

INFORMATION TO USERS

This material was produced from a microfilm copy of the original document. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the original submitted.

The following explanation of techniques is provided to help you understand markings or patterns which may appear on this reproduction.

- 1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting thru an image and duplicating adjacent pages to insure you complete continuity.**
- 2. When an image on the film is obliterated with a large round black mark, it is an indication that the photographer suspected that the copy may have moved during exposure and thus cause a blurred image. You will find a good image of the page in the adjacent frame.**
- 3. When a map, drawing or chart, etc., was part of the material being photographed the photographer followed a definite method in "sectioning" the material. It is customary to begin photoing at the upper left hand corner of a large sheet and to continue photoing from left to right in equal sections with a small overlap. If necessary, sectioning is continued again — beginning below the first row and continuing on until complete.**
- 4. The majority of users indicate that the textual content is of greatest value, however, a somewhat higher quality reproduction could be made from "photographs" if essential to the understanding of the dissertation. Silver prints of "photographs" may be ordered at additional charge by writing the Order Department, giving the catalog number, title, author and specific pages you wish reproduced.**
- 5. PLEASE NOTE: Some pages may have indistinct print. Filmed as received.**

Xerox University Microfilms

300 North Zeeb Road
Ann Arbor, Michigan 48106

75-21,812

LEWIS, Kenneth E., Jr., 1945-
THE JAMESTOWN FRONTIER: AN ARCHAEOLOGICAL
STUDY OF COLONIZATION.

The University of Oklahoma, Ph.D., 1975
Anthropology, archaeology

Xerox University Microfilms, Ann Arbor, Michigan 48106

© 1975

KENNETH E. LEWIS, JR.

ALL RIGHTS RESERVED

THIS DISSERTATION HAS BEEN MICROFILMED EXACTLY AS RECEIVED.

THE UNIVERSITY OF OKLAHOMA
GRADUATE COLLEGE

THE JAMESTOWN FRONTIER: AN ARCHAEOLOGICAL STUDY OF COLONIZATION

A DISSERTATION
SUBMITTED TO THE GRADUATE FACULTY
in partial fulfillment of the requirements for the
degree of
DOCTOR OF PHILOSOPHY

BY
KENNETH E. LEWIS, JR.
Norman, Oklahoma
1975

THE JAMESTOWN FRONTIER: AN ARCHAEOLOGICAL STUDY OF COLONIZATION

APPROVED BY

P. D. Pailley
Robert E. Bell
Joseph W. White
Stephen J. Thompson
Charles R. Wicks

DISSERTATION COMMITTEE

ACKNOWLEDGEMENTS

The author owes a debt of gratitude to the following individuals, without whose help the completion of this dissertation would not have been possible. First, he wishes to express his appreciation to the members of his committee, Dr. Richard A. Pailes, Dr. Robert E. Bell, Dr. Joseph Whitecotton, Dr. Stephen I. Thompson, and Dr. Charles R. Wicke, for their assistance and encouragement during the completion of this study. Thanks are also owed to several persons directly involved with the archaeological and historical aspects of the Jamestown frontier. They include Ivor Noël Hume, Director of Archaeology at Colonial Williamsburg; William M. Kelso, Archaeologist for the Virginia Historic Landmarks Commission; and of the National Park Service staff at the Colonial National Historical Park, Virginia, thanks are owed to James N. Haskett, Chief Park Historian, Yorktown; Charles E. Hatch, Jr., Research Historian, Yorktown; and J. Paul Hudson, Museum Curator, Jamestown.

Acknowledgements are also due several individuals at the University of Oklahoma, especially to David Ross of the Stovall Museum of Science and History and Mary Ann Holmes and Marsha Hill of the Oklahoma Archaeological Survey for the aid in the production of the figures. William S. Cooter of the Department of History provided thoughtful criticism throughout the preparation of this dissertation. Sharon McDonough of the Department of Anthropology helped to coordinate many parts of this study in the assembly of the final report. Patricia Birchall proofed, typed, and edited the oft-changed and often illegible manuscript. Finally, the author wishes to thank his wife, Carolyn, who proofed the original manuscript and offered innumerable suggestions which helped clarify the arguments therein.

TABLE OF CONTENTS

	<u>Page</u>
Acknowledgements	ii
List of Figures	v
List of Tables	vii
 CHAPTER	
I. Introduction	1
II. The Frontier Model and Its Development	14
III. Systems Theory, Culture Change, and the Frontier Model	47
IV. England and Virginia: The Preconditions of the Frontier Model	61
V. The English in Virginia: The Characteristics of the Frontier Model	186
VI. The Archaeological Situation at Jamestown: Recognition of the Frontier Model	196
VII. The Documentary Situation at Jamestown: The Confirmation of the Archaeological Conclusions	348
VIII. Summary and Conclusions	419
Appendix A: Nearest Neighbor Analysis of Settlement Patterns	429
Appendix B: Mean Ceramic Dates and Pipestem Dates for Structures at Jamestown	431
Appendix C: Percentage of Occurrence of Subsistence Artifacts in Jamestown Structures and Other Structures Where They Occur in Relation to Other Metal Artifacts	441
Appendix D: Deviation of Chi Square Value for the Relationship Between Site Locations and the Extent of Agricultural Subsistence	442
BIBLIOGRAPHY	444

LIST OF FIGURES

FIGURE	PAGE
1. The regions of Britain: the Midlands and Southwest	67
2. The climate of Britain	70
3. Nucleated village with surrounding open fields, Germany	79
4. Enclosed fields and dispersed farms, Wales	85
5. Centers of the English wool-textile industry, ca. 1500	109
6. Settlement patterns in the Midlands and the Southwest	121
7. The Virginia Coastal Plain: general topographic features	139
8. Jamestown Island: general physiographic features	142
9. Jamestown Island vegetation	144
10. Floral zones of coastal Virginia	148
11. Distribution of Powhatan settlements in 1607	171
12. The Jaquelin-Ambler house on the site of Jamestown, 1710-1895	198
13. Locations of archaeological investigations at Jamestown	208
14. Locations of archaeological sites in the James-York River area	205
15. Settlement pattern of the English Midlands with 2 km. catchment areas indicated	222
16. Settlement pattern of coastal Virginia with 2 km. catchment areas indicated	224
17. Settlement model for coastal Virginia	227
18. Map of settlement at Jamestown, 1650-1690	234
19. Plans of seventeenth century English farm types	240
20. Map of settlement at Jamestown, post 1700	245
21. Location of industrial areas at Jamestown, 1607-1690	262
22. Plan of structures at Green Spring	264
23. Plan of the glasshouse complex	269
24. The church tower at Jamestown	293
25. Locations of churches and cemeteries in coastal Virginia	295
26. Conjectural reconstruction of Jamestown, 1650-1690	302
27. Location of high status residences and public buildings at Jamestown, 1620-1690	306
28. Comparison of seventeenth century colonial house plans in North America	319
29. Comparisons of settlement patterns at Williamsburg, 1690-1750	326
30. Archaeological excavations along the Great Road	332

31.	English settlements in coastal Virginia in 1622	374
32.	Expansion of English settlement to the York River after 1630	375
33.	Virginia in 1676	376
34.	Locations of Jamestown structures dated by ceramic and pipestem hole analyses	437
35.	Graphic representation of ceramic and pipestem hole dates	438

LIST OF TABLES

TABLE	PAGE
1. Climate Data for Eastern Virginia	146
2. Occurrence of Ceramics in Coastal Virginia by Type and Site	343
3. Frequencies of Ceramics at Jamestown	344
4. Mean Dates for Structures at Jamestown Based Upon Ceramic and Pipestem Hole Analyses	436

CHAPTER I

INTRODUCTION

In his provocative analysis of American archaeology three decades ago Walter Taylor made clear the affiliation of archaeology to the larger science of anthropology:

When the archaeologist collects his data, constructs his cultural contexts, and on the basis of these contexts proceeds to make a comparative study of the nature and workings of culture in its formal, functional and/or developmental aspects, then he is doing cultural anthropology and can be considered an anthropologist who works in archaeological materials (Taylor 1967:41).

This role, the study of functional and developmental aspects of culture, was recognized also by other anthropologists who perceived that "its conclusions with regard to process have become part of the common knowledge of all anthropologists working with the phenomena of culture change" (Linton 1945: 10).

Traditionally, archaeology has been associated with the temporal aspect of culture because of its ability to view the remains of human societies over long periods of

time. It is able to observe changes which often cannot be seen in the short duration of most ethnographic investigations. In this light archaeology has been chiefly concerned with three principal aims: the reconstruction of past life-ways, the reconstruction of culture history, and the delineation of culture process (Binford 1968:8). This study will focus on the realization of the last of these goals.

By culture process it is here meant "the dynamic relations (causes and effects) operative among sociocultural systems . . . which are . . . responsible for changes observed in the organization and/or content of the systems, or the integration of new, formal components into the system" (Binford 1968:14). It has been suggested (Steward 1949:2-3) that culture process is reflected in the trends, regularities, and patterns that are revealed by the comparative study of the distribution of cultural forms either sequentially (through time) or functionally (through space).

Numerous sociocultural regularities have been proposed by anthropologists to describe and explain changes witnessed in ethnographic and historical societies. Because of the assumed limited nature of their data, however, such investigations are frequently not attempted by archaeologists. In recent years this attitude has been changing, and a number of archaeologists have persuasively argued that it is

possible to identify archaeologically particular processes of past change (e.g., Binford 1965, 1968; Hill 1972; and Deetz 1971). It is possible to test their argument by examining the archaeological record relevant to a situation in which a documented change of a particular processual nature took place.

The type of change to be considered here is thought to parallel one described by an ethnographic model developed to explain sociocultural changes undergone by intrusive societies in frontier situations. By utilizing this model (hereafter referred to as the frontier model) as a basis for inference, it will be possible to postulate that certain phenomena observed in the archaeological record are indicative of the processes inherent in the model. The use of documented sources will serve as a control by which to measure the validity of the archaeological conclusions.

Because the primary emphasis of this study is on the definition of regularities in cultural change, the study lends itself to a systems approach which allows the combination of both structural and processual analyses in the study of sociocultural phenomena. It follows the notion defined in anthropology by Evon Vogt (1960:20-21) that social and cultural systems as integrated wholes always tend toward change rather than states of equilibrium and that the

investigator should concentrate on describing and interpreting this change. Social and cultural structures are seen as merely the intersections in particular time and space of systems changes that are translated into particular observations. Change is seen here as a continuous adaptation of the components of a social system to varying internal and external conditions. It is through the study of change and adaptation that an understanding of cultural forms in general emerges.

The systems approach also stresses organization. A complex system such as human society has been described as:

. . . a complex of elements or components directly or indirectly related in a causal network, such that each component is related to some others in a more or less stable way within any particular period of time . . . and will . . . constitute the particular structure of the system at that time, thus achieving a kind of "whole" with some degree of continuity and boundary . . . When we deal with a more open system with a highly flexible structure, the distinction between the boundaries and the environment becomes a more and more arbitrary matter (Buckley 1967:41).

Open systems are characterized by an exchange of materials or information with their environments, allowing them to utilize energy from the environment and thus decrease in entropy or elaborate in structure (von Bertalanffy 1951:161-162). This implies that a sociocultural system is part of an even larger system. It may be viewed as man's

extrasomatic adaptive system that is employed in the integration of a society, its environment, and other socio-cultural systems (Binford 1965:205). Drawing on biological analogy, Geertz (1963:9-10) contends that such a system may be seen as an:

. . . ecosystem within which certain selected cultural, biological, and physical variables are determinantly interrelated, and which will yield to the same general mode of analysis as ecosystems within which human organisms do not happen to play a role . . . This mode of analysis is a sort which trains the attention on the pervasive property of systems qua systems . . . rather than on point to point relationships between paired variables of the culture and nature variety.

One final concept involved in the study of systems bears mentioning: that of feedback. Briefly, this is a mechanism by which a certain amount of the output of a machine is monitored back as "information" to direct the action of the machine (von Bertalanffy 1951:160). Buckley (1967:56) sees such mechanisms as necessary to the progression of a sociocultural system, because they allow it to receive information from the outside world and its own past as well as information about itself and its parts, thus allowing the system to continually adapt. Feedback mechanisms are also seen as "goal directed" in that they permit the system to vary its behavior in order to direct itself toward

a restricted number of outcomes rather than restricting its behavior to a prescribed, deterministic course.

In order to approach a model of sociocultural change archaeologically, it would be extremely beneficial to do so in terms of a systems orientation. If archaeological data is capable of reflecting both the pattern and structure as well as the changes in past sociocultural systems (Hill 1970b:104), it should be possible to trace the interrelationships of systemic components through time and view the various cultural patterns or structures in light of the changes in these relationships.

It is important to note that culture as an adaptive system is not necessarily shared by all members of the society but is participated in differentially by various members.

In cultural systems, people, things, and places are components in a field that consists of environmental and sociocultural subsystems, and the locus of cultural process is in the dynamic articulations of these subsystems. This complex set of interrelationships is not explicable by reduction to a single component.

A basic characteristic of cultural systems is the integration of individuals and social units performing different tasks . . . articulated by means of various institutions into broader units that have different levels of corporate inclusiveness . . . Within any given cultural system, the degree to which all participants share common ideational preferences should vary

inversely with the complexity of the system as a whole (Binford 1965:205).

Thus, we may imagine a cultural system as a morphologically integrated system composed of sets of interdependent subsystems which we artificially conceptualize as having spheres of reference of their own (Clarke 1968:87). It follows that the material remains in an archaeological site should be highly structured or patterned directly as a result of the ways in which the extinct society was organized and the ways in which behavior was articulated among its subsystemic components (Longacre 1971:131). Furthermore, they should mirror changes in organization and behavior through time.

In addition to the study of regularities or processes in the operation of sociocultural systems, many archaeologists have gone further to propose that it is not enough to merely study regularities of past behavior but to explain them through the use of covering laws. Basically, this approach involves centering research around hypotheses concerned both with the explanation of particular behavioral phenomena and those general laws which make their explanation predictable. In order to establish the validity of hypothetical laws, test implications which predict relationships among the data which occur if the

hypotheses are valid must be deduced (Fritz and Plog 1970: 410). Next, data are collected and examined in light of these predictions. These data must ideally be kept separate from those used to construct the hypotheses in order to prevent arguments of explanation from becoming circular. Since it is important to avoid narrowing one's choice of explanations, alternate hypotheses must be considered and tested. Hypotheses that do not test in the affirmative are just as significant as those that do, because in each case new information is gained that may be instrumental in the development of future hypotheses (Hill 1972:84-85). It must be realized, however, that laws of this nature are not final truths but rather the most satisfactory hypotheses relating to a specific problem (Morwood 1975:114).

Flannery (1973) views the separate emphasis on the definition of systemic regularities and the search for laws of human behavior as indicative of a schism among those archaeologists concerned with the study of processual change. Perhaps the most significant point of contention between these two factions stems from the contention of the former that sociocultural systems are so complex that it is difficult to establish the linear causality relationships upon which the law-like statements of the latter are based. This problem has, for the most part, inhibited the

development of comprehensive covering laws and has instead resulted in an overabundance of "low-level" generalizations of somewhat limited utility (Flannery 1973:51). It does not preclude the use of law-like statements in the explanation of past human behavior but instead focuses attention on the necessity of making clear lower-level assumptions before attempting to proceed to those at a higher level.

The chief goal of this study will involve the testing of one such lower level generalization concerning the explanatory potential of the archaeological record. It postulates the presence of linkages between the patterning of the behavioral context of past cultures and the archaeological context in which it is observed by the investigator. For this reason the study may be seen as being primarily oriented toward the formation and testing of laws. In doing so, however, it incorporates the advantage gained by viewing culture as an operating system with that of recognizing and defining the rules which govern its transformations.

The use of written documentation in an archaeological situation offers a great advantage in that it allows precise recognition of certain variables present in a particular context at a specific time in the past (Harrington 1952:

337). Indeed, the use of documents may even serve to identify and describe certain sociocultural processes. But the use of documents must by no means be limited to this level of interpretation.

Documentary evidence may be used in much the same way as ethnographic analogs (Deetz 1971:123). In the case of both inferences may be made concerning the interpretation of particular artifacts or forms of data as well as about organizational and behavioral aspects of extinct societies (Longacre 1971:136). Gould (1971:175) has pointed out that ethnographic knowledge can be brought to bear at three levels of archaeological research. In each case historical documentation might easily be substituted for the ethnographic sources. The first level of practical interpretation involves the use of informants (documents) to locate sites and describe background mythology or historical information relating to the sites. The second level of specific interpretation is directed toward solving particular problems within the context of an individual site. An example might be the functional interpretation of a tool type. Finally, general interpretation attempts to present broad explanations of culture history and process.

