes with the tar while it is hot and when they take the tar out of such drains or reservoirs to fill the barrels, sand, dirt and water is taken up with it, which your memorialist are of the opinion may be prevented by sinking a large cistern or cask in the ground to receive the tar as it runs from the kiln, with a cover to prevent the rain getting into such cistern or cask when the tar is hot.¹⁴

The petitioners also requested that all planters put tar into well-hooped casks of 32 gallons, and bunged with wood or cork as they were often put into green casks and bunged with grass, so that 15-20% was lost before shipping. They wanted the tar be kept in a cool, shady, place and that if these recommendations were enforced, it would most certainly be used by the Royal Navy- possibly not a recommendation in 1770.

The memorialists accused colonial manufacturers of putting sand into turpentine barrels, and asserted that "Pitch is generally imported from North Carolina, half made and intermixed with sand, dirt, dross, and stones, which is occasioned by the planter putting the tar into holes dug in the ground and setting fire to the same; when half-burnt it is put into slight barrels in a

¹⁴ Waller, Bridgen &, and Hindley & Needham, "Memorial from Bridgen & Waller and Hindley & Needham concerning North Carolina trade in naval stores," *Documenting the American South: Colonial and State Records of North Carolina*. 03 31, 1770, <http://docsouth.unc.edu/csr/index.html/document/csr08-0105#p8-187> (accessed 01 05, 2013).

very adulterated condition.” The memorialists complained that the barrels were weak causing extreme leakage, the colonial inspectors weren’t doing their jobs, since they were appointed by magistrates who were tar-burners themselves, and that not more than one barrel in twenty was really entitled to the bounty. Still, the bounty on naval stores didn’t expire until 1774.¹⁵

The English continued to push tar production right up to the beginning of the Revolution, and continued to fight against illegal production. Governor Josiah Martin issued his own proclamation in 1772 at the behest of his Governor’s Council meeting in New Bern. A common practice was to make an application for land, burn the lightwood and destroy the timber, without ever taking legal possession, thereby evading quitrents. Martin proclaimed that this practice was “to the great injury of his Majesty’s revenue and his well-disposed subjects who come to settle this Province,” and strictly prohibited it, warning that “it is hereby further declared that any person or persons who shall be known to gather lightwood upon any of the ungranted lands of his Majesty within this province shall be rigorously prosecuted for such offense.”¹⁶

As tensions increased and conflict appeared more likely, the royal administration under Martin attempted to take stock of its land values. In 1773 it listed 40,000 pounds lost because of lands “taken up in fictitious names for the sake of Lightwood”.¹⁷

In 1774 the Deputy Surveyor William Palmer wrote to Martin that he had followed the Royal Instructions and reported:

¹⁵ Waller, Bridgen &, and Hindley & Needham, "Memorial from Bridgen & Waller and Hindley & Needham concerning North Carolina trade in naval stores," *Documenting the American South: Colonial and State Records of North Carolina*. 03 31, 1770, <http://docsouth.unc.edu/csr/index.html/document/csr08-0105#p8-187> (accessed 01 05, 2013).

¹⁶ North Carolina Governor’s Council, "Minutes of the North Carolina Governor's Council," *Documenting the American South: Colonial and State Records of North Carolina*, 07 05-28, 1715, <http://docsouth.unc.edu/csr/index.html/document/csr02-0088> (accessed 01 05, 2013).

¹⁷ Author, “Accounts” 1773.

I have made all possible enquiries of the Deputy Surveyors for the different Counties in his Majesty's district in this Province who have assured me that it is their belief there is not to be found in one body a Tract in that district three hundred acres of real good land, most of the lands lately patented being very indifferent, having been taken up mostly with the view to make Tar or for Pine Timber for their Saw mills, but the greatest part by very poor people for Range for their black cattle. It is my humble opinion that the Royal Instruction with respect to such lands will operate as a prohibition and in all probability the vacant poor lands will be Pillaged by the destruction of the Timber and Lightwood and the Range destroyed without any benefit to the Crown and but little to the Province by Transient People who are continually passing from one Province to the other.¹⁸

The pervasive nature of tar production in North Carolina and its relation to the English as a highly valued commodity can be seen in the records of a 1774 hearing before the Governor's Council concerning this same William Palmer over a small legality. Ormond, the Deputy Attorney General, stated that the Court was not a place to dispute the authority of the Governor's Commission, since its members were justices appointed by the king. Palmer's lawyer, Edwards, observed that the Governor couldn't supersede Royal authority: "Suppose the Governor should issue a Commission to some persons forbidding them a Tar-Kiln, whether that Commission be obeyed or not? Surely Not."¹⁹

The obsession with turning lightwood into tar during the colonial period had its repercussions on the fledgling state. Most of the longleafs in extreme eastern and north-eastern North Carolina were already gone or being tapped for turpentine, though huge tracts remained in the Sandhills region and areas not yet settled. The mobile turpentine distillery, spreading settlement and railroad expansion would destroy those during the antebellum period.

¹⁸ William Palmer, "Documenting the American South: Colonial and State Records of North Carolina," *Letter From William Palmer to Josiah Martin*, 07 26, 1774, <http://docsouth.unc.edu/csr/index.html/document/csr09-0288> (accessed 01 05, 2013).

¹⁹ North Carolina General Assembly, "Acts of the North Carolina General Assembly," *Documenting the American South: Colonial and State Records of North Carolina*, 09-10 1755, <http://docsouth.unc.edu/csr/index.html/document/csr25-0033#p35-326> (accessed 01 05, 2013).

In 1776, Robert Williams of Carteret County wrote to the North Carolina Council of Safety concerning his contract for seasoning wood. Among his many reasons for being unable to satisfy his contract, he lists the longstanding habits of Carolinians:

We have cut all the pines that we could find...few would have squared 8 inch at 20 ft long, nor one of them maul into rails, the land for many years past had been constantly Pillaged by the town People. There is a bit of tolerable land where a Plantation formerly was but the chiefest part is only low grassy piney land with tolerable Clay bottom and no ways preferable to pineyland of the kind in common; only for this disadvantage that it has no trees for turpentine, or rails, nor a knot of lightwood left unpillaged.²⁰

Mature longleafs would have produced sixty to eighty feet of straight timber. By declaring that the lumber couldn't square eight inches at twenty feet meant the longleafs were gone and a different species of pine had already begun taking over.

North Carolina colonists could, and did, turn dead longleafs into food, land, slaves, and wealth. They made tar as simply as possible, by burning wood they picked up off the ground in holes and collecting the run-off. This crude method supplied most of the tar and pitch for the greatest navy in the world, and for a time nearly all the tar and pitch came from North Carolina. The heart of this global export during the earliest stages of the exploitation of the longleaf was the Tar-Pamlico River basin, and the center of the Tar-Pamlico was Bath, four and a half miles from Goose Creek State Park.