Within the present study the analysis of the archaeological data will primarily employ documentary sources at the second level. Here the documentary sources need not directly refer to the particular site under consideration. However, they need to depict contemporary culture to aid the general functional interpretation of material remains found at any site of a particular cultural affiliation that was occupied during a specific past time period. Of course, the documentary data used in this manner must be separate from those used later to substantiate the validity of the archaeological postulates. Ideally, they should be sources general enough to have a very broad degree of application yet be specific enough to assist the interpretation of items and configurations of items that might otherwise remain conjectural. Documentary sources will also be utilized at the third level in that they will constitute the means by which to verify the conclusions arrived at through the use of the archaeological methodology.

The central problem of this study is that of determining the use of archaeological methodology in identifying variability and change in the behavioral aspects of socio-cultural systems to the extent that it will be possible to

recognize archaeologically a particular process described in the frontier model.

Two considerations in carrying out a study of this nature are: first, that the site or series of sites chosen must have extensive historical documentation on various aspects of their entire occupations, and second, that the sites must have been subjected to extensive archaeological investigations in order to provide as close a complete sample as possible of the spatial and temporal array of material evidence. For these reasons the site of Jamestown in the Colonial National Historical Park, Virginia, has been selected for this study. Not only has the site of the town and much of its surrounding area been the object of thorough archaeological excavations, but the unique position of Jamestown in the early colonial history of English North America has resulted in the amassing of great quantities of documents concerning the background, history, and development of the site.

As will be discussed in detail later, Jamestown also represents a physical situation of contact between two societies of the type in which the process identified by the frontier model would usually occur. The documentary and archaeological data will respectively provide the information necessary to establish at Jamestown the occurrence

of those changes indicated by the characteristics of the model and to recognize these changes in light of the remains left behind by the societies involved in this contact situation.

CHAPTER II

THE FRONTIER MODEL AND ITS DEVELOPMENT

Before attempting to deal directly with the great mass of archaeological and documentary data from Jamestown, it is necessary to discuss the model of sociocultural change used in analyzing this data. The role of models in archaeology is twofold. First, a model serves as the means by which the investigator attempts to establish hypotheses or sets of hypotheses which serve to simplify complex observations from the data. Second, a model represents a predictive framework upon which to structure certain of these observations. Models accomplish these aims by ignoring information "outside of the model's frame of reference and making accurate generalizations within it" (Clarke 1968:32).

The frontier model deals primarily with sociocultural change among intrusive cultures faced with adaptation to a frontier situation. It is based upon ethnographic and historical data from which a number of generalized characteristics have been drawn. These characteristics then act

as a set of hypotheses upon which new data may be organized and analyzed. The scope of the frontier model is necessarily limited to analyzing changes within the intrusive culture but excludes certain other changes that precipitate colonization or, in fact, are the result of the colonization. For example, the model is not designed to deal with the conditions that motivated colonization or migration nor is it overly concerned with the effect of the colonization on indigenous peoples. The frontier model was developed for investigating a particular process of sociocultural change within these confines. Such a model is actually the result of several converging lines of interest involving historians, geographers, and anthropologists.

The phenomena of culture change has long been the subject of anthropological inquiry. Change involves the acculturation of a sociocultural system in response to the pressures of a changing world. Such change is often brought about by interaction with foreign peoples with whom little or no previous contact had taken place. Anthropology has traditionally been concerned with the aboriginal, nonwestern societies of the world, and its studies have usually dealt with changes among these peoples as they have been exposed to the brunt of European expansion and subsequent colonization.

Colonization is a two-way proposition which results in changes to both of the cultures involved; however, only in historical and, to some extent, in sociological literature have studies of the effect of colonization on the intrusive peoples had a substantial impact.

Perhaps the best known early proponent of the role of the frontier in culture change was the nineteenth-century historian, Frederick Jackson Turner. As early as 1893 he wrote of the North American frontier:

The evolution of institutions in a limited area is a process which occurs in each western area reached in the process of expansion . . . As successive terminal moraines result from successive glaciations, so each frontier leaves its traces behind it, and when it becomes a settled area the region still partakes of the frontier characteristics . . . Line by line as we read from west to east we find the record of social evolution (Turner 1893:200-201).

Twenty-five years later, he stressed the value of the vantage point of the frontier in the study of change in addition to that of the colonists' homeland. Speaking of the colonist, he wrote:

Whatever old names attached to his institutions they became essentially different things in their operation, their adjustments, and their modifications to suit the American conditions" (Jacobs 1965:107).

Turner, however, did not view the frontier in a comparative sense but rather saw it as the unique result of the European expansion in America. Indeed, this bias seems to

have limited his perception of the frontier to the extent that it ruled out his use of comparative studies (Hofstadter 1968:74). His particularistic notions should not be construed to negate the usefulness of two of his concepts which apply here: the necessity for a culture to adapt certain of its features when confronted with a different environment and the repetitive manner of this adaptation in relation to the movement or "advancement" of the frontier itself.

James G. Leyburn broadened Turner's concept of the American frontier change to include frontiers in a general sense. In his book, Frontier Folkways (1935:2), the frontier is viewed as:

. . . that region on the outer fringe of settlement where pioneers are forced, for the sake of survival, to make new adjustments to a raw environment. It is a region, it is a process . . . if the student of process devotes himself to the process, endeavoring by comparison of one frontier to another to get at the basic structure of social institutions and the true nature of custom, his attention is fixed upon an impersonal series of actions--adjustments--whose working out enables societies to survive amidst the hostility of nature and the aborigines.

Leyburn's emphasis (1935:4) on the explanation of change by the use of comparisons not limited by time or space is somewhat reminiscent of later anthropological writers such as Steward (1949 and 1955) though perhaps less sophisticated. Of equal importance is his realization that all societies as integrated wholes are adapted to

their particular physical environments as well as to other societies and that the removal of a society into a markedly different physical and social environment necessitates an alteration of its "traditional adjustments" to permit its continued existence. Leyburn's use of comparative evidence resulted in the distinguishing of a number of "subtypes of social adjustment" based on variation in motives for colonization and the nature of the colony. It also led to a generalized "process" of adjustment and adaptation through which all colonies are assumed to pass (Leyburn 1935:4). His "small farm frontier" subtype most closely resembles the type of colonization dealt with by later authors.

Both Turner and Leyburn worked with societies of the past and based their studies essentially upon historical data alone. Although utilizing adequately documented situations of culture change to reconstruct their models, all of these sequences are of a retrospective nature and, for this reason, were not subject to "in process" analysis.

Anthropologists on the other hand seem to have shown little concern for studies dealing with the effect of colonization on the colonists. Even though early statements agreed that acculturation brought about changes in both groups involved (Redfield, Linton, and Herskovits 1936:149), their interest in the dynamic aspects of this phenomenon led them

back to the study of the indigenous, nonwestern peoples, the details of whose acculturation was more readily at hand (see Herskovits 1948:524). Attempts to describe the reverse acculturation in papers such as those by Hallowell (1957a and 1957b) have tended to overestimate the impact of the indigenous culture by citing scattered and often unrelated traits that have passed to American culture from the Indian cultures.

It has been only recently that anthropologists have combined their examination of the dynamics of culture change with the historians' and geographers' regard for frontiers as adaptive situations. As Thompson (1973:3) points out, the frontier provides not only one of the most dramatic instances of change in natural habitat but also the methodological advantage of allowing the investigator to define a "base line" culture from which to measure change.

As a result of this pooling of ideas, attempts have been made to overcome the shortcomings of earlier writers by conducting analyses of culture change among intrusive groups in contemporary frontier situations. This type of study makes possible observation of the dynamic aspect of change in a known culture when it is exposed to certain variables to which it must adapt.

On the basis of their study of colonization in formerly isolated areas of Ecuador, Casagrande, Thompson, and Young (1964) have postulated a series of cross-cultural regularities present in the colonization process. This phenomenon of change has been characterized by the term "colonization gradient." Basically, the colonization gradient is an effort to deal with those changes undergone by an already established sociocultural system as it is extended, replicated, or reintegrated. It also involves the "creative process" necessitated by the accommodation of colonists to a new ecological situation and to novel sociopolitical and economic arrangements.

Colonization is viewed through biological analogy as:

. . . a process whereby a type of organism establishes itself in a new ecological niche. By doing so it may supplant another type of organism, occupy interstitial areas, or come to some form of symbiotic adjustment with other species in the new environment . . . It is analogous to the spread of a species by radiation whereby the species tends to expand its range over the space available to it within a given ecological niche until stopped by a competing species within that niche with a boundary situation with which it cannot cope (Casagrande, et al. 1964:283).

When applied to colonization by human populations, the factors of political and technological superiority of the intrusive peoples are usually requisite to their expansion into a frontier. However, the inability of the colonists

to divorce themselves from their traditions tends to encourage the maintenance of the principal features of the parent sociocultural system in an attempt to retain integration with it.

The basic unit of description and analysis is the "area of colonization," which constitutes the delimited spatial area in which the sociocultural changes take place. It extends from the entrepot that connects it with the outside world of the parent culture to the unfolding frontier. In this area the colonization gradient is manifested.

Perhaps the most distinctive feature of the area of colonization as a whole is the rapid tempo of change and the pervasive flexibility of its geographical boundaries, its settlements and their social structure, its economic, political, and social institutions. As one moves away from the metropolitan area (where the parent culture is dominant) and toward the frontier, and as the links with national institutions become more tenuous, fluidity increases and social and cultural attrition is more evident. This phenomenon we call the colonization gradient (Casagrande, et al. 1964:311).

The simplification of the intrusive culture or loss of its specialized forms appears to express the evolutionary principle which states that a generalized, non-specialized culture is more "highly efficient in dealing with an extensive, relatively open environment" (Sahlins and Service 1960: 52).

The colonization gradient is reflected in a definite settlement pattern that varies with the function of each settlement, with the relationships of each settlement to one another, and to the moving frontier.

Casagrande, et al. (1964:312-313) have described five settlement types which are characteristic of the colonization gradient. They are as follows:

1. The entrepot is the vital link of the frontier area to the metropolitan area from which the colonists came. It is located within or on the edge of the metropolitan area and is the terminus of the transportation system that serves the frontier. The entrepot further provides the main connection of the settlements in the area of colonization with the national level of sociocultural integration.

2. The frontier town serves as a supply center for the surrounding territory within the area of colonization. It is also the jumping-off point for new colonists entering the colony. Not only is it the terminus of the transportation network linking the colony to the metropolitan area, but it also serves as the focal point of social, political, economic, and religious activity in the colony. The frontier town is often the seat of the municipal government and the exclusive location of a rather complete range of national institutions, including banks, land

offices, and medical facilities in the area of colonization. Its function as a market for goods from the frontier, as well as a market for those from the outside world, tends to make the frontier town a center of social activity within the colony. It is larger than the other local settlements in the vicinity and contains a large number of people who provide goods and services. Demographically, it is characterized by a greater proportion of males and younger people.

3. Further away from the more settled area of the colony are the nucleated settlements. Each of these is composed of a number of households politically organized to the extent of having a municipal government. The position of each at the end of a transportation route makes them a secondary foci of social and political activity in the area; although they are joined by the governmental affairs to the frontier town. Many of these matters, however, are carried out only on an irregular basis.

4. Semi-nucleated settlements have no facilities for the dispersal of provisions larger than the individual house. The settlements are characterized by a singular lack of integration and facilities rather than by their presence.

5. Finally, dispersed settlements are zones inside the area of colonization identified by the presence of

scattered houses that are frequently not even located on trails or roads. They may be included in a larger corporate entity but are usually only loosely integrated in it.

In addition to viewing these settlement types with their spatial arrangements and functions, it is also possible to consider them temporally as:

. . . graded stages in a developmental process by which the area of colonization may achieve a higher level of socioeconomic integration that tends to approximate the national level of the . . . metropolitan area (Casagrande, et al. 1964:314).

Thus, a settlement might go through the stages of dispersed settlement, semi-nucleated settlement, nucleated settlement, and frontier town. But each settlement need not go through all of these stages and may, after reaching a high point, even retrogress to the state of becoming a ghost town. In the case of each a culmination stage is reached when the area of colonization becomes integrated at the national level. The various types of settlements may remain, but as they are not all part of the metropolitan area itself, they are likely to differ demographically from their frontier counterparts and are integrated more directly with the towns and cities of the metropolitan area than with the frontier town alone.

Examined spatially, the divergence from the traditional culture increases with receding proximity to the metropolitan

area and is a function of accessibility to the main transportation route leading to the metropolitan area. Owing to the rapidity of advancement in some frontier areas, an interesting phenomenon often occurs by which settlements along the main transportation routes are integrated to the degree of becoming towns but then are "passed over" by the advancing frontier. Their roles, having been taken over by other settlements but not yet being part of the metropolitan area, are no longer viable parts of the frontier and are often abandoned completely and become "ghost towns."

The success of colonization has been hypothesized as being dependent on the magnitude, direction, and changes over time of the gap between the level of expectation of the colonists and the extent to which their expectations are realized. This would be reflected by the decision of the colonists to remain in their new location. The level of expectation seems to vary directly with the previous socioeconomic status of each colonist (Casagrande, et al. 1964:316-317).

In his study of a Japanese immigrant colony in eastern Bolivia, Thompson (1970:4) has attempted to determine the nature of proposed "broad regularities" that underlies the colonization of a frontier. He has described three variables which might significantly affect the nature of

sociocultural change on the frontier. These are chiefly concerned with classifying various types of frontier communities in order to determine the limits of theoretical generalizations derived from his data.

The first concerns the type of colonization involved. Those types that entail only males or are transitory in nature such as Leyburn's "camp frontiers" and "exploitive plantations" as well as the category of trappers and traders have been eliminated from consideration here. Hence, only cases of permanent agricultural settlement that are characterized by relatively large tracts of land are suitable for study (Thompson 1973:11).

Second, the geographical continuity of the colony and the homeland may influence the development of the colony in that important political or geographical boundaries would be reflected in the communication and continuity maintained with the metropolitan area (Thompson 1970:198).

Finally, the degree of homogeneity sustained by the colonists as a group may affect the colony's ability to cope with its new environment as well as its very success. This variable does not seem to generally affect settlement; however, and a diffuse settlement pattern almost always occurs except where extreme conditions in the social or physical environment prevail (Thompson 1973:13).

The Bolivian colony clearly represents an agricultural frontier composed of what Leyburn (1935:6) has defined as "settlement plantations." Though widely separated from its homeland and interacting peripherally with the Bolivians, it has maintained continuity with Japan. Finally, the heterogeneity of its inhabitants has resulted in factionalism but has not caused the colony to fail. It seems, then, that those conclusions drawn from this situation should be equally applicable to colonies which share a similar range of behavior with regard to the above mentioned variables.

Thompson (1970:198-201) draws four principal theoretical conclusions:

1. "Cultural impoverishment" or reduction of cultural complexity is an inevitable concomitant of the frontier regardless of the economic base. The degree of impoverishment varies with the discrepancy in levels of expectation and realization of the colonists in the manner suggested by the theory of relative deprivation (see Stouffer, et al. 1949).

2. In agricultural frontier communities the relationship of the settlement pattern to market agriculture favors the maintenance of complex households as opposed to a fragmentation of such groups. In situations where land is plentiful and labor scarce, large families and multi-family

households have an adaptive advantage in that they can more effectively exploit the land.

3. Crops cultivated in an agricultural frontier are limited by the primitive transportation network available. A market orientation and the difficulty of access to the chief market impose limitations on the choice of cultigens that may be grown in the colony.

4. Finally, factionalism is extremely prevalent on the frontier. It results from the conditions of free and cheap land and a lack of hostile aborigines which favor a dispersed settlement pattern of isolated homesteads. Such a dispersed settlement pattern, in turn, restricts social contacts and breaks down traditional cooperative labor patterns.

In a recent paper Wells (1973) has regarded both intrusive and indigenous societies involved in a contact situation as representing a single "system" of interaction. Wells (1973) sees a frontier system as a phenomenon consisting of "a dynamic social network that covers an extensive geographic area and which links a number of culturally distinct societies." This concept is notable in that it tries to explain the adaptive changes of the societies incorporated in such a system in terms of their relationships as components of a larger system.

The frontier system must have the following characteristics: at least one focus where wealth and political control rest; territorial expansion directed away from the focus; direct contact with culturally distinct societies that results in reciprocal diffusion and mutual socioeconomic adaptations that create changes in both societies; and finally, the presence of a single communications network that links the intrusive as well as the various societies of the frontier system together (Wells 1973:7-8). Particularly important in defining the adaptation of any of these aboriginal societies is to determine a society's position in the communication network and the geographical zone it occupies in relation to the focus of the system (Wells 1973:10).