²⁰ Robert Williams, "Letter from Robert Williams to the North Carolina Council of Safety," *Documenting the American South: Colonial and State Records of North Carolina*, 09 14, 1776, <http://docsouth.unc.edu/csr/index.html/document/csr10-0368> (accessed 01 05, 2013).

Chap 9: Construction

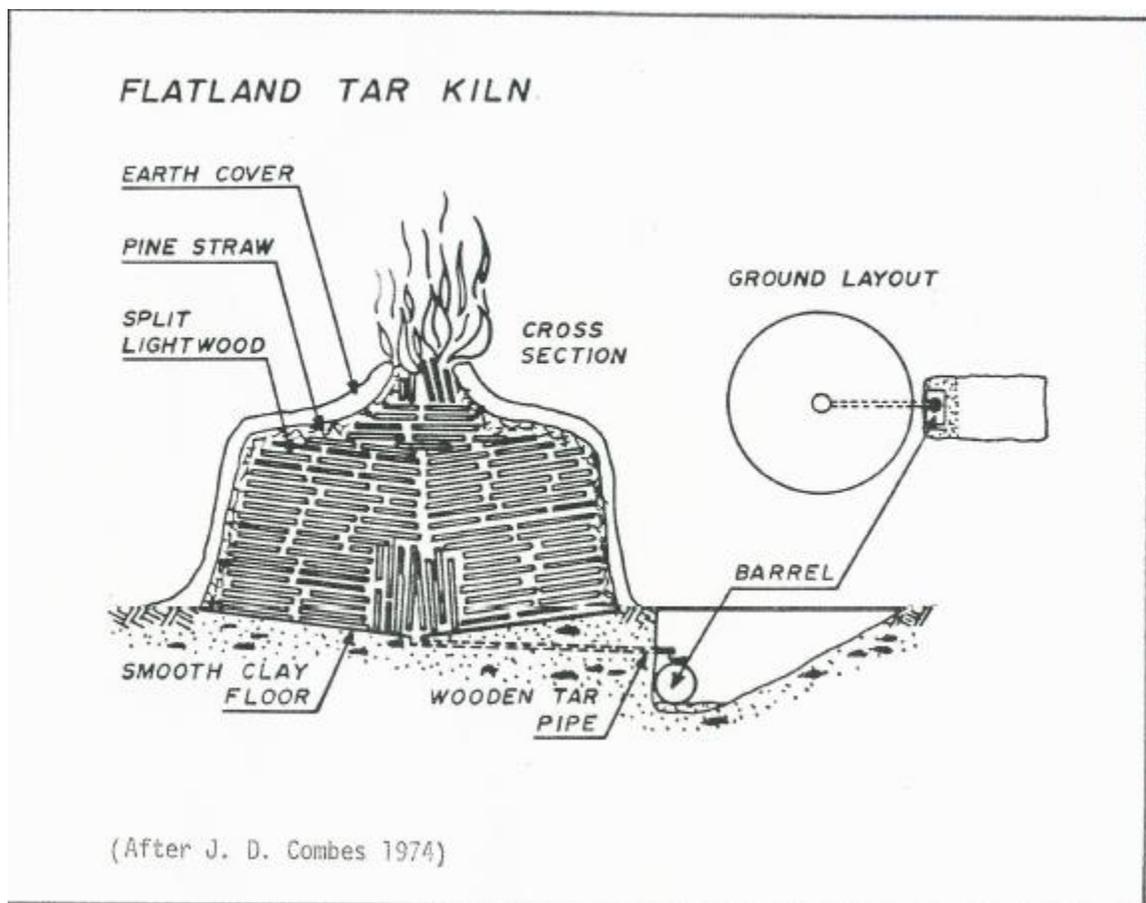


Figure 17: Carolina Tar Kiln (Source: Hardison and Snedeker)

Dating Carolina kilns is exceedingly difficult. They generally do not divulge significant numbers of artifacts, their construction methods were not standardized, and few records were kept that describe the operations or activities of the workers. The historical record is sparse, but does follow general guidelines.

John Brickell's *Natural History of North Carolina* is one of the earliest accounts and describes tar burning in the 1730's. Brickell describes making tar from dead longleafs that have been tapped for turpentine for several years and have died:

The Planters, at certain Seasons of the Year and especially in Winter, make their Negroes gather great quantities of Lightwood, which they split about the thickness of the small of a man's leg, and two or three Feet in length: when they have got a sufficient quantity of it in readiness they set their Kilns on some rising Ground or Earth thrown up for that purpose in the center whereof they draw a Funnel some distance from the Kiln. Then they take the Lightwood, which they pile up with the ends of each placed slanting towards the center of the Kiln, which is generally made taper from the Ground, afterwards they cover it very secure with Clay, Earth or Sods to keep in the Flames. After this is done they set fire to the top, the Weather permitting, which must be neither too dry nor too wet. By this means the Tar runs into the center and from there into the Funnel, where they attend Night and Day...till the kiln is quite burnt out, which is generally in eight and forty hours or less, according to the dimensions of the Kiln.¹

Brickell notes that planters have a general idea of what quantity of tar will be produced based of kiln dimension and provide enough barrels for that purpose, and he remarks on the possibility of the kiln blowing up, "as if a Train of Gunpowder has been laid under them, by which accident their Negroes have been very much burnt or scalded."

Michaux's (1805-1810) description of tar burning is more detailed, and he notes that while he encountered vestiges of kilns in Florida forests, most tar production was already confined to the southern part of North Carolina:

¹ John Brickell, "Making Tar, Pitch, and Rosin in the Province of North Carolina in 1730", in Gamble, ed., *Naval Stores*, 16.

To procure the tar, a kiln is formed in a part of the forest abounding in dead wood. This is first collected, stripped of the sap, and cut into billets two or three feet long and about three inches thick, a task which is rendered long and difficult by the knots. The next step is to prepare a place for piling it. For this purpose a circular mound is raised, slightly declining from the circumference to the center, and is surrounded with a shallow ditch. The diameter of the pile is proportioned to the quantity of wood which it is to receive. To obtain one hundred barrels of tar it should be eighteen or twenty feet wide. In the middle is a hole with a conduit leading to the ditch, in which is formed a receptacle for the resin as it flows out. Upon the surface of the mound, beaten hard and coated with clay, the wood is laid round in a circle like rays. The pile, when finished, may be compared to a cone truncated at two-thirds of its height and reversed, being twenty feet in diameter below, twenty-five or thirty feet above, and ten or twelve feet high. It is then strewed with pine leaves, covered with earth, and contained at the sides with a slight cincture of wood. This covering is necessary in order that the fire kindled at the top may penetrate to the bottom with a slow and gradual combustion. If the whole mass was rapidly inflamed the operation would fail and the labor in part would be lost... A kiln which is to afford one hundred or one hundred and thirty barrels of tar is eight or nine days in burning.²

This is clearly a description of a kiln constructed with care and skill, and likely indicative of the post-Revolutionary War practices. Without the bounty subsidy, some burners realized that higher-quality tar was necessary to compete on a more open market.