Roughly speaking, Wells' approach strongly resembles the notion of the colonization gradient except that the former places its emphasis primarily on the effect of colonization on the indigenous peoples. Both Wells and Casagrande, et al. recognized the phenomenon of sociocultural variation in relation to the geographical and cultural proximity to the focus of the system, the frontier town. The various settlements are united by a communications network to this focus which in turn is linked to the entrepot on the edge of the metropolitan area. The typology of

settlements established by Casagrande, Thompson, and Young indicates the settlements' relationship to the metropolitan area in time and space. Changes within the communications network over a period of time would result in those changes observed in the component settlements of the colonization gradient. On the basis of the information given in the above discussion along with that found in additional papers by Thompson (1971 and 1973), a number of criteria have been set forth which may be incorporated into a "frontier model" of sociocultural change. These criteria should, in turn, reflect the workings of the systemic variables that are interacting within the framework of the sociocultural system and its subsystems which are undergoing change in a frontier situation.

However, before attempting to discuss the systemic characteristics of the frontier model, a brief summary will be made of those phenomena which constitute its observable characteristics as delineated above. These may be divided into two categories; the diagnostic traits of the model itself and a series of what may be termed "preconditions" which must exist in a given situation if the changes to be described in the model are to occur. These preconditions must be identified in order to determine whether or not the context, archaeological or otherwise, has the potential of

revealing the model of change. The preconditions may be described as follows:

1. Two distinct sociocultural entities must be in contact with one another. The more complex of these must be apart from, or at least on the periphery of, its previously occupied territory. The degree of separation visible here may well be directly related to the ability to recognize and observe the presence of an intrusive people in an alien environment. Obviously, the intrusive society must intend to maintain permanent residence in its new territory.

2. The level of sociocultural integration of the intrusive culture must at least be that of a stratified society as outlined by Fried (1967:186-190). This presupposes the existence of a hierarchical organization of statuses and economic functions based on differential access to the basic resources the society utilizes. Such societies are usually distinguished by a relatively complex technology and consequently, a varied division of labor. Maintaining this organization demands sanctions that command power beyond the resources of a kinship system. When these sanctions appear, they lead to the development of a state by means of certain mechanisms of integration which involve legitimized force (Service 1962:173-174).

The management of an organized penetration of a frontier area not contiguous with the homeland requires overseeing by a society capable of directing its resources to sustain long-term supply and communications between a basically nonproductive segment and its parent society. Sanders and Price (1968:198) have noted that societies must be integrated at the urban state-level in order to play the crucial role of catalyst in the expansion and development of subsidiary urban communities through long-range trade and colonization. They have also observed that the institutional role of markets, which tends to figure prominently in the integration of colonies to the metropolitan area, also is of paramount importance in the integration of the many components of state societies. The nature of the attenuated link involved in colonization indicates the presence of such a hierarchically organized society, very likely one organized at a state-level of sociocultural integration. This precondition will serve to define the "base line" culture of this study, and it is from this description that all aspects of change in the area of colonization must be reckoned.

3. The indigenous culture's integration must be lower than the intrusive culture's. The particular level is not important; however, its ability to challenge the

intrusion of a foreign colony will vary with the technological and organizational means it has available. As Fried (1967:215) points out, the ability of a hierarchically structured society to divert resources and labor into military activities associated with expansion and conquest give it an obvious advantage over a sociocultural system without this capability.

Together with the new and alien physical environment of the frontier area, the indigenous culture must be considered as an agent of social change acting upon the colonial society. Usually the indigenous society's role is considered insignificant compared to the effect of the new physical environment. Indeed, those elements of native culture most likely to be adopted by the intrusive culture are limited to those which may facilitate its achieving a more favorable adjustment (Thompson 1970:6-7). Fried (1952:410-411) recognized the indigenous culture's form of "social organization" as being important in determining the manner of its contact with a more complex culture. He suggested that the difference between the ways in which exploitative rights to strategic resources are distributed in the two societies will tend to govern the outcome of this contact. Ultimately, this contact results in the annihilation, gradual transformation, or incorporation of the indigenous

people. In ecological terms the greater adaptiveness of the stratified society nearly precludes any other outcome from the contact (see Sanders and Price 1968:235). This outcome, however, is also dependent on two other factors: the character of the physical environment in the area of colonization and the intrusive society's ability to retain effective communication with its segments and with the parent society. The final two preconditions of the frontier model will deal with these two aspects in terms of the area of colonization.

4. In broad perspective the area of colonization must contain the potential of useful exploitation by the intrusive culture. Despite the "primeval" condition of the newly settled region, the colonists must be able to re-establish subsistence activities there in order to physically sustain the colony on a permanent basis. Thompson (1973:11) has pointed out that the primary attraction of a frontier area to a society based upon agriculture is an abundance of land. This availability of land is the primary prerequisite for the establishment of a subsistence base in an area under colonization. Of course, subsistence activities should be seen in terms of the level of integration and technological complexity of the intrusive culture. The technological complexity possessed by societies with high levels of integration

allows them decided advantages in the exploitation of native food resources along with other cultigens introduced by them. Hence, potential areas of colonization must be viewed in accordance with not only its native resources but also its ability to support subsistence activities which the intrusive culture might bring with it. In short this precondition may be investigated in light of its ecological potential for exploitation by the sociocultural system introduced by the colonists.

5. Finally, the area of colonization must be accessible to the colonists. This presupposes that, given the degree of technological complexity of the intrusive society, it will be possible to travel from the homeland to the frontier area. It also assumes that this area will be internally accessible to allow the colonists to expand within it while simultaneously keeping up a regularized communication with the other components of the colony as well as with the metropolitan area.

An important aspect of communications with a frontier area is the role played by markets. The frontier system is tied culturally and economically to a central hub, the frontier town. From here alone the system is connected to the entrepot in the homeland. For this reason the passage of market products will be restricted to a limited network

of routes. The very existence of the colony is dependent on the movement of these products. Because of the confinement of the frontier system's components to particular relationships within this network, other means of communication than those involving market products alone would be likely to be restricted to it. Consequently, the extent to which an area might be physically amenable to frontier settlement is limited to the degree to which the area will allow the transportation of market products to and from the frontier town.

Environmental barriers, therefore, play a prominent role in determining an area's capacity to be colonized. Thompson (1973:11) observes that the unaltered condition of the area of colonization usually forces a dependence on natural transportation routes such as rivers and other waterways in lieu of roads. Hence, regions marked by such features are desirable to the colonist. Conversely, those regions lacking these features and exhibiting natural barriers, for instance mountains or impenetrable swamps, would be avoided by him.

Factors affecting communication, like those governing the exploitation of the land itself, must be considered in terms of their ecological relationships with the intrusive society to determine the possibility of colonization in a

particular locale or region. It must be emphasized that the presence of these two factors, along with the other three preconditions, does not by itself indicate the existence of a frontier system or the presence of the model of frontier change. These phenomena must be identified by those characteristics specified in the model itself. The preconditions may be seen as necessary elements that must be present for the frontier colonization process to take place, but their presence alone does not make it inevitable.

The relevance of the frontier model to a given situation is, on the other hand, dependent on the presence of certain traits that describe the nature of changes inherent in the frontier colonization process. Eight major characteristics of the frontier model may be stated as follows:

1. Prolonged contact must exist between the intrusive and indigenous cultures and result in mutual diffusion. This would exclude transient contacts of the type found in "camp frontiers" and "exploitation plantations" in which the effect of adaptation by the colonists will persist only as long as the short-term duration of the contact lasts. It is only within the context of the "small farm" and the "settlement plantation" (see Leyburn 1935) types of colonization that the intent of the colonists to remain is inherent. The adaptation undergone by these types of settlement

will obviously involve diffused elements from native cultures. Although not of primary concern here, the acculturation experienced by the indigenous peoples as a consequence of the frontier contact will be inclined to be more profound if the contact is continuous.

2. The intrusive culture must exhibit a sudden loss of complexity and become much more generalized and unspecialized as it tries to adapt itself to a new series of ecological relationships imposed by the new environment. This disappearance of many specialized and even typical culture traits has been termed "cultural impoverishment" (Thompson 1970:198-199).

3. The settlement pattern of the intrusive culture will become noticeably more dispersed than in the homeland. This is primarily because of the individual pioneer's access to large areas of land and its potential agricultural bounty and to an initially poor transportation network. The dispersion is apparently a universal trait of frontiers except where particular ecological conditions operate as a control over dispersion. Examples of such controls might be the use of intensive agricultural techniques brought about by the necessity for irrigation in the settlement of arid regions and the clustering of homesteads close to a fort due to a persistent danger from hostile aborigines.

Inherently tied to this dispersion tendency is a breakdown in those traditional cooperative work patterns found in the metropolitan area. A breakdown of this sort, when combined with the heterogeneous nature of the colonists as a whole, usually results in conflict and factionalism that would normally be avoided if the usual mechanisms of integration are operative.

4. The dispersed settlements in the area of colonization will be organized around one focal point at least, the frontier town, which will function as the main connection between the colony and the entrepot in the metropolitan area. This focus should serve as the center of social, political, economic, and religious activities within the colony and as the terminus of the transportation network linking the colony to the homeland. It also operates as the funnel through which new immigrants to the frontier must pass. Its position as a transient and commercial hub of the colony "system" distinguishes it from other components found within the area of colonization.

5. The settlements will, in turn, be joined together by a communications network which entails ties of several different types. Mainly, it will provide the economic communication necessary to support the outlying settlements and to allow them to dispose of their excess or marketable

produce. Politically, communications provide at least a minimum of organization and control inside the colony. Such control serves not only to unify the colony in its early years when hostile aborigines and shortages of basic materials pose very real dangers but also later to furnish the means by which the settlements of the frontier area may be integrated more fully with the metropolitan area. Religious and prestige systems of communications should also supply mechanisms of integration; although, their roles may be completely different from their respective counterparts in the metropolitan area. All of these aspects of the communications network link the settlements to one another and to the outside world through the frontier town. It is presumably through this network that information from the metropolitan area is received, transmitted, and modified by the pressures exerted by other components of the colonial system.

6. Related to the network of communications that ties the colony, the frontier town, and the homeland together is the colonization gradient concept. This states that settlements in the network will vary in complexity and in similarity to the culture of the metropolitan area according to their distance from the focus. As the frontier expands through time, this gradient should also be discernible

temporally within certain sites which have played the roles of several different types of components through the years, perhaps even ending up as the focus of a later frontier network.

The process of change that is an integral part of the colonization gradient will be the primary concern of this study, for it is the notion of regularized change by intrusive societies encountering frontier situations that is elemental to it.

7. The limitations of the new environment and primitive transportation network will have a number of effects on the economic aspects of frontier society but probably none so profound as on its basic food resources. For this reason the utilization of a limited number of crops by the intrusive society is to be expected. Those chosen should be crops most adaptable to the local environment and thus may include indigenous as well as introduced cultigens. This choice may be further conditioned by familiarity with certain crops, a factor which often outweighs a rational assessment of the local environment's potential. In a settlement plantation frontier this choice may be even further restricted to those crops that can be transported to market (Thompson 1973:14-15).

8. Lastly, the success of the colony can be measured by the colonists' tendency to remain in the area of colonization. This will happen only if the level of expectation of each colonist is reached. It is possible to gauge this by comparing the levels of subsistence in the colony and in the metropolitan area from which the colonists came. A much more apparent sign of success in the colony is long-term occupation by the intrusive society accompanied by population growth and expansion in the area of colonization.

In the succeeding chapter, the systemic variables that are reflected in the above model of the frontier process will be investigated. Changes in these variables should identify adaptations of various subsystems to the pressures placed on them by the frontier environment. It is proposed that such changes will be observable in the archaeological record and that it will be possible to identify the process of frontier change archaeologically.

The ability of archaeological method to accomplish this is the central concern of this study. More precisely, it is concerned with analyzing the capability of this method to recognize a particular model of change in a single historical situation.

The most promising method of testing its ability to do so is to utilize the deductive model outlined by philosophers of science (Hempel 1966 and Hempel and Oppenheim 1948). Fritz and Plog (1970:407) have recently summarized it in the following manner. Particular phenomena are explained by and may be seen as the cause or effect of other particular phenomena. The relationship between these two sets of phenomena is defined by laws which provide the explanation of cause and effect between all such sets of phenomena. The deductive model is designed to establish the validity of such laws.

In this case the law becomes a hypothesis to be tested. A hypothesis of this sort consists of those conditions which are offered for the particular explanation of a phenomena as well as the laws which make the explanation predictable. In order to test the relationships between the variables described in the hypothesis, it is next necessary to deduce a series to test implications which predict similar relationships in the data. The analysis of the collected data should then confirm or deny the hypothesis by affirming or refuting its test implications (Fritz and Plog 1970:410-411). Hill (1970a:27) has pointed out that hypotheses that do not test in the affirmative are just as important as those that do, for they provide new information upon which to base new hypotheses for further testing.

This study will deal with the efficiency of the archaeological method in recognizing the occurrence of the frontier model through the use of archaeological data from a particular site, Jamestown. It is based upon the relationship of two sets of phenomena, changes that took place within the sociocultural system that existed at the site, and the material remains which that system left behind. The proposed "law" that unites these two sets is simply the statement that human behavior now and in the past is patterned or structured and changes through time, and the remains left behind by the social system that produced this behavior will likewise mirror this structure and the changes within it (Hill 1970b:104). Thus, it may be presumed that, if this statement is true, archaeological method can make valid inferences concerning a past sociocultural system from its material remains.

Stated as a hypothesis, this statement is combined with the explanation of the ability to recognize a particular model of change at Jamestown in the following manner. Given the proposition that valid inferences can be drawn with archaeological method, the archaeological data from Jamestown will provide evidence of the changes described by the frontier model because a frontier situation, with Jamestown as the frontier town, existed on the eastern Virginia

peninsula in the early seventeenth century. In order to affirm such a hypothesis, test implications must be drawn in terms of data independent of that used to develop the hypothesis in the first place. As the archaeological data from Jamestown would be utilized in the recognition of the frontier model in that location, it cannot be re-examined to substantiate its own conclusions. To do so would be circular reasoning. Rather, another source of data apart from the archaeology should provide the means by which to demonstrate the predicted relationship between the data and the culture that produced it. The other form of data is historical documentation which occurs in suitable abundance to yield answers concerning the appearance at Jamestown of the process of frontier change described in the model. Indeed, it is for this reason that a historic site such as Jamestown was selected for this study.

When applied to the recognition of the test implications of the above hypothesis, historical documents will be used at Gould's (1971:175) level of general interpretation which tries to make broad interpretations of culture history. Documents may be utilized in the analysis of the archaeological data but only to the extent that they be confined to the role of providing analogy. Historical evidence may also be used at Gould's (1971:175) specific level of

interpretation which will serve only to aid in the functional analysis of particular forms of data that might occur at Jamestown. It must, however, avoid references to actual happenings at the site itself.

In summary, in the following chapters we will test our ability to recognize past sociocultural change which fits a particular model. This argument is based on the assumption that by utilizing archaeological methodology we have the ability to describe and examine past cultures through an analysis of their patterned remains. The study will utilize data from the historic site of Jamestown, Virginia, and historical documentation pertaining to this site will act as a check on the archaeological conclusions.

CHAPTER III

SYSTEMS THEORY, CULTURE CHANGE, AND THE FRONTIER MODEL

In ethnographic literature the frontier model outlined a process of sociocultural change that occurs, if certain conditions are met, within a special type of sociocultural system. This model features several distinct phenomena which have been abstracted from ethnologists' observations of the transformation taking place in contemporary frontier communities. Unfortunately, it is impossible to witness the same range of phenomena archaeologically, for only a residue of material artifacts survive for study. Therefore, the examination of archaeological data requires a different approach from that used by the ethnologists. The archaeological approach consists primarily of determining the relationship between the patterning of the archaeological record and that of the past society being studied. If the investigator is to view the array of material data as part of a once-living culture and attempt to define

structure and variation in the society that produced them, it is necessary to consider the data within a larger organizational framework which will explain all cultural phenomena in terms of an integrated system.

General systems theory provides such a means by which to examine structure and change within society, for through it one may unify the elements of man, culture, and environment into a larger system of interacting parts. Following an ecosystem model, it brings those elements together within a single framework. Such an analysis disposes of geographic idealism, because the emphasis here is not on any particular relationship but on the functioning and nature of the system as a whole (Stoddart 1967:524). The character of the interaction between the components of such a system constitutes its structure. As events, rather than rigid connections, comprise the structural interrelationships in a sociocultural system, that system tends to be dynamic rather than static (Katz and Kahn 1966:94). A system of this type also provides the possibility for an unlimited supply of inputs and outputs as the result of interaction with environmental elements not defined as part of it and, hence, is an open system.

Renfrew (1972:20-21) discusses several points which need to be considered in a study of social systems. The first is that the system may be simplified in form by

combining its states. For example, each man in a social system might himself be regarded as a system, as could each artifact he used, if their atomic and molecular structures were analyzed. In practice this is unrealistic, and the study of large systems becomes a study of selected aspects of them (Ashby 1956:107). In Renfrew's analysis three components are isolated: natural objects (environment), artifacts (including non-material aspects of culture), and people.

Just as it is possible to lump individual elements together to form components, it is also possible and convenient to combine these components and create larger units within the system. If such units are themselves structured, they may be regarded as subsystems.

Renfrew's (1972:21) second point pertains to the establishment of system boundaries. Its spatial boundaries must, of course, be arbitrary, as no settlement is completely isolated from all others. This is certainly true of a frontier colony of a complex society with numerous contacts throughout the world; however, the frontier itself, when considered as a system, might easily be separated from elements that are present in the larger system of which the metropolitan area is a part. Due to the fact that any

system is constantly changing, it is often necessary to redraw these boundaries at different times.

Finally, the complex aspect of cultural systems results in multiple linkages or connections between the elements of the social system. This is the consequence of the multi-dimensional character of man's relationship with his environment. Renfrew (1972:21) suggests that people in society must be "viewed as nodes in a lattice connected in numerous ways, each representing, each way corresponding to one of the various dimensions of the environment." The definition of subsystems must be along the lines of the different kinds of networks. Likewise, the archaeological record may be seen as the byproduct of the operation of such a system of interrelated components. Furthermore, any facet of the record can be referred back to multiple variables or components of the system.

The determinants which operated to produce one part of the archaeological record need not be . . . the same determinants which produced another part of the archaeological record. . . . A single characteristic observed in the archaeological record might well be the compounded byproduct of a number of codeterminal variables (Binford 1968:24).

A cultural system's complexity may be reduced by applying to it the definition of subsystems based on different types of communications which the investigator considers

notable. Regarding this, Wolf (1967:449) has written:

. . . we may regard civilization as social sets, in which the elements are linked to each other in a large variety of ways and with very different degrees of cohesion. Methodologically this means that we do not have to account for all the elements contained in the array or the set--only those we hold to be significant.

Following Renfrew (1972:22-23), four subsystems may be distinguished within a sociocultural system.

1. The subsistence subsystem involves those interactions which relate to the production, acquisition, and distribution of food resources. The components of this subsystem are people, food resources, and food units affiliated by subsistence activities.
2. The economic subsystem is defined by those activities of man which result in the production of material artifacts. Its components are people, the material resources, and the finished artifacts.
3. The social subsystem is a system of behavior patterns in which the defining activities are those that take place between men. The activities may be difficult to separate clearly from those of the subsistence and economic subsystems, but this system differs from the former in that it seeks to discern activities as patterned interpersonal behavior rather than as an aspect of food or craft

production. It is also possible to perceive an economic subsystem in this category.

4. The trade and communication subsystem is identified by those activities that involve transferring information or material goods between and inside human settlements. This subsystem encompasses all activities that entail travel by any of the components of the system whether men or artifacts.

Each of these subsystems can be seen as a self-regulating mechanism in a cyclical sense. The variables of behavior in each are kept in a limited range, because it is necessary for survival (Ashby 1956:197). When systems stay in such a restricted range of variation, they are said to be in stable equilibrium and employ negative feedback. The feedback functions to neutralize change in a system by reducing the source of variation's output (Clarke 1968:48). An example of such a negative feedback mechanism is the ritual cycle of the Tsembaga of New Guinea. The Tsembaga's ritual cycle serves as a check on periodic variation among certain components of their sociocultural system, particularly the rapid increase in the pig population (Rappaport 1968:4).

On the other hand sociocultural systems do change through time, and the source of this change may be traced

to the operation of an alternative mechanism, positive feedback. Rather than diminishing the source of variation's output, positive feedback adds to it (Clarke 1968: 48). It is a "deviation amplifying" phenomenon consisting of "all processes of mutual causal relationships that amplify an insignificant or accidental kick, build up deviation and diverge from the initial condition" (Maruyama 1963: 164). An example of positive feedback is the series of genetic changes that took place in several domestic plants in prehistoric Mesoamerica which caused one minor procurement system to grow out of all proportion to others and led to profound changes in the ecosystem of the Southern Mexican Highlands (Flannery 1971:93-94).

These mechanisms reflect two aspects of general systems theory, those of equilibrium and adaptation, that help to explain change in sociocultural systems. Any living system can be seen as continually attempting to maintain a status quo through adaptive responses to change in its environment. This is accomplished by the mechanism of negative feedback.

Changes in the system itself or "systematic change" occur only when the changes in inputs and outputs in the system are extensive enough to sufficiently disturb this equilibrium so that the homeostatic mechanisms no longer

support a steady state. At this stage, the mechanism of positive feedback comes into play, as the system tries to adapt itself and reach a new equilibrium.

Glassow (1972:291) contends that:

. . . if we are seeking explanations of systematic change, we must look at the interfaces between the system and that portion of the environment to which it is articulated by inputs and outputs of matter and energy.

The adjustment to new environmental variability may require gradual change in the whole system or structural changes in only several subsystems. But if the environmental changes are extreme or persistent enough, these types of adjustment in the system will prove inadequate, and overall structural alteration must ensue if the system is to survive. He further contends that, because of the interdependence of all of the system's components, a change of this nature would be abrupt and comprehensive and would cause relatively complete disorganization followed immediately by reorganization. "Transitional" states would be nonexistent because systematic change is not conceived to be a continuum (Glassow 1972:291). The occurrence of systematic change should likewise be reflected in the archaeological record as a complete reorganization of the patterned remains of the past culture. This notion is extremely relevant to

the frontier model, as it is possible to perceive many changes described in the latter as being so profound as to entail a temporary but complete reorganization of the intrusive sociocultural system.

Renfrew (1972:36-38) sees the mechanism of positive feedback as the primary agent of initiating sociocultural change. Due to the complex interconnectedness and interdependence of subsystems found in larger sociocultural systems, he argues that innovations in one subsystem that facilitate innovations in another will sustain prolonged change. He has introduced the term "multiplier effect" to explain this phenomenon of change in which innovation in one field of human activity can result in change of a different sort in another. He describes the multiplier effect as follows:

Changes or innovations occurring in one field of human activity (in one subsystem of a culture) sometimes act so as to favour changes in other fields (in other subsystems). The multiplier effect is said to operate when these changes in one or more subsystems themselves act so as to enhance the original changes in the first subsystems (Renfrew 1972: 37).

When the multiplier effect is operative, sustained growth takes place on the scale of the sociocultural system and in its structure, resulting in an enlarged and much more complex environment. Thus growth, and presumably

decline, in culturally complex systems is linked to a phenomenon much more complicated than schemes which imply that a single, independent variable is responsible for change. An example of the latter is Boserop's (1965:12) argument for the causal role of population increase in agricultural growth and development.

In summary, the approach offered by systems theory provides a means by which to analyze structural changes outlined by the frontier model. It allows the investigator to group the three components of a sociocultural system (man, artifacts, and natural objects) into separately structured units or subsystems within the context of the larger system. As the complex nature of sociocultural systems leads to a multiplicity of linkages between its elements, subsystems must be defined in terms of the various networks connecting man with the other dimensions of his environment. Renfrew (1972) has proposed four such subsystems, each of which exists in a range of variation regulated by negative feedback mechanisms. Change occurs only when positive feedback mechanisms operate to amplify deviation in the system. Such deviation is an adaptive response to a drastic change in the relationship of the sociocultural system to its environment. Due to the complex interrelationship of the subsystems in such a sociocultural system,

positive feedback within a single subsystem often results in changes in all others. The consequent alterations of the size, complexity, and structure of the total system is caused by the multiplier effect. A major change of this sort is likely to be rapid and extensive and will not produce "transitional" forms as would more significant changes within the system.

The frontier model suggests a process which at first appears to run counter to the multiplier effect. It is chiefly brought about as a consequence of placing a population into an environment so different from that in which it had formerly existed that the normal environmental inputs and outputs from the sociocultural system are severed. This necessitates the immediate restructuring and simplification of the subsystems which are most closely related to this environmental component. Due to the radical changes in the interaction between the subsystems, systemic change would occur causing a general decline in complexity and bringing about the attenuated characteristics of the frontier society. Archaeologically, such change would appear abrupt; hence, it would mirror the extreme alteration in the intrusive people's sociocultural system.

But the frontier still remains tied to the metropolitan area, and this fact is crucial in the colony's development. The inputs the system receives from this outside source allow it not only to begin to successfully compete for the ecological niches human populations occupy in the area of colonization, but also to regain much of its former complexity. The constant influence of the metropolitan area, in effect, modifies the environment and the system's relation to it. It provides the source for positive feedback which, in turn, results in rapid growth through continuous innovation brought about by the multiplier effect's operation.

These general statements will guide the construction of the analysis of the archaeological data recovered at Jamestown. In the next chapter the systemic variables which were involved in the Jamestown frontier will be delineated in detail. First, it is necessary to discuss the intrusive society in regard to its subsystemic components, for it is by an analysis of this system that a "base line" from which change may be calculated can be drawn. Next, it must be established that a portion of the population representing this sociocultural system was transported to another region. The new territory, though basically unmodified, should exhibit potential for exploitation and

incorporation into the network of systemic relationships which characterizes the sociocultural system of the metropolitan area. Contact between the intrusive society and one of a lesser level of complexity must be established in order to provide some knowledge of the potential effect of the indigenous sociocultural system on the former.

On the basis of the evidence to be revealed in this discussion, it should be possible to postulate precisely what variations will occur in the intrusive system from an examination of the characteristics of the frontier model. For example, with a description of the subsistence subsystem of sixteenth-century England in mind, one might state with reasonable certainty that the conditions outlined in the model would predict certain changes in this subsystem through time. Hypotheses based on these assumptions will then form the basis for testing the archaeological data. As the conclusions drawn from these tests will later be subjected to the scrutiny of historical documents, the degree to which it is possible to verify the hypotheses archaeologically will constitute a test of the method used in the archaeological analysis. A major portion of that analysis is founded on the assumption that patterning in the archaeological record reflects systemic patterning in cultures, and confirmation of this assumption

will make it possible to evaluate the validity of systemic analyses of cultures in general.

CHAPTER IV

ENGLAND AND VIRGINIA:

THE PRECONDITIONS OF THE FRONTIER MODEL

Introduction

The occurrence of the changes described in the frontier model depends on the presence of a series of preconditions which are necessary antecedents of the process of frontier change. It is the purpose of this chapter to present evidence pertaining to late sixteenth century England and the coastal region of Virginia in order to demonstrate whether the preconditions of the model are present there.

The first precondition discussed in this chapter will seek to analyze the English sociocultural system in terms of its ability to effectively initiate and maintain a frontier colony. This precondition also serves to establish a base line culture from which to measure subsequent change and adaptation. Two preconditions deal with the suitability of the Virginia environment for colonization and for later

expansion. Elements of the natural environment will form a major component of both intrusive and indigenous socio-cultural systems. As each system is organized differently, the articulation of their elements with those of the environment will assume separate patterns. The relationship expressed by these patterns constitutes the adaptation of each culture. The intrusive culture's expansive nature and its more efficient and extensive utilization of natural resources implies that it will inevitably displace the indigenous culture with which it competes for the same niche. The success of the colony is dependent upon such a displacement.

The fourth precondition involves a discussion of the indigenous cultures of the area of colonization. Though perhaps less significant than the natural environment of the area, they are a source for many frontier innovations and, if powerful enough, may greatly hinder the initial success of the colony. Contact between these groups must be established as the fifth precondition.

As these preconditions do not constitute the criteria for the frontier model itself, their presence need not be established solely on the basis of archaeological data. It will greatly facilitate matters here to utilize the extensive historic and ethnohistoric documentary evidence that is available.

In order to be amenable to analysis, according to the archaeological data, the model of frontier change must be based on a description of the data which takes into account the structure of the sociocultural system that produced it. Many of the model's characteristics have to be defined in terms of the information provided in the preconditions. Therefore, it is necessary that the latter also deal with the systemic aspects of the cultural and natural phenomena they describe. On the basis of such descriptions it will be possible to later construct hypotheses concerning the recognition of the frontier model's characteristics in the archaeological record.

The Intrusive Culture on the Jamestown Frontier:
Great Britain at the Turn of the Seventeenth Century

Introduction

The sixteenth century in Europe marked the full emergence of nation states characterized by increased political centralization, economic and technological complexity, and commercial expansion. This period witnessed not only an increase of trade within Europe itself, but also the beginning of the creation abroad of colonial empires designed to provide strategic resources for the mother countries' use (Flinn 1965:98). Such colonial ventures brought European traders and settlers into contact with diverse societies throughout Asia, Africa, and the Americas and exposed both

the colonist and the aborigine to a variety of new influences.

Not all of the colonies were established for similar purposes; however, and they differed immensely from one another. It is likely that these differences reflected the varying motives of the colonizing states. This study involves early colonization by the British on the east coast of North America.

The English colonies contrasted with the exploitive plantations of the Spanish and others in Middle and South America and the Caribbean and with the extensive trapping and trading frontiers of the French in Canada. The English colonies along the Atlantic coast of North America were characterized by settlements of small farmers who were transplanted there from the Old World by commercial companies to produce raw materials (Parry 1963:226).

Rather than viewing this apparent uniqueness in terms of historical factors alone, the situation may be seen as the operation of a larger sociocultural system constantly readapting to varied stimuli and continually evolving through time. It is possible to regard late sixteenth century English culture as such a system. The definition of its organization should make possible the observation of the phenomena of expansion in light of the operation and interaction of its subsystemic elements.

At the beginning of the seventeenth century an organized group of English colonists landed on the north shore of the James River on the coastal plain of Virginia. The intention of these colonists was to establish a permanent colony in North America.

The discussion of the British sociocultural system of the sixteenth century will follow Renfrew's (1972:21-23) outline which seeks to investigate the different subsystems or types of networks by which the various components of the sociocultural structure are linked. For purposes of analysis he has defined four such subsystems: subsistence, technological, social, and trade or communication. Obviously, a complete analysis of a culture as complex as Britain's would require a very lengthy treatment. Therefore, this study will be limited to the discussion of the interrelationship of those sociocultural elements which bear most directly on the frontier model.

As cultural systems may be seen as part of larger ecological systems, the environmental components of the British culture must not be overlooked. Certainly, the diversity of natural and semi-natural resources in late sixteenth century Britain offered a widely differing potential for exploitation and development in a culture continually growing more complex and specialized. This section will be prefaced by a summary of the regional physiographic conditions

existing in Britain at that time. The information contained in the physiographic section may be referred to later in order to ascertain more fully the environmental components of each of the four subsystems.