Thomas Gamble, describing tar burning in the early twentieth century, reported kilns being constructed in generally the same fashion as Brickell and Michaux, although he suggests a twenty-five cord pile might take two weeks to burn, and must be watched constantly as the gases from the tar would blow off the earth and pine straw covering.

Williams also describes much the same method, but gives an output of one cord to forty or fifty gallons. A barrel was 31.5 gallons, indicating a rather inefficient output. Michaux's description is likely on the upper reaches of efficiency from the ability of the kiln builder, but the detail given can provide some approximation of the amount of wood required. If the stack, presumably stacked fairly close together, was twenty by twenty by ten (using the calculation for

² Michaux, *Pine Trees*, 9-16.

a cylinder, $V=\pi r^2 h$, rather than for a truncated cone) this would give a volume of 3140 cubic feet. A cord of wood (4x4x8 feet) has 128 cubic feet, meaning a kiln of this dimension would hold approximately 24 cords. Increasing the dimensions to twenty-five feet in diameter and twelve feet in height gives a volume of 5887.5 cu. ft., or roughly 46 cords. Michaux reported an output of 100 to 130 barrels, or two to three barrels per cord.

Although these dimensions are approximations, its evident that small increments in kiln size greatly increased the labor required for construction. For a cylinder twenty feet in diameter, each one foot increase in height meant an extra 314 cubic feet, or 2.45 cords. For the larger dimension (twenty-five feet diameter), every foot in height equaled 490.6 cu. ft., or 3.8 cords of lightwood needed.

The weight of a cord of wood can vary greatly, from 2000 pounds. to 5000 pounds, and can lose considerable weight as it dries. Pine can weigh as much as 4700 pounds per cord wet, and 2500 pounds dry. Using the dry weight, the twenty-foot kiln would require 6125 pounds of lightwood per foot in height- over three tons. The larger kiln would require 9500 pounds of lightwood for every foot in height, or over four and one-half tons. A 24-cord kiln would need at least 60,000 pounds of lightwood, loosely stacked, probably much more using Michaux's methods. It deserves mentioning that by all accounts, lightwood was much heavier than plain pine lumber, so these estimates are probably low.

This discrepancy points to several features of kiln construction. The cords referred to must have been stacked extremely tightly to fit within these dimensions. That explains why they had to be split into small uniform pieces, or what Michaux describes as billets. This would have greatly increased the amount of wood needed. The quality of the lightwood varied as well, from

the fat lightwood of stumps, hearts, and knots, to the less-dense limbs and smaller branches. Kilns constructed by early colonists within the virgin longleaf forests were likely an easier effort. Deadwood in larger pieces lay on the ground, ancient heartwood stumps surrounded them, and as the Native Americans dispersed and the firing of the woods ceased, the accumulation of ground litter increased. Making tar might have seemed as if it was guided by providence at least for a short period.

From the late - colonial period on, tar burning would have become increasingly unpleasant. The royal subsidy was gone. Without the persistent burning by the Native Americans, the lightwoods became infested by stinging and disease-carrying insects, especially in low-lying areas. The undergrowth became much thicker than before, making travel and fuel procurement difficult. The longleafs, tapped out and cut, became harder and harder to find. Finding the fuel to make tar required far more effort than before, and the longleafs weren't coming back. An environment that had developed for thousands of years was rapidly altered.

How this change in the environment affected the location, construction and size of the Carolina kilns has yet to be determined. Kilns are typically found in clusters of two or more.³ This might be the result of several factors including proximity to a known transportation route, especially a landing area. Soil composition may play a role- if a particular ridge was known to have clay close to the surface, constructing the kiln in that area would be logical. Finally, the use of slave labor likely made it necessary to construct kilns close together in order to provide supervision over a job that might take a week or more in the forest.

³ Michael J. Harmon and Rodney J. Snedeker, "The Archeological Record of Tar and Pitch Production in Coastal Carolina," in eds. Linda F Stine, Martha Zierden, Lesley M. Drucker, & Christopher Judge, *Carolina's Historical Landscapes: Archeological Perspectives*, (Knoxville: The University of Tennessee Press, 1997) 145-160.

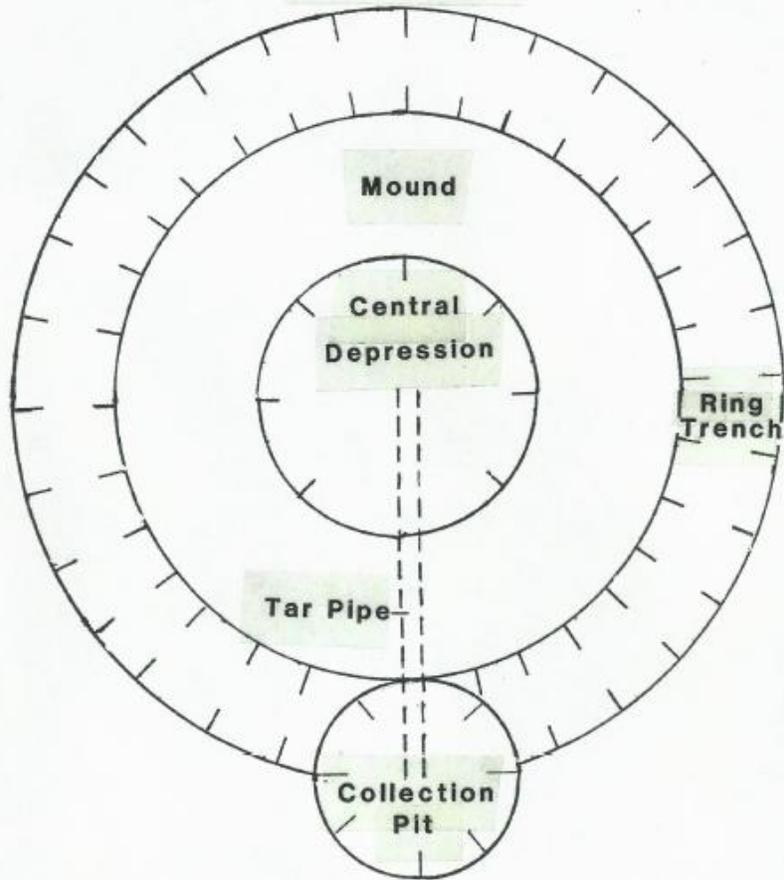
The pioneering work on kiln variation and typography has been done by Forest Service archeologists Joel Hardison, Rodney Snedeker, and Michael Harmon. After decades of studying and researching kilns throughout North and South Carolina and publishing numerous papers, they are indeed the leaders in the field. The following is based on their work, as is the schematic drawing of a kiln (see figure 7). Harmon and Snedeker, in *The Archeological Record of Tar and Pitch Production in Coastal Carolina*, give seven steps in kiln construction:

- 1) *Selection and procurement of fuel*- usually waste wood (stumps, knots, and limbs) was split and stacked for fuel.
- 2) *Kiln foundation preparation* - a circular kiln floor was cleared, possibly with a clay floor, basin shaped with a slope to the center.
- 3) *Trench construction* -A trench or trench with a pipe extended outward from the kiln center.
- 4) *Fuel wood placement* -May be shaped like a haystack or a pyramid, and the top may be wider than the base.
- 5) *Kiln covering* - a covering of earth or turf generally, which prevented the tar from catching fire, eliminated ash, and allowed the wood to produce more tar.
- 6) *Ignition and burning* -the kiln was set on fire from the top which was then covered, and holes poked in the sides of the kiln regulated oxygen.
- 7) *Tar collection* -the tar might drain into an open pit or into barrels. The kiln was then plugged to preserve the charcoal. ⁴

⁴ Harmon and Snedeker, *Archeological Record*, 145-160.

TAR KILN ELEMENTS

Plan View



Profile



1 meter

Figure 18: Schematic Drawing of Tar Kiln Elements (Source: Hardison and Snedeker)

Harmon and Snedeker report that kilns weren't generally studied by archeologists until the 1980's, and continue to be overlooked. They are noted on state forms, however, and kilns found within 100 meters of each other, on the same landform, are considered a kiln site. Not all kilns are considered worthy of preservation since they are unlikely to yield further information, and many thousands have been lost to logging and development. Snedeker and Harmon also believe that many have been lost to rising coastlines.⁵ Snedeker's and Harmon's development of kiln characteristics serve as the basis for eligibility on the National Register. The elements include: mound, central depression, ring trench, and collection pit.⁶ Variations serve as possible characteristics for dating and preservation.

Kiln mounds are usually circular and can range from three meters to over twenty meters in diameter. Usually circular, mounds have also been found to be oval, rectangular, and keyhole-shaped, with rectangular being of later construction and keyhole possibly the latest design.⁷

Central depressions range from one to eleven meters in diameter, and can be fifteen to sixty centimeters deep. These can be circular, oval, and keyhole shaped. Variations include shallow central depressions, deep central depressions, ones with a deep central depression and a central high spot.⁸

Harmon and Snedeker maintain that ring trenches are not found in historical documents, and suggest that only Gamble mentions their use. This may indicate that ring trenches are a relatively late feature, however it should be noted that Michaux describes (see above) a circular

⁵ Harmon and Snedeker, *Archeological Record*, 145-160.

⁶ Joel Hardison and Rodney Snedeker, "Croatan National Forest Fiscal Year 2012 National Register of Historic Places Evaluations, Archeological Survey" (Asheville: National Forests in North Carolina, 2012), 6-10.

⁷ Harmon and Snedeker, *Archeological Record*, 145-160.

⁸ *Ibid.*

mound surrounded by a shallow ditch. Harmon and Snedeker suggest that the lack of documentation may be because of their common occurrence.⁹

Collection pits were fed with tar pipes or simple trenches or troughs. The pipe may have been a hollowed log, which would have become fire-hardened and was often re-used. This may have accounted for a “slumping” that is observed near collection pits.¹⁰

Snedeker and Harmon also report on kiln distribution, and state that the likelihood of finding kilns is based on landform, relative elevation, and present vegetation. They are usually on low ridges, and the presence of longleafs suggests the likelihood of previous tar production. Kiln sites are not usually associated with agricultural or domestic production. Present kiln locations are biased towards National Forests because of the lack of development activities, especially logging and agriculture.¹¹ Kiln distribution and density may make kilns sites eligible for National Register consideration as well, especially if near known historic transportation routes.¹²

Snedeker and Harmon suggest that kiln sites can be addressed under criteria A and D of the National Register of Historic Places guidelines. They are associated with events that have made a significant contribution to the broad patterns of our history (A), and may likely yield information important in prehistory or history (D).¹³

⁹ Harmon and Snedeker, *Archeological Record*, 145-160.

¹⁰ *Ibid.*

¹¹ *Ibid.*

¹² Hardison and Snedeker, “Croatan”, 6-10.

¹³ Harmon and Snedeker, *Archeological Record*, 145-160.

Chap 10: Carolina Kilns at Goose Creek

Goose Creek was created from a tract of land donated by the Weyerhaeuser Corporation in 1976, intended for use as an ecological and natural preserve rather than out of a notion of historical relevance. Two archeological surveys were completed between 1980 and 1986, albeit serving different purposes. Goose Creek was part of a larger timber tract, and the west side of Goose Creek to Broad Creek was developed by Weyerhaeuser into a housing division called Pamlico Plantation. Goose Creek State Park expanded in 1980, and commissioned a survey before beginning construction on shelters, campgrounds, etc. Prior to construction, Weyerhaeuser commissioned a survey in 1986 to determine whether any archeological sites may be disturbed.

Neither report generated anything considered significant at the time, nor construction continued as planned. The first report, *Archeology Survey of Goose Creek State Park* by Irwin Rovner, recommended fencing off some cemeteries, but otherwise was dismissive of the entire area. “With respect to specific and/or general research objectives of the Principal Investigator, the attempt was made to find any and all historic and prehistoric sites in the impact area. The results proved completely negative.” Rovner explained that “In terms of possible interpretive themes for the park, Goose Creek is historically trivial. No valid themes exist.”¹In fairness, as

¹ Irwin Rovner, "Archeology Survey of Goose Creek State Park, Beaufort County, North Carolina." 1981.

noted by Snedeker and Harmon above, archeologists tended to ignore tar kilns during this period. Rovner noted some disturbed land, but attributed it to spoil piles from logging.

The 1986 report, “Archeological Survey of site 31BF94, site of the Boyd Plantation, Beaufort County, N.C.,” by Thomas Hargrave, came to a different conclusion. Even though the boundaries fell within Goose Creek, Hargrave realized the historical nature of the site. He did not identify any tar kilns either, but concluded that Thomas Boyd was a member of the Proprietary administration, briefly Solicitor-General, and a close friend of Edward Moseley among others. His name appears on Moseley’s map in the Goose Creek area. Hargrave also suggests that Boyd was engaged in the production of naval stores, which concurs with Boyd’s will as noted above.² Boyd directs his son to use his inherited slaves to work the lightwood continually, in order to buy more slaves, and requests that Moseley and Simon Alderson be his executors.



Figure 19: Boyd's land on Moseley Map (Source: East Carolina University Special Collections)

² 1725, see pg. 58

Hargrave believed that Boyd lived within the confines of Goose Creek, and that his slaves' quarters were there as well. The overlay map he produced is a re-survey from 1774, fifty years after Boyd died, and it's likely that his land extended into the present Goose Creek area. Even if this was not the case, it's difficult to accept that he did not use his slaves to work the longleafs that bordered his land.

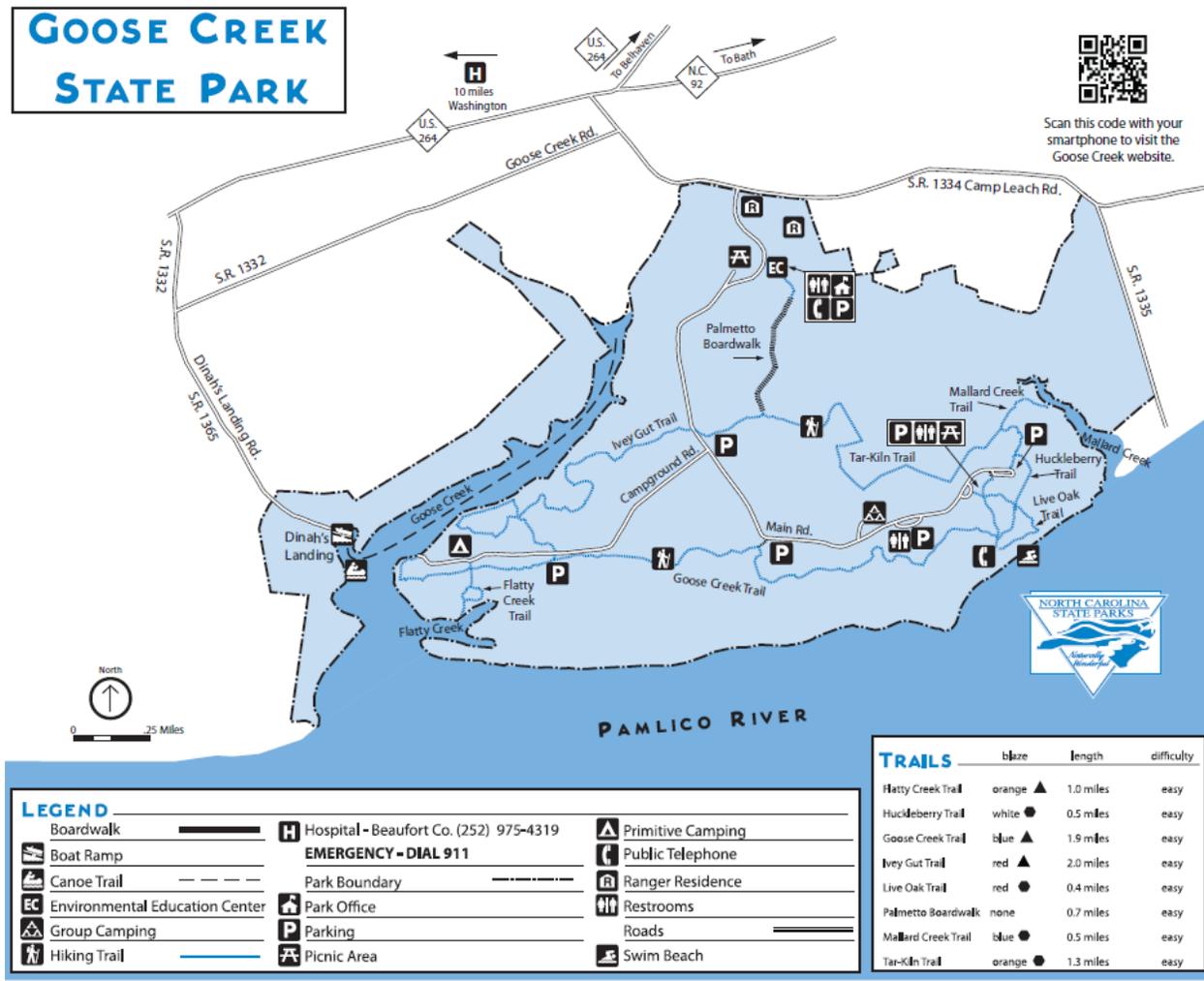


Figure 20: Map of Goose Creek State Park (Source: North Carolina State Parks)