The Physical Environment

The island of Great Britain has been divided roughly into two physiographic regions (Fig. 1). These are defined geologically as Paleogenic and Neogenic regions (Stamp 1946: 5). The former consists of a series of separate districts of high relief. Each of these is deeply dissected ancient peneplain with an epigenetic river system more or less re-adapted to the rock structure now exposed. These upland regions are confined mostly to north, west, and southwest Britain and consist of the "Scottish Highlands," the Southern Uplands, the Cheviot and Pennine Hills of northern England, the Cumbrian Mountains to the west of the Pennines, most of Wales, and the southwestern peninsula of England. The Paleogenic region, more commonly called Highland Britain, is described by Stamp (1946:5) as an area in which:

. . . the dominant character of the country is upland. There are high and continuous stretches more than a thousand feet above sea level; plains and valleys occur but they are of limited extent and tend to form interruptions in the general upland character of the country as a whole. In some places are rugged mountains and even at lower levels crags of rock may appear at the surface. Even where the rocks do not thus appear at the surface they are often but thinly

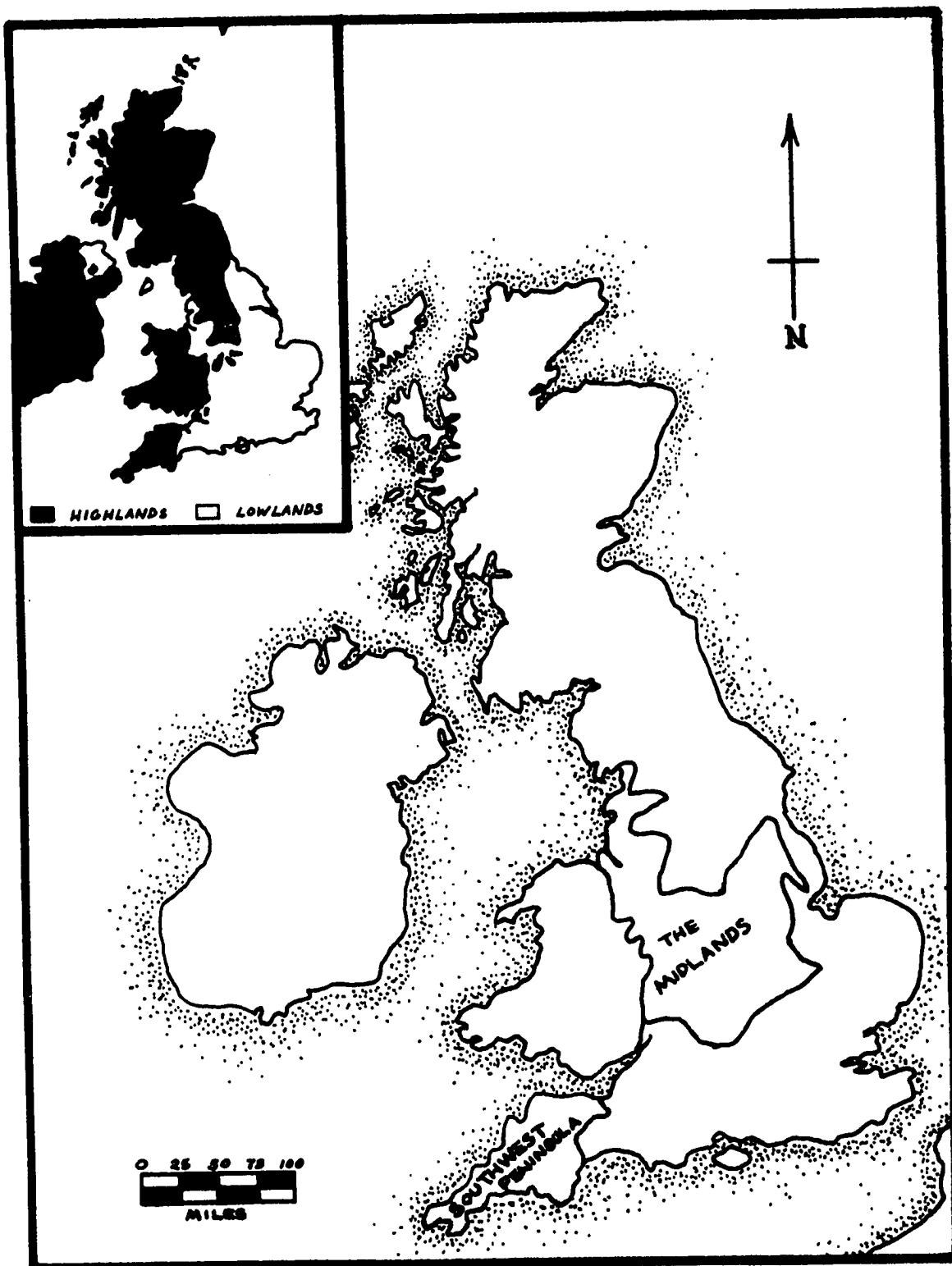


Fig. 1.-- The regions of Britain: the Midlands and the Southwest. Inset shows Highland - Lowland Division.

covered by poor stony soils, whilst the many steep slopes as well as the broken character of the relief may make farming difficult . . . The higher, poorer, wetter or less accessible parts of Highland Britain have been left largely to nature. There are vast stretches of moorland . . . as well as mosses and bogs, scrub woodland and forests.

Paleogenic soils of the Highland region, though varying greatly in terms of lithological and pedological details, tend to have a similar effect on the vegetation. They are predominantly shallow, supporting low oak or birch forests and rough grassland grading to bog in poorly drained areas. With the exception of the Paleogenic limestones, they are generally unsuitable for arable cultivation (Tansley 1949: 14).

In contrast the Neogenic region, or Lowland Britain, is composed of softer sedimentary rocks--shales, clays, sandstones, limestones, and marls--laid down by seas lying to the southeast of an older northwestern continent now represented by the Highlands and much of Ireland. The natural division between Highland and Lowland Britain is formed by the Coal Measures, deposits formed by extensive forests that grew in swamps and later fossilized as coal (Tansley 1949:15). Stamp (1946:6) describes Lowland Britain as:

. . . an undulating lowland where lines of low hills are separated by broad open valleys and where "islands" of upland break the monotony

of the more level areas. Even the highest of the hills scarcely exceeds a thousand feet above sea level, though many of the ridges reach 600 or 700 feet. The environment is kinder; the soils tend to be deeper and richer, there are few steep slopes to interrupt cultivation and plough lands are to be found right to the tops of the hills.

The topography of Lowland Britain is an extension of a plain that runs south along the western coast of France and then eastward in the form of a wedge to include the coast of Sweden and continuing to the Ural Mountains in the north and the Caucasus in the south. Throughout this area, the climate is particularly advantageous to agriculture. The prevailing southwest wind from the Atlantic brings in warm air which is bordered by a high pressure front bringing in cold Arctic air along the Alps and Pyrenees. This forms a corridor in which rainfall is evenly distributed throughout the year. Rainfall averages twenty to forty inches annually, and summers are wet with moderate temperatures (Miskimin 1969:15).

Climatic differences in Highland and Lowland Britain are strongly influenced by the southwest rain-bearing winds which tend to pass over the Highlands first and consequently create an uneven distribution of rainfall over the islands (Fig. 2). The heavy rainfall of over thirty inches for much of the Highlands causes waterlogged conditions in many areas, and in general, the distribution of moorland shows



Fig. 2. -- The climate of Britain: A. The mean annual rainfall, B. The average daily mean temperature.

a close correspondence with both high ground and high rainfall (Stamp 1946:7). On the whole the climate of Britain may be described as temperate and damp with extreme temperatures being rare and never of long duration, and the air having an average high moisture content (Tansley 1949:43).

The following discussion of the subsystemic aspects of English culture would be made needlessly complex if an attempt were made to deal with all of the particular regional variations that existed in the late sixteenth century. To avoid repetition while emphasizing the environmental differences in the two physiographic regions, the discussion will be confined to two smaller areas, one in the Highlands, the other in the Lowlands.

The southwestern peninsula of England, consisting for the most part of the counties of Devon and Cornwall, is a typical Highland region (Fig. 1). Geologically, the region is complex. It contains two eroded mountain chains of Devonian or Carboniferous age which extend from east to west with valleys containing younger rocks. Several larger granite masses are injected into the southern chain, breaking up the surrounding rocks and creating veins of quartz which often contain metal ores. These older rocks are separated from the more recent red sandstones of Permian or Triassic age by a line which roughly follows the Exe River. This

line is also marked by noticeable changes in topography (Hoskins 1954:17).

The topography of Southwest Britain is characterized by plateau surfaces and stream-cut valleys generally oriented in a south or southwesterly direction. The plateau increase in altitude from west to east with Dartmoor, Exmoor, and Bodmin Moor attaining a height of 1300 to 1400 feet above sea level (Shorter, Ravenhill, and Gregory 1969:24). The coastline is extensive and uneven due to the post-glacial rise in sea level which inundated many river valleys and produced deep estuaries stretching far inland (Stamp 1946:215).

Like the topography, the climate of Southwest England is extremely varied. The highland structure and long coastline with many inland estuaries tend to produce a warm, wet climate (Hoskins 1959:21). The maritime air masses passing over the land also vary greatly in temperature, and this causes striking differences in climate between upland moors and the sheltered valleys (Shorter, Ravenhill, and Gregory 1969:55).

Soils also vary with acid brown loams supporting forest vegetation dominated by the pedunculate oak, Quercus robur, that originally covered the valleys and lower hills. Peaty, gleyed podzol soils occur on the poorly drained upland moors which are covered by blanket bogs dominated by heather, Calluna vulgaris. Grasslands and heaths are present in

lower elevations. By the sixteenth century man had greatly changed much of this natural environment by removing the forests and grazing sheep in the moorlands. For the ecological effects of these practices, see Stamp (1948:168), Kayll (1967:32-33), and Gimingham (1970:310-314).

In contrast to the varied environment of the highland Southwest is the lowland region stretching from south of the Pennines from Cheshire in the west to the scarplands of Lincolnshire in the east (Fig. 1). This landlocked, undulating plain is known as the Midlands (Rees 1966:250). Geologically, it is composed of Triassic marls, clays, and sandstones broken by intermittent islands of Paleozoic rocks often containing extensive coal deposits (Stamp 1946:209). Glacial deposits are also present in some areas, greatly varying the content of the soil (Tansley 1949:26).

The climate of the Midlands is dryer with much more pronounced seasonal variation. Rainfall is distributed evenly throughout the year. Three basic soils are present. The rich marls originally supported natural oak forests (Quercetum mixtum) which were dominated by pedunculate oaks, while in the calcareous "Lias" soil in the east, an ash-oak complex forest is common. The lighter, mixed sandy soils are characterized by a mixed oak forest (Quercetum ericetosum) containing both pedunculate and sessile oaks, Quercus sessiliflora.

Sherwood Forest on the Bunter sandstones in Nottinghamshire is an example of such a mixed forest (McCulloch 1969).

Man had greatly reduced the natural forests of the Midlands by the sixteenth century. Agricultural expansion throughout the Middle Ages continually threatened those woodlands not retained as royal forests which served as wildlife preserves and hunting grounds of the nobility (Kerridge 1973: 19).

In addition to the clearing of forests for pasture and arable land, forests were exploited for "small wood" by villages near them. The practice of "coppice-with-standards" involved removing a number of large oak trees to allow the continuous growth of scrubby underwood, particularly hazel, Corylus avellana. Coppiced areas were rotated to allow restoration of soil fertility (Tansley 1949:270-271).

In summary the English Midlands in the sixteenth century was characterized by a uniformity of geology and climate that produced a basically flat, well-watered plain that was ideal for the development of extensive agriculture. The removal of much of the original oak and ash-oak forest vegetation resulted in a semi-natural environment of arable, permanent grasslands and coppiced forests. In contrast the highland Southwest was characterized by a dissected terrain exhibiting great variation in climate and vegetation. This considerably restricted the agricultural potential of this

region, yet it also favored it in terms of the exploitation of other resources.

The Subsistence Subsystem

In late sixteenth century England man's most active and intense interaction with his natural environment involved those activities associated with the food quest. This is not to say that other exploitive activities did not bring him into contact with the natural environment, but rather that food production involved a more intensive participation in the larger ecosystem of which man is part. In England the variation in subsistence patterns reflects markedly the ecological diversity occasioned by the two physiographic regions described above.

Three primary means of subsistence were practiced in late sixteenth century England: agriculture, herding, and in coastal areas, fishing. Each category involved the exploitation of a number of plant or animal resources. These resources differed between the Highlands and Lowlands due to the differing effect of the two environments and the adaptability of each species. Exploitation of the resources in each region is usually associated with particular procurement systems. Each procurement system comprises all those activities pertaining to obtaining a certain resource, and it is often characterized by its own technology which includes both implements and facilities (see Flannery 1971:83). It

is on the basis of these procurement systems that the subsistence activities in England will be analyzed.

The adaptive nature of the procurement systems employed in the metropolitan area is significant when considering their potential development in the area of colonization. It is upon these older systems that adaptations to the new environment must be based and into which new subsistence elements of the frontier must be incorporated if the colony is to survive. For this reason it is necessary to consider the procurement systems not only in terms of their reflection of old adaptations but also in terms of their potential for change and adaptation to new environments.

Procurement Systems--the Midlands. In the Midlands the primary means of agricultural procurement involved the short-term fallowing system. This is a system "in which land cultivated for one or two years is reoccupied after a year of regeneration. The dominant tool is the plow, drawn by draft animals. Such systems are usually associated with the cultivation of cereals . . ." (Wolf 1970:21). Like all other agricultural systems, short fallow farming satisfied six basic requirements: the breaking up of the ground, preparation of a seed bed, restriction of animals from the growing crops, taking the harvest, preparation of crops for storage or use, and finally, the storage of crops (Bower 1961: 5). The uniqueness of the agricultural system employed in

the Midlands lies in the manner in which it was organized to fulfill these requirements. This organization is best reflected in the term "field system" which has been used to signify the manner in which the inhabitants of a township subdivided and tilled their arable, meadow, and pasture-land (Gray 1915:3). In the Midlands two types of short-term fallowing field systems predominated. These have been called the two-field and the three-field systems.

Briefly, the two systems were distinguished, because areas practicing two-field farming left one-half of the arable fallow each year while only one-third of the land cultivated was left fallow under the three-field system. Both may be seen as adaptations to the natural environment as well as to other procurement systems which together formed the traditional mixed farming of the Midlands.

First, the soils of Midland Britain required the use of a plow capable of cutting a deep furrow to turn the heavy clays and loams, while the heavy annual rainfall necessitated plowing methods which would allow adequate drainage of the land. The introduction of the heavy wheeled plow and the plowing of long strip fields seems to have solved both of these problems (Wolf 1966:33). Both of these innovations were intimately tied to one another as well as to the development of open-field farming in Britain.

Open-field farming is characterized by the presence of a number of unenclosed fields surrounding a settlement (Fig. 3). Each of the fields contains holdings belonging to most of the inhabitants. Open-field farming seems to have arisen as land was reclaimed from the Midland forests by the communal labor of a village community. Subsequently, the fields were divided among its members. As additional areas were cleared and added to the initial fields, each individual family received a share in them. Village fields were generally few in number; two, three, and four being the most common numbers of fields. Each of them contained a number of holdings of each farmer (Flinn 1965:7).

The use of the heavy plow required the use of four to six oxen, more than were usually possessed by an individual. Therefore, it was necessary to pool the community's resources for clearing and later, cultivation. The heavy plow also was most efficient in plowing long rows with the least number of turns. Such a procedure resulted in the characteristic strip fields with long parallel furrows. These strip fields were plowed along the contours of the land to allow drainage, and this often produced a patchwork quilt appearance. Thus, the creation of the open-field plots common to both two- and three-field systems may be seen as the result of the need to make the holdings conform to the demands of the plowteam which,

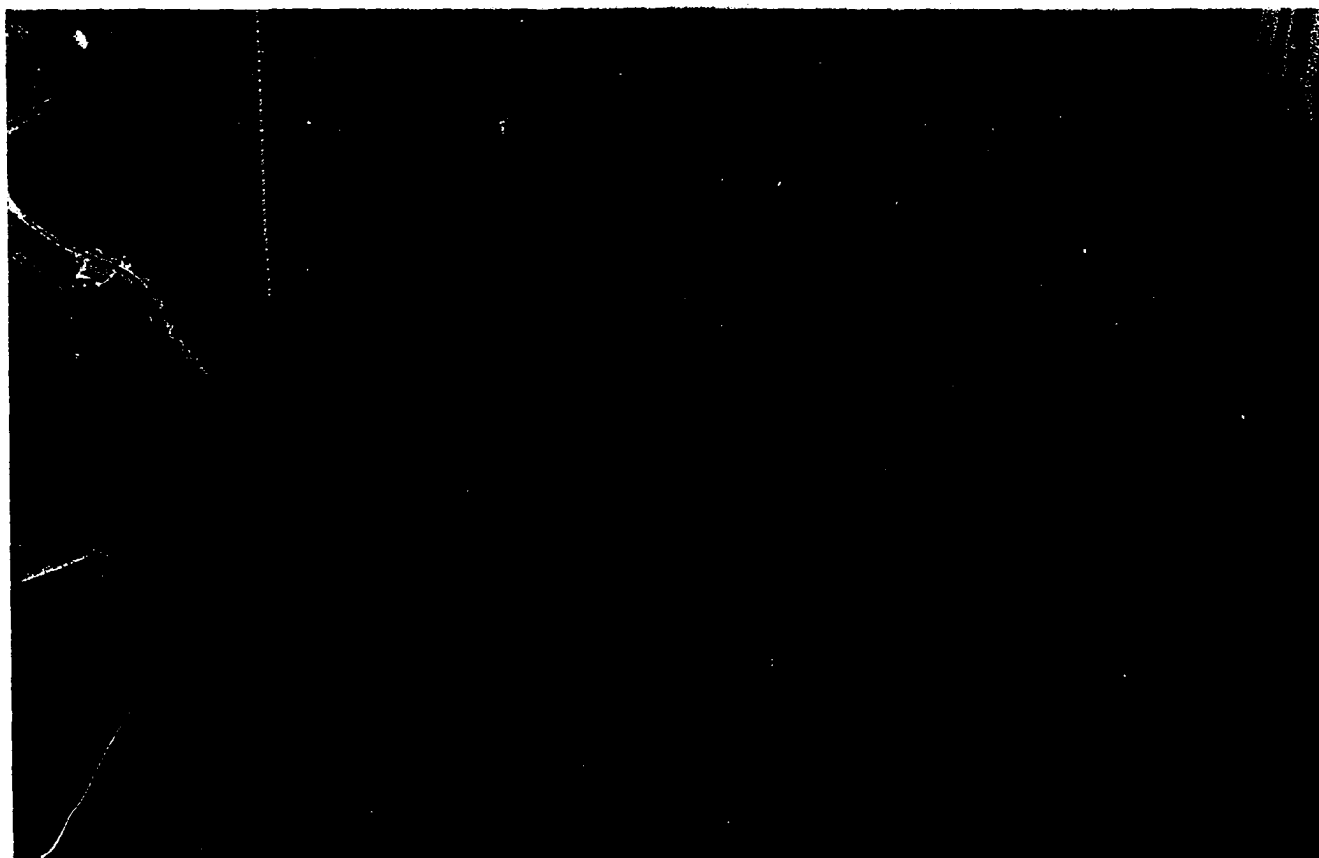


Fig. 3. -- Nucleated village with surrounding open fields, Germany. (U. S. Air Force photo)

in turn, were brought about by the need to adapt to certain conditions.