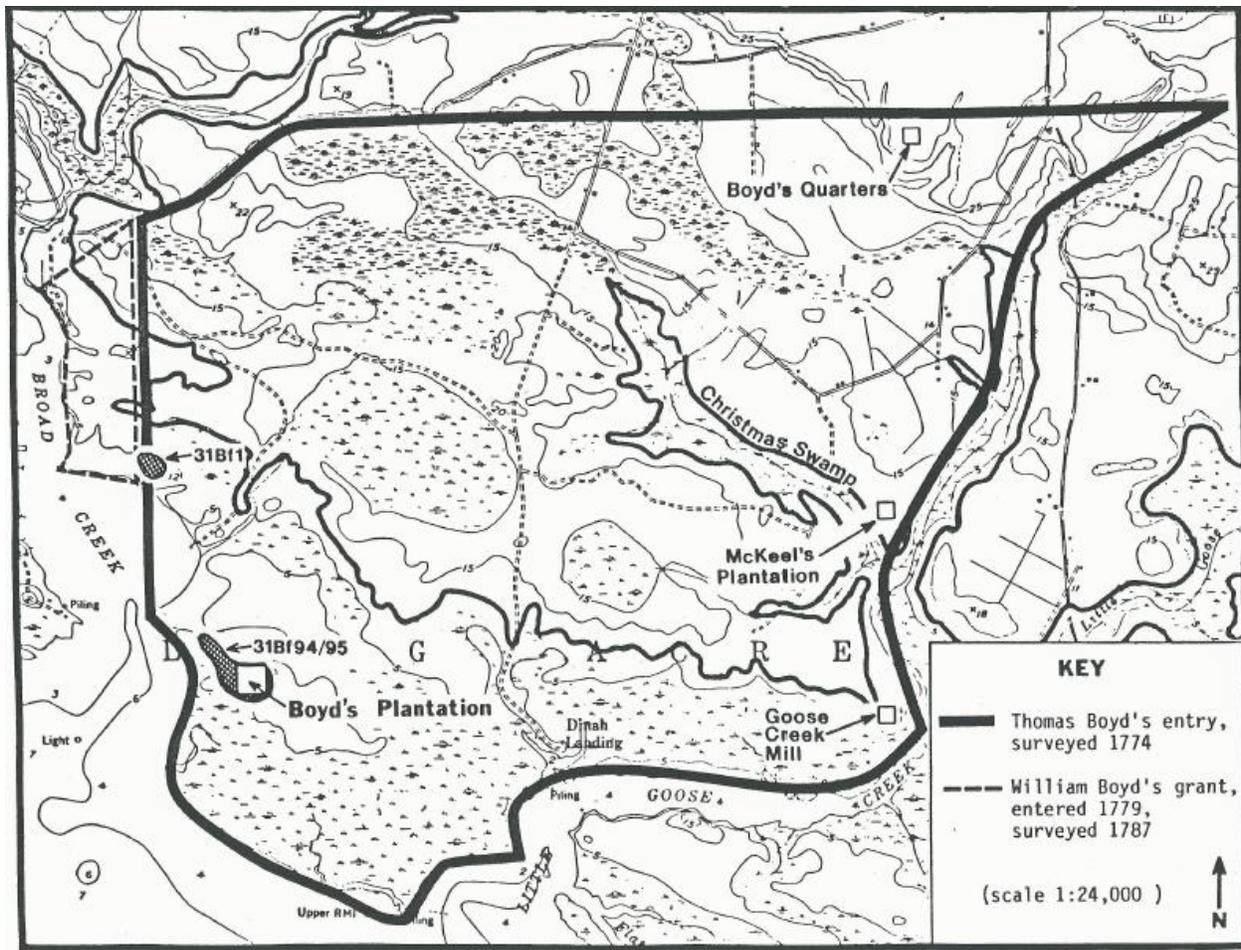


FIGURE 6 THE BOYD PLANTATION OF 1774 SUPERIMPOSED ON A MODERN U.S.G.S. MAP

Figure 21: Boyd Plantation after 1774 survey (Source: Hargrave)

Others owned land in and around the Goose Creek area. It was the first land entry that was set foot on in Beaufort County, by Thomas Blount in 1701.³ As noted, John Lawson likely owned land there, as did John Drinkwater, Simon Alderson, John Corprew, Thomas Chilley, William Ormond, Philip Shute, John Forbes and Edward Tison.⁴ A Thomas Campen

³ (Rovner 1981, 2)

⁴ Allen Hart Norris, *Beaufort County Deed Book One*, Ed. John H. Oden III, (Washington: Beaufort County Geneological Society, 2001).

bought land on Little Tar Landing, near Bar's Creek in 1746, and Hargrave mentioned him as a possible early settler. The headstone of J.T. Campen (1853-1882) was reported by Rovner as part of his survey.

The possibility remains that tar could have been produced on the site for a much longer period than just the colonial. Isolated longleaf stands could have remained. Michaux reports that areas exploited for tar could "replenish" within eight to ten years, presumably meaning enough limbs dropped from storms and trees died naturally to build another kiln. But this would mean that a tract of land, in close proximity to Bath, was ignored as a prospect for turpentine and cutting, and all evidence points to the exact opposite conclusion.

Tar was produced in the area for a century and a half longer. Records from 1785 show 2137 barrels of tar exported from Bath, and 1960 barrels of pitch. How much of this came from Beaufort county is unknown. The 1860 manufacturing schedule shows tar still being produced in the LongAcre area, as that part of Beaufort County is called. However, it lists only 10 producers making just over 800 barrels, in conjunction with turpentine, the majority of which producing only 20 or 30 barrels. None of this indicates that Goose Creek was spared the desire for tar by the early colonists.

Chap 11: National Register Criteria

Using Snedeker and Harmon’s guidelines, the kilns at Goose Creek meet the criteria for eligibility to be included on the National Register for both criteria A and D. They are a part of North Carolina’s earliest history, and further examination could provide a detailed glimpse of colonial life. Hargrave’s report surmised that “The site of Boyd Plantation...has the potential to provide valuable historical information on the English colonization of Tidewater North Carolina during the eighteenth century....Possible areas of study include the fields of colonial economy....”¹

In April 2012, the author, along with Dr. Thad Wasklewicz of East Carolina University, captured two of the kilns using 3-D terrestrial lasers. The following images clearly show major elements of kiln construction: circular mound, ring trench, and central depression.

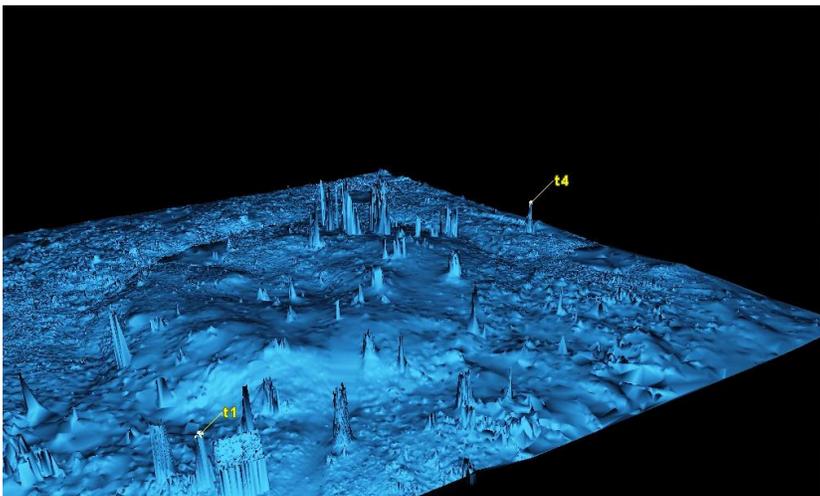


Figure 22- Terrestrial Laser capture of North Tar Kiln (Source:Harrup)

¹ Thomas Hargrave, Archeological Test Excavation of 31BF94, the site of the Boyd Plantation, Beaufort County, N.C., (Raleigh: Archeological Consultants, Inc., 1986).

The above 3-D rendering clearly shows a circular mound, central depression and ring trench. This kiln, the “North” kiln, measures nearly 20ft. in diameter. The “t1” and “t4” are targets used by the laser to extrapolate XYZ coordinates (3D).