Rotation of field use was related to the mixed nature of farming practiced in Britain at this time. In addition to arable farming, this included the raising of cattle for draft animals as well as for meat and dairy products and the raising of poultry and pigs. These animals, especially the draft animals, had to be fed and cared for to be available season after season. Hence, some land had to be devoted to the cultivation of animal fodder. Due to the cold winters, arrangements for stall feeding of draft animals had to be made. Because of this, land had to be set aside for the production of hay and feed, and further space was needed for summer pasturage. In order to produce fodder in an agricultural system utilizing draft animals, Boserup (1965:35) suggests that at least one of the following conditions be met: (1) that a considerable part of the land be left as permanent grazing; (2) that the cultivation period is considerably shorter than the fallow period to allow the animals to feed; or (3) that part of the harvest be given to the animals. In the Midlands the use of the two- and three-fields in a rotating manner permitted the communal employment of fallow fields for grazing on a regular basis. Also, the uncultivated common meadows were a source of grass for hay, and they were often irrigated especially for this purpose. It would

seem, as Gray (1915:48) points out, that this need for fodder was the determining factor in the communal two- and three-field systems. In an ecological sense the occurrence of two- and three-field systems is directly related to the extent of potential agricultural land in tillage, for it provides the sole source of food for domestic animals. The presence of open-field systems on the British Channel island of Guernsey (see Harris 1968), an area with limited areas for grazing, tends to substantiate this contention. In contrast these systems are less common in areas with extensive poor grasslands or moorlands for cattle grazing (Uhlig 1971: 108).

In the sixteenth century both two- and three-field systems were in use; although there is evidence the former antedates the latter. As the purpose for the rotation of fields, apart from providing fodder for livestock, was to allow the natural regeneration of the soil, the two systems of rotation provided the means by which land of different quality was most efficiently cultivated. For example, poor land which needed to lie fallow every alternate year in a two-field system might be planted with a grain crop every other year, while better land which could support crops in two successive years, such as a winter crop of wheat and a spring crop of barley, were farmed in a three-field system, leaving the land fallow the third year (Flinn 1965:9).

Postan (1972:50) points out that neither system was always followed rigidly, for variations in local climate and soil as well as other factors, such as transportation and markets, might influence the type of crop grown, the frequency of its repetition in the rotation cycle, and even the amount of arable land utilized for farming or grazing in a particular year.

A wide variety of crops was cultivated under the two- and three-field systems in the Midlands, most strains of which were the result of long artificial selection process. Several winter wheats, Triticum sp., were grown: rivet or cone wheat for cold, retentive, and rank soil and bread wheats for ordinary soils. Spring varieties of wheat were seldom grown. Conversely, spring barley, Hordeum sp., was most commonly grown to the exclusion of winter types of this crop. Only bigg or "beer" barley, Hordeum vulgare, was grown in the winter and then rarely outside the northern parts of England. Spring barleys consisted of late-ripening, middle-ripening, and rath ripe or hotspur varieties. Rye also was grown in spring and winter, but it was most commonly sown in winter as a separate crop or in a mixture with wheat. Rye, Secale cereale, began to decline as the major winter crop in the late Middle Ages as wheat replaced it in popularity (Postan 1972: 51). Oats, Avena sativa ssp., were also planted; naked oats, which made porridge without any milling, black oats,

and "skegs" for poor lands, and red, white, and reed oats for good ones. Postan (1972:52) suggests that the ability of oats to survive in cold and wet conditions caused this crop to be used extensively on newly reclaimed lands after which it was replaced by wheat. Field peas, Pisum sativum and P. arvense, were grown in many variations, including hot-spur varieties; horse, field, or tick beans were also present in winter and spring types; as were winter and spring vetches, Vicia, and tares, V. sativa and V. hirsuta (Kerridge 1972: 37-39).

For non-human consumption other plants were cultivated. Rape, Brassica napus, or cole seed was grown in marshy lands as a forage crop for pigs and sheep; buckwheat, Fagopyrum sp., for poultry feed; mustard, Brassica sp., to smother weeds; woad, Isatis tinctoria, grown for the blue dyestuff extracted from its leaves; saffron, Crocus sativus, for condiments; and flax, Linum usitatissimum; and hemp, Cannabis sativa, for linens and sackcloths (Kerridge 1972:39).

In addition to the short-term fallowing systems of agriculture and mixed farming, pastoralism was practiced to some extent in the Midlands. Pastoralism involved not only the exclusive raising of an animal food source for meat and other byproducts but also the combination and enclosure of pastureland.

Enclosure of land or the separation of private holdings by fences or hedges (Fig. 4) for agriculture was not unknown, and Postan (1972:53) notes the presence of compact plots held in severality by their owners outside the framework of the common fields as early as the fourteenth century. Individual plots seem to be associated with an expansion of farming at this time and with the reclamation of land. In the fifteenth century temporary and some permanent enclosures were allowed on common land for the growing of fodder and for purposes of limited grazing (Hoskins 1957:163). Bennett (1968:71) has demonstrated that a general trend in the increase of grain production had taken place in England since the late Middle Ages. For this reason agricultural enclosures do not seem to have been prompted by a decline in overall productivity as suggested by Ernle (1917:64-65). Instead, it was brought about by a need for more efficient cultivation of specialized crops such as fruit, vegetables, hops, and even barley. Enclosures for specialized agriculture resulted in the closing in of both arable and common grazing lands (commons) in many parts of England where open fields had formerly predominated. The intensive cultivation of individual crops seems to have resulted in an increase in the productivity of certain agricultural items in the sixteenth century. However, its piecemeal nature makes it impossible to determine if

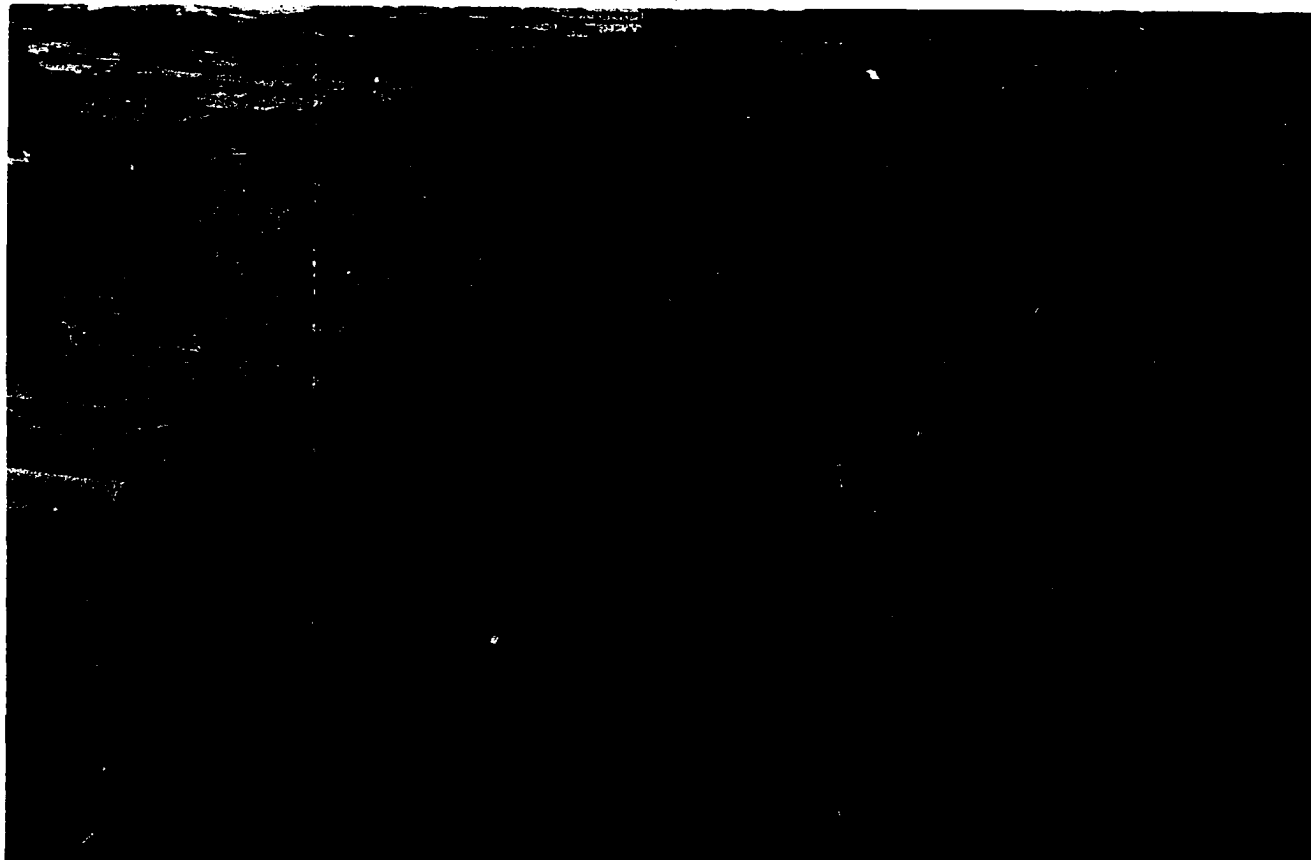


Fig. 4. -- Enclosed fields and dispersed farms, Wales. (U. S. Air Force photo)

agricultural output and productivity in England as a whole was increased (Postan 1972:69).

The greatest cause of enclosure in the sixteenth century was the consequence of introducing sheep and cattle raising on a large scale into the Midlands economy in the second half of the fifteenth century. Pastoral enclosures were designed primarily to produce specialized items much like many of the early agricultural enclosures. The two chief products of pastoral enclosures were meat and wool for the manufacture of clothing. Imported beef cattle were raised, and breeds of sheep were developed which yielded twice the meat and fleece of those kept by the common field farmers (Kerridge 1973:85). Most of these enclosures took place between 1475 and 1550 in areas that would support grasslands and that could be made into permanent pastures. Therefore, many of the Midland counties such as Leicestershire, Warwickshire, Northamptonshire, and Bedfordshire were affected to a considerable degree (Flinn 1965:91). The enclosure of farmlands was an extremely disruptive process which often displaced whole villages and dislocated their former inhabitants who found work in neighboring villages or in early industries (Hoskins 1957:212).

Enclosure on the Midlands, both for agricultural and pastoral purposes, was not as extensive in the late sixteenth century as it was to become in later times, yet it may be

viewed as an attempt to produce specialized food items and raw materials for the early industries on a scale not practical in the basically self-sufficient open-field farming villages. The ecological adaptiveness of such specialized production should become clearer when viewed in light of the increasing complexity of the British sociocultural system during this period. Similar trends will also be noted in other subsystemic elements of this larger system.

In summary the two basic procurement systems operating in the Midlands were short-term fallowing field systems and enclosed agricultural and pastoral systems. The former was oriented toward the cultivation of mainly cereal grains as well as other commodities and was, for the most part, self-sustaining. It was intimately tied to the nucleated village form of settlement pattern in addition to the use of the heavy plow, an instrument requiring communal labor practices. Ecologically, it was necessitated by the need to utilize a limited amount of land to grow crops and pasture the draft animals. The latter, on the other hand, appears to have been developed much later as a means to produce specialized commodities for a wider market. Both, however, were well adapted to the environment of the Midlands in that each involved the extensive use of the basically uniform well-watered lowland which was capable of supporting both agricultural crops or grass for grazing on a wide scale.

Procurement Systems - the Highland Southwest. The environment of Southwest England is too varied and good soil too limited and, in many cases, too scattered to allow the practice of extensive short-term fallowing systems such as the open-field farming of the Midlands. As a result the agricultural procurement systems developed there were not only different from the Midlands but more diverse as well. Other nonagricultural procurement systems were also present in the Southwest. These tend to reflect a more complex ecological adaptation necessitated by the environment of the area.

Agricultural procurement systems were basically of two types, a limited short-term fallow system and an infield-outfield system involving the permanent cultivation of favored crops. Open fields apparently existed to a smaller extent in Devon well into the sixteenth century, but the land had been almost totally enclosed by 1600 (Fussell 1951:179).

The Highland short-term fallow system contained all of the characteristics of the open-field farming practiced in Lowland Britain. Crops were rotated in a manner similar to that of the two- and three-field systems; strip cultivation was predominant and employed the heavy plow; individual holdings were intermixed; common grazing rights were exercised over fallow land; and the settlement pattern most common was the nucleated village. The open fields of the

Southwest differed in that the symmetrical groupings of the individual strips of land into two or three larger fields was usually absent. If it occurred, it was coincidental, for the strips were necessarily scattered about in accordance with the nature of the soil and subsoil (Finberg 1969a:142-146).

Open fields in Devon never developed into the extensive two- and three-field systems utilized in the Midlands, primarily because the need for pasture was not as pressing in a region that contained larger areas of upland grasslands suitable for pasture but not for agriculture. For this reason the adaptive advantages of a short-term fallow system appears to have been absent here. Gray (1915:263-264) has suggested that open fields in Devon and Cornwall were located on more recently reclaimed land and that the scattering of the individual holdings was associated with the subdivision of the progressively reclaimed land. In this sense the open-field nature of the holdings in the Southwest seems to have had the same ecological advantage in agricultural expansion that they did in the Midlands. Unlike the Midlands, however, the environment of the Southwest was such that once the irregular fields had been brought under cultivation, their proximity to grasslands on poorer soil eliminated the impetus to rotate the crops for fallowing lands to provide fodder. This fact, combined with the lesser amount of good soil

present in the area, would seem to favor the permanent cultivation of the arable land if its fertility could be maintained. This was accomplished by the implementation of the infield-outfield system.

The infield-outfield (or run-rig) system basically involves the permanent cultivation of favored plots combined with a fringe of sporadically utilized hinterland (Wolf 1966: 21). Finberg (1969b:32) describes the farming system as follows:

This involved the division of the arable land into two unequal portions. The infield, or portion nearest to the hamlet, was manured with household or farmyard refuse and subjected to intensive tillage. The outfield consisted of the wild heath, furze, and moorland that lay outside and usually above the hamlet. Part of this was broken up at long intervals, cropped for two or three years in succession, and then abandoned to the furze and rough grasses which quickly resumed their hold; after which the process might be repeated on another division of the moor.

The infield consisted of the enclosed arable land (usually under thirty acres) of the individual farm within the hamlet. Often a number of holdings were enclosed together. The enclosures were formed by ditches or hedges and served to protect livestock from the wind as well as to provide wood in a land deficient of timber (Hatcher 1970:11). Evans (1956:236) distinguishes the hamlet from the village in that the former comprises only a cluster of farms exhibiting none of the outward forms of community activities

(e.g., public buildings, churches) characteristic of the village (Fig. 4). Within the infield, crops were grown in succession in regular rotation, often allowing sections to remain fallow (Postan 1972:54). A number of methods were used to fertilize the soil in addition to manure. These included the use of seaweed, sea sand, soap ashes, and marling, or the addition of lime to negate the acidity of the soil and to flocculate the heavy earth (Fussell 1951:182).

The use of the outfield has many parallels with long-term fallowing or swidden systems in that both involve clearing the field of vegetation cover, planting crops to a point of decreased yields, and finally abandoning the field to regain its fertility. The key variable here seems to be the availability of land, for the most significant technical limitation of this kind of procurement lies in leaving to nature the tasks required to regenerate the used plots. Sufficient land must exist to allow the greater portion of it to rest in fallow while the smaller portion is in use (Wolf 1966:20-23). The proximity of large areas of upland pasture provided the necessary land for outfield cultivation, yet the primary dependence on the intensely cultivated infields appears to have required the utilization of the former at a rate slow enough so as not to normally denude the vicinity of most settlements.