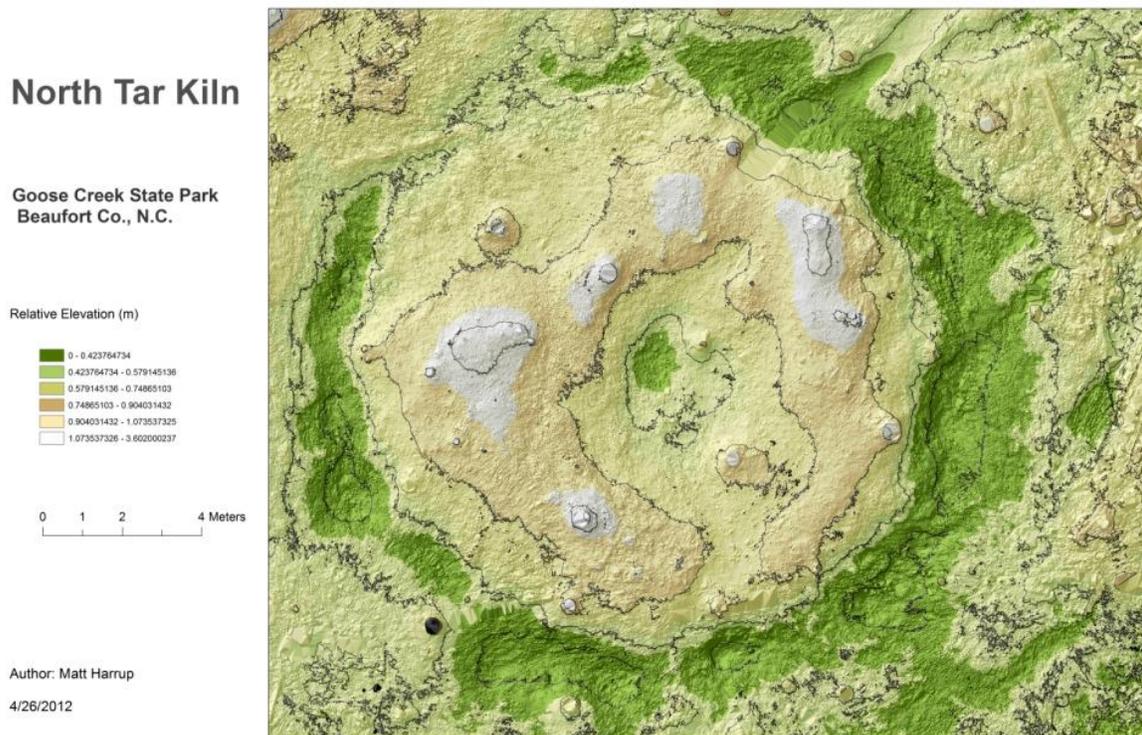


Figure 23-Digital Elevation Model of North Tar Kiln (Source:Harrup)

This digital elevation model (DEM) shows a likely area for a collection pit. Higher elevations are trees that have been removed with vegetation- clearing software.

NORTH TAR KILN



GOOSE CREEK STATE PARK BEAUFORT CO., N.C.

4/25/2012
Author: Matt Harrup

Figure 24- DEM of North Tar Kiln (Source:Harrup)

This DEM shows the ring trench, collection area, and circular mound.

North Tar Kiln- Goose Creek State Park

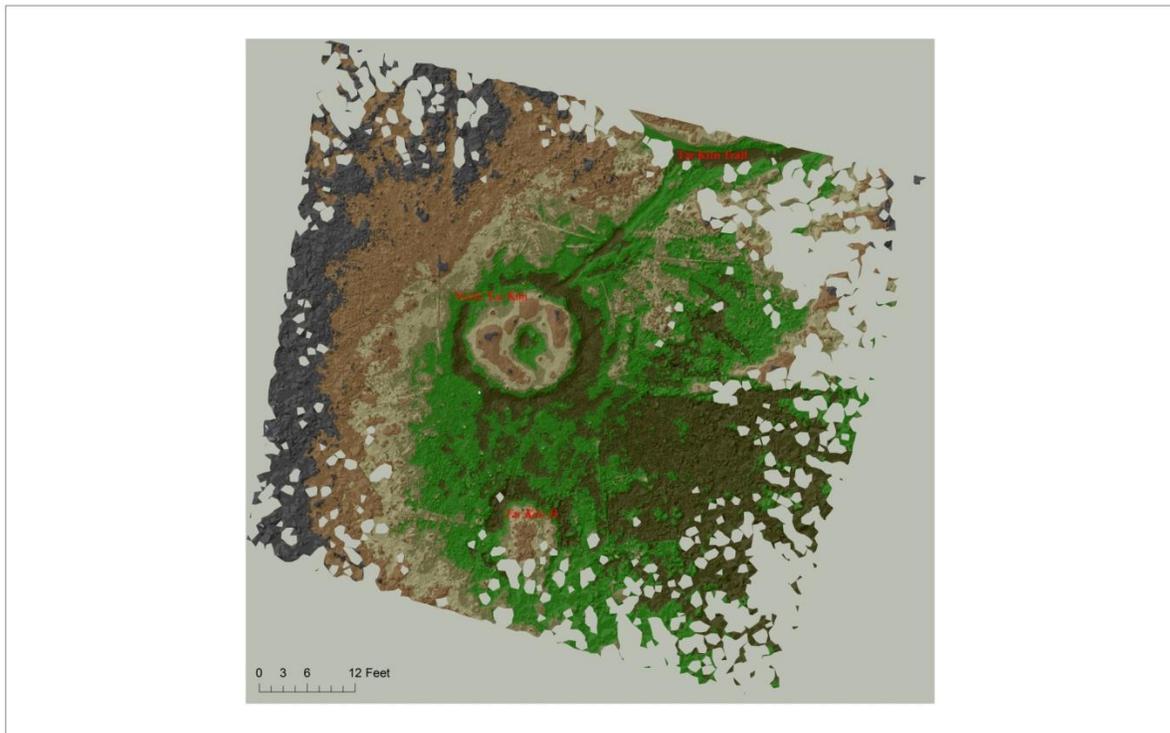


Figure 25 (Source:Harrup)

This DEM was created by capturing the kiln with the terrestrial lasers, processing with vegetation clearing software, and re-formatting to be read in GIS programs. The Tar Kiln Trail is at the top of the image, and at the bottom is another, smaller kiln or possibly pitch kiln revealed by the software.

Using the guidelines established by Snedeker and Harmon, the kilns present all features of early construction. Their location at the edge of major waterway and transportation routes and proximity (4.5 miles) to the naval store port of Bath indicate colonial period construction as well. The historical record places numerous tar manufacturers in the area, including Thomas Boyd, whose plantation covered parts of Goose Creek State Park.

Conclusion

The Carolina kilns at Goose Creek represent a significant and formative period of colonial life in North Carolina. The colonists depended on the longleafs for subsistence, and the bounty provided by the English made tar production irresistible, especially to those, such as Thomas Boyd, who were large landholders and owned slaves.

The complete history of Bath has yet to be told, despite the efforts of historians, educators, and archaeologists. Too often has the story centered on the semi-romantic tales of piracy, and naval store production is glossed over as an afterthought or sideshow. The facts reveal that a significant portion of Bath's economy included the exploitation of the longleafs, and for a time tar was its most important commodity. Colonists, in particular merchants, became rich from tar, and well-known residents such as Michael Countanche, builder of the Palmer-Marsh House, made regular trips to England with large quantities of tar. Speculation about colonists who enriched themselves usually centers on their possible connections to pirate loot, rather than the mundane but important likelihood of tar production.

Many questions remain about tar production. What was the culture that developed around it? What did the slaves, overseers, and poor white burners do among the longleafs while the tar slowly burned? Were there specialized tools, and how was the skill required for construction and safety passed along? Were there specialists? Why are there usually clusters of kilns? What role did the desire to attain lightwood play in pressuring Native Americans?

It is only by fortune and forgetfulness that a tar plantation in the heart of eastern North Carolina survived. The 300th anniversary of Bath recently passed with no mention of the importance of the kilns in Goose Creek. A survey of Goose Creek itself (the waterway) would likely shed light on the maritime activities of this area.

Tar kiln preservation today is the domain of relatively few people. Joel Hardison, Rodney Snedeker, and Michael Harmon, federal archaeologists deserve credit for decades of persistence and scholarship. North Carolina State Park Rangers, like John Fullwood at Goose Creek, are responsible for a lot of preservation activity. Foresters like Bill Barber of Weyerhaeuser, who identify and attempt to avoid kilns, and Weyerhaeuser Environmental Manager Bryan Hulka, who recognizes their historical significance and provide education for foresters, deserve mention. Weyerhaeuser's donation of land to the state for Goose Creek is the reason that development and logging ceased and the kilns remain today.

Most preservation efforts are merely avoidance. Hardison and Snedeker sometimes recommend a split-rail fence around kilns that warrant preservation, something which might serve Goose Creek well. The research on the kilns at Goose Creek has not been fully completed. Core samples will provide another insight into construction, and possibly dendrochronology could date them with a high degree of accuracy. These kilns could provide a wealth of information on colonial eastern North Carolina, and their inclusion on the National Register of Historic Places will be one step in educating the public of their significance.

This thesis has focused on the beginnings of tar production in America, especially the heart of production in North Carolina. This time frame usually lies within the colonial period for a simple reason- the naval stores industry moved south as the longleafs disappeared. The

press of settlements into the western and southwestern parts of the Carolinas, off waterways and along expanding roads and railroads, was a slow process, and the longleafs furnished a living for generations. Tar was manufactured in eastern North Carolina until after the Civil War, even in areas that were the epicenter of production one hundred and fifty years earlier. But this production was different. Instead of large landholders employing slave labor, struggling farmers and owners of otherwise unproductive tracts of land exploited the last surviving stands for personal or local use. The last vestiges of tar production likely signaled the end of turpentine. Longleafs that had been tapped for years finally gave out, and were burned in kilns as they always had been.

The process of tapping the longleafs continued well into the early to mid- twentieth century in the western areas of the Gulf Coast, from Mobile to Texas. Lightwood was still a sought-after commodity. The author's parents recall gathering "lighter knots" in southern Alabama until the 1960's. The author's in-laws, landholders bordering the Croatan National Forest since the early eighteenth century, cite a long history of lightwood gathering. From North Carolina to Alabama, lightwood was prized. Strikingly, however, neither sides of the author's family were aware of the extent or practice of tar production. Tar production in Alabama lost its economic value before the naval stores and logging industry arrived. Tar production on a commercial scale in North Carolina moved out of the coastal areas a century ago, and even the cultural ways of turpentine were lost. Tar kilns in the Croatan are often associated with Native American practices by local residents.

Why was the memory of such a large and important industry lost? The answer lies in all that was lost along with it. The spectacular longleaf forest is gone, along with the lightwood. A

forest grew up in its place, a forest that resembles the old one, an important forest that provides jobs and resources and deserves attention in its own right.

Tar is no longer necessary. Wooden ships have been replaced by metal ones, man-made non-vegetal tars are easier and cheaper to produce, the myriad uses of tar besides on wooden ships have been replaced by chemical-based products, often still from the extraction of terpene, as turpentine is still the base for many products. Tar was often used on roofs, hooves, fence posts, and axles.

Tar kilns are decidedly unglamorous. To find one requires time in an insect-infested forest, and the ability to distinguish one from the forest floor. There are no beautiful edifices, no Gothic or Federal or Georgian-style kilns, though there may be one day, with enough research and public awareness. One cannot restore a kiln and receive a generous tax credit.

While colonists and the English were after tar itself, they realized all too well that once production ran its course on a piece of land, more land was needed. It took far too long for the lightwood to re-appear. It was exploitation in the extreme. There wasn't a crop rotation to replenish the lightwood. Once it was gone, it was gone.

Little was written about kilns, as ubiquitous as they were. Most documentation is circumstantial, and little is known about the processes and cultural ways that surely developed around burning tar. Much more research is needed to illuminate this important part of southern life. North Carolina place names swell with references to tar production, though the reasons behind the nomenclature have been forgotten. The Tar River, Tarheels, Tar landing, Pitch Landing, Lightwood Cove, Tarkill Creek, Tarkle Creek- these are a fraction of the names that

mark areas of production and transportation. While this thesis refers to tar kilns and lightwood, many southerners would use the terms tarkills and lighterwood instead.

With the end of slavery in the south, perhaps much was lost in the understanding of tar construction as well. As in other forms of labor, slaves probably gained proficiency in gathering the best lightwood, kiln construction, and became trusted to be in the woods for extended periods of time. Poor white tar burners were unlikely to keep written records of tar manufacture, meaning the same bias towards the white experience that plagues southern history has a role in the understanding we have of the processes involved. There was nothing about tar manufacture that was easy or pleasant, other than perhaps the few days the kiln cooked before the tar started running.

The explosion of turpentine in the early nineteenth century helped erase some of the memory of tar production. Turpentine became synonymous with naval store production and labor among the longleafs, and many trees remain with the physical scars of tapping, boxing and scraping.

These are reasons for the preservation of as many kilns as possible. Their eligibility for the National Register of Historic Places is based on sound criteria, but it must be kept in mind that this is a federal government program. Preservation exists outside of this program, and has been practiced for generations by foresters, farmers, and private landholders. The professionalism of the federal archeologists who have studied, preserved, and recorded the kilns over the past decades is commendable. Where preservation wasn't feasible, the recording of the locations of the kilns will prove to be invaluable.

As in the case of Thomas Boyd, historical research is paramount to understanding each kiln site. What appeared to be a simple site of tar production, lost in the reaches of a state park, is most likely part of a colonial tar plantation owned by a member of the Proprietary administration and Solicitor-General, and his heirs. The product of that plantation would have been bought and sold in Bath, shipped to England via Boston, and used to waterproof merchant ships or in the production of oakum by English convicts. As Boyd's will instructs, the profits were to be used to increase his slave and land holdings and continue the cycle economic progression.

Today, tar kilns in North Carolina continue to be ignored and overlooked. This is because the knowledge of the cultural and economic ways tar burning has been lost. A few scholarly articles and interesting books have appeared recently, but most continue to rely on turpentine as the story of naval store production in the south. This is a reasonable choice, since the manufacture of turpentine was more recent, more pervasive, and more stunningly destructive.

The Carolina kilns in Goose Creek State Park exist by fortune. The land was logged for generations before being donated to the state. Why were they left? They were preserved by avoidance for probably the same reasons most kilns in North Carolina are left intact. Foresters, who recognized their importance and connection to the history of North Carolina, who may have known far more about them than we know now, decided they were worth keeping.

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