In Devon and Cornwall the outfields were usually rough pasturelands temporarily enclosed for cultivation (Postan 1972:55). Unlike the infields, the outfields could not be broken up for planting by the plow. Instead, the tough covering of weeds and grasses was broken up into turves with a mattock or a beating axe, dried in the sun, and then burned prior to plowing the ashes and soil. A crop of oats was usually sown in the newly prepared soil with other crops coming later (Fussell 1951:180-181). The ashes perform a critical role in the preliminary treatment of the soil in that they yield potash, the addition of which causes significant biochemical changes favorable to grain growing. The high acidity of the soil is reduced, the value of the phosphoric content is increased, and the mineralization of organic nitrogen compounds in the soil makes these nitrogen resources available for exploitation by the grain (Hatcher 1970:12-13). This process of preparation is called "beatburning" or "denshiring" (a corruption of Devonshire) and was practiced throughout Highland Britain until the early nineteenth century (Evans 1956:229).

Similar practices of beatburning applied to deciduous and pine forest played an integral part in land reclamation in sixteenth and seventeenth century Scandinavia (Soininen 1959) and form a regular part of swidden farming in tropical areas.

Like the open-field farming, the infield-outfield system involved mixed farming. Annual accounts of Devonshire manors of the sixteenth century show the majority of crops raised to be grains: wheat, rye, barley, oats, and pill corn (Finberg 1969b:116). Farm animals consisted of draft horses and oxen as well as cattle, goats, sheep, pigs, and poultry. Peas and beans were also grown in large quantities (Fussell 1951:185).

In addition to the mixed farming of the infield-outfield system, specialized agriculture was also practiced as a third type of procurement system. This development took place primarily in those areas where environmental conditions were most favorable: the Vale of Exeter, the country between the Teign and Dart Rivers, and certain lowland parts of North Devon (Hoskins 1954:93). Orchards were planted for the manufacture of apple cider in Devon as early as the thirteenth century, and by the fifteenth century, the coastal parishes of this county were supplying large amounts of cider for the provisionment of ships.

Orchards planted for the production of a fruit called "massard," a form of black cherry, were located near Barnstaple in northwest Devon. The raising of pears is mentioned in Harrison's 1587 Description, also apparently for the manufacture of drink (Harrison 1968:139). Beekeeping

was a busy trade in both Devon and Cornwall, and large quantities of honey were produced in both counties (Fussell 1951:185).

The fourth procurement system utilized in the Southwest, and one of at least as great an importance as the agricultural systems described above, is that of pastoralism or animal husbandry. The environment of Southwest England was favorable to the pasturing of large herds of sheep and cattle which fed on the natural grasses, thistles, heath, and bracken of the extensive upland pastures. Most landowners possessed access to these lands as common pasture (Finberg 1969b:131).

The use of pastures for the specialized development of certain animals and animal products on a large scale was especially widespread here. Manorial accounts show clearly a trend from agriculture to pastoral husbandry from the thirteenth to the fifteenth centuries as grazing became intensified (see Finberg 1969b:156-157). Hoskins (1954:95) points out that, rather than upsetting the balance of land use as was the case in the Midlands, the increase in pastoral production merely expanded the use of those upland areas not suitable for agriculture. Grazing on newly reclaimed land was actually beneficial to the soil as it enriched the new ground with manure.

The major animals raised in the Southwest were oxen, cattle, and sheep. As a consequence of the nature of pastoral husbandry in this area, the animals tended to be generally unspecialized types capable of sustaining themselves on the natural vegetation. Thus, the native sheep of Devon were small-boned, flat-sided, coarsely-wooled animals, yet they were capable of producing the raw material suitable for the manufacture of woolen cloth (Finberg 1969b:146). Cattle, too, were not selectively bred and were valued more for their working qualities and meat than as dairy stock. It is interesting to note that the famous Devon cattle, developed as a local breed in the eighteenth century, first underwent artificial selection as a draft animal and then as a beef type. It was not until the nineteenth century that Devon breeders attempted to develop cattle with milking qualities (Rouse 1970:292). Though not bred for milking, both cows and ewes were milked for the production of cheese and butter for a market that steadily increased after the fifteenth century (Finberg 1969b:144).

The fifth procurement system is one centered on the catching of fish. This system had two major aspects involving inland freshwater fishing and saltwater fishing in the seas that face Southwest England on three sides. Both Cornish and Devonshire ports served as the centers of deep sea fishing fleets at least as early as the fifteenth century (Hatcher

1969:212). The greatest expansion in this system, however, took place in the mid-sixteenth century with the movement of British fishermen into northern and western Atlantic waters, but French and Portuguese exploitation of the Newfoundland Banks following John Cabot's exploration of this area in 1497 encouraged a British incursion there. By 1542 the greater part of British fishing activities had shifted to the Newfoundland Banks (Oppenheim 1968:35).

Extensive fishing in the North Atlantic involved not only the catching of fish, almost exclusively cod, but also their preservation for transport home. The English called this "dry fishing," for as the climate of Britain was not suitable for the evaporation of salt to use as a preservative, the catch had to be dried in the sun. This process necessitated the establishment of temporary shore camps to dry and store the fish throughout the annual summer (May-August) fishing season (Morison 1971:473). In addition to cod, hake, pilchards, herring, hassock, whiting, congers, rags, ling, and plaice were taken (Hatcher 1970:33).

The fishing industry of Southwest England was centered at the port cities of Topsham, Bideford, Dartmouth, and Teignmouth in Devon as well as other minor ports in Devon and Cornwall (Shorter, Ravenhill, and Gregory 1969:172). The development of large-scale fishing operations in the Southwest is obviously related to the position of Devon and

Cornwall to the Atlantic; however, the geographic features characteristic of this area also seem to have played a part in the placement of the ports. The submerged bays and drowned rivers of the southern coast of the peninsula offered excellent protected locations for port facilities, and consequently, almost all of the significant harbors were situated here. Only Bideford, located on one of the few rivers, flowing northward into Barnstaple Bay, could offer similar conditions on the northern coast.

Inland freshwater fishing, on the other hand, was not organized on as large a scale as deep-sea fishing. The many tidal rivers of southern Devon were particularly rich in many species of anadromous and freshwater fish, and these were caught in significant quantities by fishing operation conducted at points along the major rivers.

Finberg (1969b:159-166) describes the organization of one such freshwater fishery situated in the vicinity of Tavistock on the Tamar River which separated Devon and Cornwall. It was operated by those manors possessing use rights to strategic locations along the river. Two principal means of catching fish were employed: weirs consisting of a dam and fish trap and seine nets which were used in deep pools found in association with rapids. Fish were also taken by hook and apparently were freely caught by inhabitants living along the river. This particular fishery on the Tamar

was in operation from the thirteenth century through the end of the eighteenth century. Among the fish most commonly caught were: salmon, eels, and trout. Lamprey eels were also taken. Although somewhat less significant overall as a procurement system than saltwater fishing, freshwater fishing along the many rivers and streams of the southwest peninsula appears to have accounted for a sizable portion of the animal food consumed in this area.

In summary five broad types of procurement systems have been described for the southwest peninsula of England in the sixteenth century. The agricultural systems may clearly be seen as an adaptation to an environment characterized by marked variations in elevation, climate, and soil. The wide expanses of grasslands and shortages of good arable land favored the infield-outfield system as well as the development of pastoral husbandry on a large scale. The open-field systems of the Midlands occurred only where pasture for draft animals was in short supply in relation to the arable land. The extensive adoption of the infield-outfield system also affected the rural settlement pattern of the Southwest in that it favored dispersed households in hamlets or individual homesteads in contrast to the nucleated villages of the Midlands. Both the infield-outfield system and the dispersed settlement pattern among the fields tended to lend themselves to the enclosure of holdings.

Specialized farming, pastoralism, and fishing were also adaptations in a sense to the environment of the Southwest. Not only was the area geographically suited to these activities, but in an area where arable land was not extensive, they provided alternate subsistence activities to support the inhabitants. The expansion of specialized procurement systems that took place in the sixteenth century must also be seen as a response to a number of nonsubsistence activities occurring at that time. This point will be taken up in subsequent sections.

The high diversity of subsistence activities in the Southwest is reflected by the fact that none achieved the paramount importance that open-field farming did in the Midlands. The adoption of alternate procurement systems as opposed to one is directly related to the ecological diversity of this area and may be considered an adaptation necessitated by an environment which would not allow the extensive exploitation of a single type of resource but rather required the intensive exploitation of several.

The Economic Subsystem

Early post-Medieval England was predominantly a rural agricultural nation in which industrial production was still conducted on a largely regional basis for local use. In this system local areas frequently duplicated one another

in providing limited and inelastic markets for local craftsmen and tradesmen. The autonomy of local industry is reflected in the urban craft guilds' restricted authority which rarely extended to craftsmen in the countryside (Flinn 1965:130). Industry was organized on small-scale units, usually consisting of the worker and his apprentices. Those enterprises requiring large amounts of labor, such as the manufacture of cloth, were often divided into a series of separate smaller stages, representing a horizontal rather than a vertical organization (Miskimin 1969:82). In part this organization was determined by the technology of the time. Not only was post-medieval technology limited to the use of human and animal energy as well as that provided by some wind or water machines, but with minor exceptions, it did not require elaborate processes of manufacture.

The natural resources upon which these industries depended were not, however, equally distributed. Certain localities or regions served as sources of raw materials for industries throughout a wide area. For example, the tin mines of Cornwall had supplied Britain and Europe more or less continuously with that product since at least 500 B.C. (Forbes 1956:46). Often the actual manufacture of certain products was confined to particular areas near the source of materials, and this situation led to the establishment of local or regional industries. Such areas were usually

characterized by a diversified economic structure in which industrially-oriented activities rivaled the importance of agriculture (Hatcher 1970:29).

The sixteenth century brought England into a much larger network of social, political, and economic relationships which seem to have provided the impetus for industrial expansion. Older industries were enlarged, and new ones came into being in response to these new stimuli (Flinn 1965:76). In the remainder of this section the technological systems within Highland and Lowland Britain will be examined to determine possible ecological factors affecting their development. Such factors must be taken into consideration when inspecting the potential of a frontier area to eventually support indefinite occupation.

Technological Systems in the Midlands. The Midlands in the sixteenth century typify the agricultural region which developed few specialized technological systems. Instead, it remained for a time almost totally devoted to agriculture and pastoral subsistence activities. Not even the making of woolen cloth, perhaps the single major industry of Medieval England (Flinn 1965:34) would become established in the Midland counties until the second half of the seventeenth century (Smith 1965:30).

Those technological systems that did develop here were basically extractive and, therefore, restricted mostly to

areas bordering the Midlands where natural deposits of raw material occurred. Chief among these was the mining of coal which had been carried out in areas of older rock such as those found in Leicestershire, Nottingham, and Derbyshire. Mining at these locations had taken place as early as the thirteenth century to supply the needs of dyers, brewers, lime burners, and lead smelters as well as to produce coal for domestic use (Taylor and Singer 1956:370). By the sixteenth century the coal fields had been expanded with much of the produce being funnelled through the large market at Nottingham (Smith 1965:118). Harrison's 1587 statement concerning coal mining in England, however, suggests that, though coal had an obvious and growing value as a fuel, its use was still limited.

. . . parts of our island as may suffice for all the realm of England, and so must they do hereafter indeed, if wood be not better cherished than it is at present . . . their greatest trade beginneth now to grow from the forge into the kitchen and hall, . . . in most cities and towns that lie about the coast, where they have but little other fuel, . . . I marvel not a little that there is no trade of these coals into Sussex and Southamptonshire in eastern and southern England, for want thereof the smiths do work their iron with charcoal (Harrison 1968:363-364).

Most early coal mines were open-cast excavations or "bell pits," which involved digging a narrow hole at the surface and then widening the pit as it went deeper until it became too deep to be continued economically. Often these mines were refilled with the spoil (Smith 1965:119).

Iron smelting utilizing the blast furnaces was introduced in the fifteenth century, and the number of furnaces rose to its greatest number in the early sixteenth century. It was practiced in Midland border areas as late as the mid-eighteenth century. Beds of ironstones, usually associated with coal, were smelted in primitive blast furnaces to provide local smiths with bar iron for the manufacture of nails, brackets, and iron implements (Smith 1965:123). At this time charcoal was the preferred fuel for smelting, and the remaining Midland forests were greatly exploited to provide the wood necessary for charcoal-making (Clow 1972: 63). Crossley (1972:61) has pointed out that the provision of wood for charcoal was primarily a seasonal occupation regulated by the agricultural cycle. Smelting, however, was conducted on a more year-round basis. The major object of the smelting process was to smelt continuously for as long as possible once the furnace was operating, often up to twenty weeks at a time, a fact that would also tend to affect the work schedule.

Brickmaking, on a small scale, was done in the eastern Midlands as early as the late fifteenth century. The clay deposits in the Keuper Marls and Coal Measures were employed for this purpose. As the use of bricks grew, the brickmaking industry gradually expanded; however, throughout the sixteenth century most operations remained small and were usually

confined to the individual clay pit, kilns, and grinding mill. It is uncertain whether or not brickmaking was a seasonal occupation at this time (Smith 1965:139).

Technological Systems in the Southwest. In contrast to the Lowlands, the highland Southwest was characterized by a multi-faceted ecological adaptation to its varied environment, involving numerous strategies for survival apart from agriculture. Indeed, agriculture was only a segment of what Hatcher (1969:209) has called a "diversified economic structure," which also included mining, fishing, textile making, quarrying, and shipbuilding. Rather than competing with agriculture, these technological activities provided an alternative, productive use of land which was only of marginal agriculture value. They also encouraged the further development of food production by providing a growing market for farm produce. Specialized technological activities have a much longer history here, and they seem to have been integrated early into the total sociocultural system of this area.

A diversified economy based on so many specialized activities was advantageous in the Southwest, because in the absence of a widespread, reliable basic means of subsistence, such as open-field agriculture in the Midlands, it provided a number of alternative strategies for survival. In such a varied technological subsystem the failure of one activity need not cause the total collapse of the whole, for the

other activities were basically structured independently of one another. Thus, one activity might expand or contract depending on the market for the products of that particular activity. This is reflected in the fact that many people engaged in specialized activities, particularly miners, were also part-time small farmers who grew small amounts of crops to cushion themselves from fluctuations of the metals' market (Hatcher 1970:36).

Perhaps the oldest technological activity and the most important one in the sixteenth century was tin mining. From the Bronze Age through Roman times, tin was mined and exported from Cornwall as an integral element in the making of bronze. By the twelfth century tin mining was extensively practiced in Devon, and in the second half of that century, the mines of Dartmoor produced more tin than those of any country in Europe (Harris 1968:24).

Throughout the sixteenth and seventeenth centuries, tin mines were open cast excavations which involved a gathering process called "streaming." A tin stream was a bed of detrital ore in the form of heavy black stones and sand which contained cassiterite or oxide of tin. The streams were composed of heavy weathered material from the actual lodes which collected in valley floors just below the lighter alluvial material. They were fan-shaped and expanded as distance from the lode increased. Streams varied from one

to ten feet in thickness and were located anywhere from the surface to a depth of thirty to forty feet (Finberg 1968:25).

Tin was mined by separating the "tin stones" from the rubble by hand. Then the "tin stones" were dumped into an artificial waterway constructed for this purpose where they were separated from lighter waste material. The ore was further reduced by hand into sand which was again separated for smelting. Both the artificial waterways and the sizable mounds of waste material still mark the sites of tin mines (Harris 1968:25).

Smelting was accomplished in two states. Near the mine, peat fires were used to separate the "white" tin from the ore. From here it was taken to the authorized stannary towns where it was further refined in "blowing houses." Here water powers were tapped to activate the machinery used in the final smelting process.

The tin industry remained largely in the hands of small partnerships through the sixteenth century. The prospecting, digging, and preliminary smelting operations of surface deposits were most efficiently carried out by individuals (Hoskins 1954:134). This method was adaptive in an ecological sense in that it allowed the level of mining to fluctuate with the market without vastly disrupting the local economy. Near the end of the sixteenth century, the exhaustion

of surface deposits caused a marked drop in tin mining, and presumably the miners shifted into other industries.

Other types of mining were also conducted in Devon and Cornwall, though to a much lesser extent than that of tin. Open cast iron mines similar to those elsewhere in England were being worked in Cornwall as early as the fourteenth century (Forbes 1956:77). Mines were opened in southern Devon and in Exmoor in the latter part of the sixteenth century, but their production remained far less than the mines to the east in the Weald (Hoskins 1954:143). The absence of iron deposits was heavily felt in the relatively highly "industrialized" Southwest. An eighteenth century observer noted that, along with coal and wood for fuel, iron was one of the chief imports in Devon (Pococke 1967:198).

Although not as extensive as in later centuries, stone quarrying formed another important industry in the Southwest. Quarries in Devon were well known as early as the fourteenth century, and the one at Beer supplied stone for St. Stephen's, Westminster, Rochester, and other cathedrals being erected at that time (Broomhead 1956:34). Roofing slates were a major export of Cornwall in the fifteenth century (Hatcher 1970:35). Pococke (1967) reported both sandstone and limestone quarries in Devon, though on a small scale. Granite was taken from Devon and Cornwall and is mentioned in both Leland's (1967:40) 1543 Itinerary and Harrison's (1968:357)

1587 Description. Dartmoor granite in the form of "clitter," a loose stone shed from outcrops, was used extensively for building and the manufacture of such items as domestic mills, cider and cheese presses, and feeding troughs. The regional stone-cutting industry on Dartmoor was centered in the village of Sticklepath which produced cut stone items as late as the nineteenth century (Harris 1968:73).

Potters clay, formed by the alteration of rock due to the intrusion of granite, was present in a number of deposits in southwestern Devon; however, the lack of coal or wood for fuel hampered an early development of a pottery industry here. Much of the clay mined was exported as a raw product (Hoskins 1954:143). Some tiles and domestic earthenwares were turned out in the fifteenth century by potters in the north Devon port cities of Barnstaple and Bideford. Pottery for export saw a rapid rise in the manufacture of export earthenwares (Watkins 1962:27).

Closely tied to the large-scale raising of sheep on the extensive upland pastures of Devon and Cornwall was the woolen cloth industry. The manufacture of coarse woolen cloth was well established in England by the time of the Norman conquest and was practiced to some extent in most counties during the Middle Ages. Certain areas, however, seem to have been more ideally suited to the development of a cloth industry (Fig. 5). These were: East Anglia and the

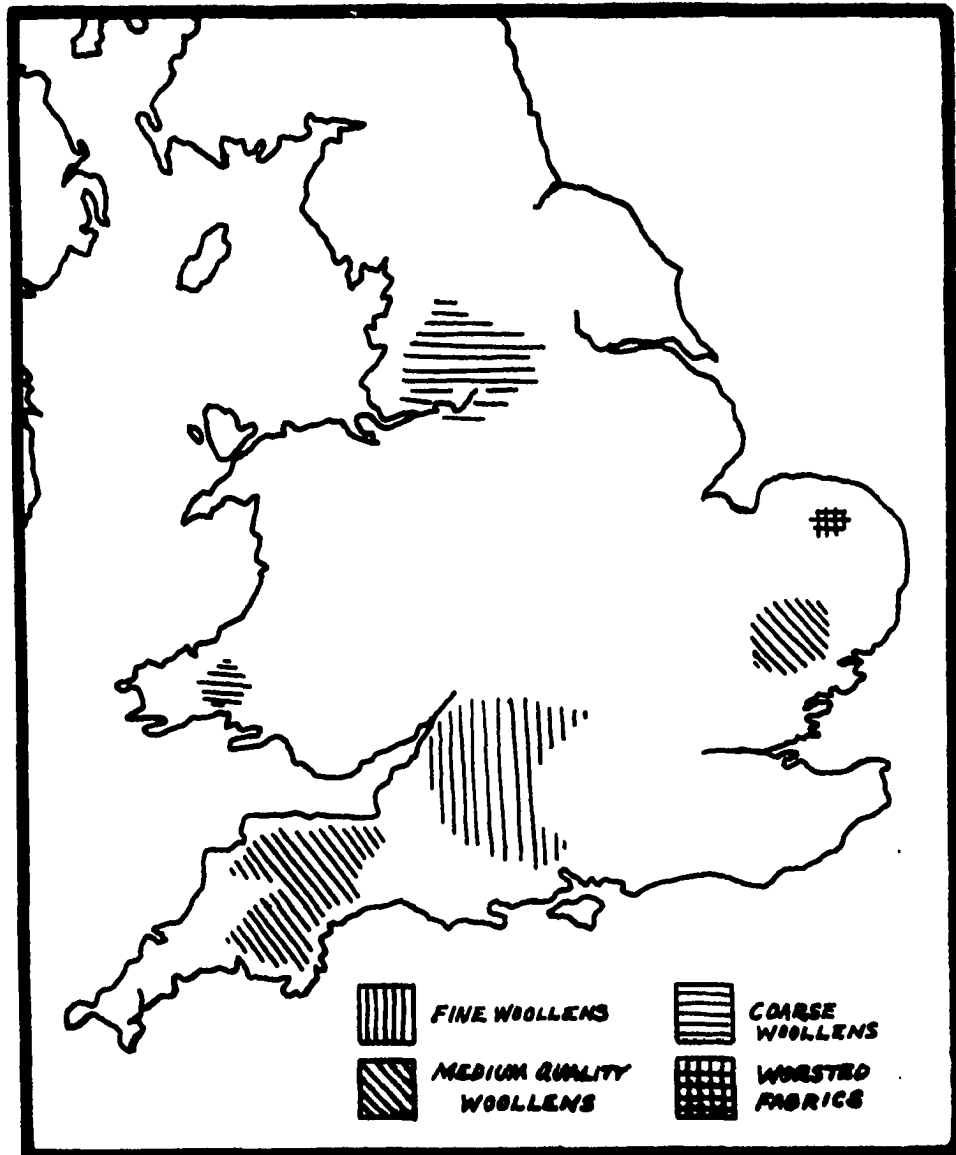


Fig. 5. -- Centers of the English wool - textile industry, ca. 1500.

highland areas of Yorkshire in the north, and the Southwest (Flinn 1965:37). In Devon cloth of coarse wool from the native sheep was woven for export as early as the twelfth century. By the end of that century, the fulling mill had been introduced. These mills were located along rapidly moving streams and utilized water power to activate machinery which mechanically shrank and felted the cloth, tedious processes formerly done by hand (Finberg 1969b:151). Fulling mills were built in both Devon and Cornwall in the fourteenth century, but clothmaking was most active in north Devon and the area around Exeter (Hoskins 1954:125).

Celia Fiennes, a seventeenth century visitor to this city, described the importance of the cloth industry as follows:

As Norwich is for "coapes, callamanco, and damask," so this is for serges. There is an incredible quantity of them made and sold in this town . . . The whole town and country is employed for at least twenty miles around in spinning, weaving, dressing and scouring, fulling, and drying of the serges. It turns the most money in a week of any thing in England . . . The weavers bring in their serges, and must have their money, which they employ to provide them yarn to go to work again . . . There is a prodigious quantity of their serges they never bring into the market, . . . they are put into the fulling mills . . . Some they dye, but most are sent up for London white (Fiennes 1967:112-114).

Several characteristics of the cloth industry are indicated by this account. First, the industrial specialization within regions of cloth manufacture is apparent.

Second, the horizontal distribution of the industrial process is manifested by the separation of the various stages in cloth manufacture. This is further shown by the fact that cloth was marketed at different phases of finishing. In the absence of large scale mechanization, each step of manufacturing involved distinct skills and demanded an organization capable of coordinating all of the steps leading to the finished product. This coordination was supplied by the clothiers, who acquired the raw product and managed its production in successive stages (Flinn 1965:41).

Prior to the late fifteenth century, the cloth woven in the Southwest consisted of rough, hairy material called "straits," usually white, grey, or russet in color (Finberg 1969b:152). The introduction of the fine spun and woven Kersey fabric led to the replacement of the older cloth in eastern Devon, but the coarser wools were still produced in the west in the vicinity of Tavistock (Hoskins 1954:125). Cloth production increased throughout the sixteenth century in the Southwest as well as in other cloth producing regions in Britain. The growth of the cloth industry was enhanced by the introduction of the lighter, more attractive "new draperies" in the late 1500's.

In summary the technological subsystem in Southwest England contrasts with that of the Midlands in that many more separate activities had developed in the former at a much

earlier date. In some localities certain technological activities became so specialized that much of the regional population was engaged in one industry alone, even to the exclusion of subsistence activities. This phenomenon is paralleled in other Highland areas, such as the Lake District to the north, where mining, quarrying, clothmaking, and fishing formed a large part of the regional economy (Bouch and Jones 1961:116-117).

The Midlands on the other hand were characterized by a much more restricted development of specialized technological activities. What industries that appeared there were confined to those areas usually possessing certain natural resources such as coal or iron ore. Glassmaking, another specialized industry not discussed here, was restricted to areas of East Anglia where abundant raw materials were available (Crossley 1967:63-64). On the whole agriculture remained the primary industry in the Midlands except in those areas where grazing on enclosed lands had become established.

The presence of varied industrial activities in the Southwest and their absence in the Midlands may be related in part to the differing ecological conditions found in each region. The undulating plain of the Midlands, well-watered throughout the year, provided an area in which agriculture on an extensive scale might be practiced as an extremely

efficient adaptation. Not only could it provide the basis for subsistence farming but also a large surplus of produce to exchange for specialized items. Other industrial activities existed only on the widely-dispersed scale necessary to provide those manufactured goods needed by this subsistence system.

At the technological level of the sixteenth century, only those areas which possessed certain raw materials appear to have departed from an open-field agricultural pattern. Many of the industrial activities provided raw or semi-finished products for regional or local small-scale industries. They may be classified as extractive rather than finishing industries which often were in operation only certain times of the year, primarily during the agricultural off-season so that they disrupted the agricultural cycle as little as possible. The Midland industries of the sixteenth century then may be seen mainly as activities supplementary to agriculture and as producers, for the most part, of raw materials for regional or local distribution.

However, during the sixteenth and seventeenth centuries, the role of the Midlands, as well as other parts of England, was rapidly changing as a result of cultural responses to technological changes taking place throughout western Europe during this time. Hodgen (1952:185) has demonstrated this

phenomenon by tracing the geographical variation in the distribution of innovations in England after 1500.

The geographical diversity of the Southwest presents quite the opposite situation in that much of the land lay outside the limits of efficient agriculture. The rugged terrain contained many easily exploitable natural resources as well as easy access to the resources of the sea along an extensive shoreline. Upland pastures were exploited early for large-scale sheep raising. What appears to have developed here, in contrast to the Midlands, is a base for diversified technological activities rivaling the importance of agriculture but, more importantly, providing viable alternatives to compensate for fluctuations which might easily occur in the latter. Industries here tended more to be full time; although in many cases workers possessed sufficient skills to transfer from one to another or to agriculture if necessary. Southwestern industries also provided some finished products such as cloth, and many were distributed over a wide area, often outside England itself. Access to running water greatly aided the development of mechanization, an important factor in the evolution of early industries. The diversity of and greater dependence on the technological subsystem in the Southwest may be seen partially as an adaptation to an environment which required alternate means of acquiring subsistence in order to insure survival. This early

diversification seems to have favored the development of technological activities to the degree that they would be capable of rapid expansion into a wider role as the level of sociocultural integration in England as a whole attained greater complexity. The accelerated pace of this trend throughout the sixteenth century was to bring Southwestern England as well as other formerly "marginal" areas into prominence not only in the centralization of the British state but also in its expansion as well.

The Social Subsystem

The social subsystem that existed in late sixteenth century England reflected the social, economic, and political organization of a state rapidly increasing in its degree of complexity and organization. In a broad sense the regularized organizational institutions may be viewed as artifacts in that they fulfill functions analogous to those of material artifacts which mediate between man and his environment. The patterns of interpersonal behavior that characterize this subsystem may be seen as adaptations to the need for the complex organization inherent in the social environment of the state in the same way that field systems represent an adaptation to the natural environment. In this sense the environment of man is "multidimensional" in that it is just as much a product of his own making as it is that of nature's (Renfrew 1972:362).

English settlement patterns. The geographical distribution of the English people in the late sixteenth century may be explained in terms of the types of settlements present in England at this time. Several have been mentioned briefly before, and for this reason they will not be treated in great length here.

At the turn of the sixteenth century, seventy percent of the English population lived in the country (Bridenbaugh 1968:47). The isolated farm was at one end of the rural settlement spectrum. Such farms occurred in greatest abundance in the Highland areas of Britain but only rarely in Lowland areas. Their presence there has long been considered the result of the particular subsistence methods practiced in the Highlands (Hoskins 1970:15). The systems of infield-outfield farming and grazing necessitated by the nature of the terrain, soil, and extreme climate encouraged population dispersal. In Wales, another Highland area, Bowen (1971:188) has suggested that the individual farms were the result of a process of expansion and subdivision of "clan" lands, consisting of both arable and common pasture which was brought about by population expansion in the late Middle Ages. Most of the oldest English farms were located on newly enclosed common lands. Factors taken into consideration were shelter from the wet, windy climate of the Highlands, proximity to water, either by a stream or a spring, and relation of the

farm to different soil types. An ideally situated farm would lie on the border where well-drained arable land met the poorer soil relegated to pasture (Hoskins 1970:17). The intensification of sheep raising to produce wool for the growing cloth trade also took place in the fifteenth century. This encouraged the preservation of the isolated farm pattern in many areas. Hoskins' (1970) study of the farms in Southwest England indicates that two-thirds of them date from Saxon times (before 1066), while those in more recently settled areas such as Dartmoor go back only to the fourteenth century.

The remainder of the English rural population resided in settlements which may be divided into two types: hamlets and villages. Hamlets may be defined as a cluster of farms or houses and associated outbuildings, usually arranged without any formal plan. Evans (1939) has referred to this type of settlement as a "clachen" after its Irish counterpart. It was occupied by tenants who farmed the township jointly in an infield-outfield system and utilized the extensive hill pastures for grazing. Flatres (1971:170) indicates that size is the primary criterion separating larger settlements from the clachen and limits the latter to settlements of less than twenty houses or fifty inhabitants. Like the individual farm, it may be seen as an adaptation to the Highland environment.

The village, on the other hand, was an adaptation to the more uniform countryside of the Lowlands. It was the nucleus of an open-field farming system and was designed to allow its inhabitants access to the common arable land, meadow, and woodland. The village was originally intended as a basically self-sufficient farming unit, the boundaries of which were set so that they would contain a measure of each of the necessary environmental assets (Homans 1960: 86).

The village was usually arranged along one or several intersecting main streets with the farmhouses and cottages lying along them. Back lanes and short lanes leading to the open fields were also present, and these were bordered by the more narrow lots laid out during the later periods of expansion. The village or parish church was located at the edge of the village along one of the main roads (Hoskins 1957:92). Homans (1960:97) points out that the arrangement of the house sites along the roads paralleled the arrangement of strips in the common fields so that an individual had the same neighbors at home as at work. This practice effectively integrated both fields and village into a single unit.

In addition to full-time agriculture, the village also included a number of part-time craft and trade specialists: blacksmiths, wheelwrights, carpenters, millers, bakers,

butchers, and tailors. These specialists usually cultivated small farms along with their craft or trade which allowed them to turn to agriculture for subsistence in slack times (Hoskins 1957:167). The village, then, differs from the hamlet chiefly because of ecological reasons, each of them being primarily associated with a particular type of subsistence. Together, these two types of settlements formed the bulk of the rural settlements of sixteenth century England.

Despite many of the activities of the rural settlement being subsistence oriented, they formed one portion of what Redfield (1956:65) termed a "part society" which was tied in a multiplicity of ways to an urban portion represented by the city. The city may be seen as a center of political, religious, or intellectual functions within a state system which is caused if one of these functions comes to overshadow the others and exerts an attraction on them to allow a concentration in one location. In the absence of such conditions, these state functions may remain dispersed (Wolf 1966:11).

In Medieval England both dispersed centers or towns and cities occurred. Towns were present in all counties and differed from villages or other rural settlements mainly in that their inhabitants were, for the most part, full-time specialists engaged in industries or trade. Concomitant with these activities was the regular holding of markets

for the exchange and distribution of goods and products (Flinn 1965:24). For this reason a town's origin, survival, and subsequent expansion were dependent on the efficiency of the links it was able to maintain with the surrounding countryside. Cities such as London, Chester, Gloucester, Exeter, York, and Newcastle arose as river port towns, while other trading centers grew up along inland trading routes or in locations protected by feudal lords or religious monasteries.

Therefore, the occurrence of towns would tend to vary with the adaptation of the total environment made by the inhabitants of a particular region. This is reflected in the distribution of towns in Post-Medieval Devon and a portion of the eastern Midlands (Fig. 6). The closely spaced and overlapping markets of the former and the widespread markets of the latter indicate not only the respective difficulty and ease of movement in the two areas but also the types of products marketed. The predominance of closely spaced cattle markets in Devon is due to the expense involved in transporting the animals, whereas the grain markets which are most common in the east Midlands need not have been so frequent because grain was much more easily transported for greater distances (Stamp 1948:180). The proliferation of small industries in the Southwest helped further to increase the number of market towns (Hoskins 1954:107).

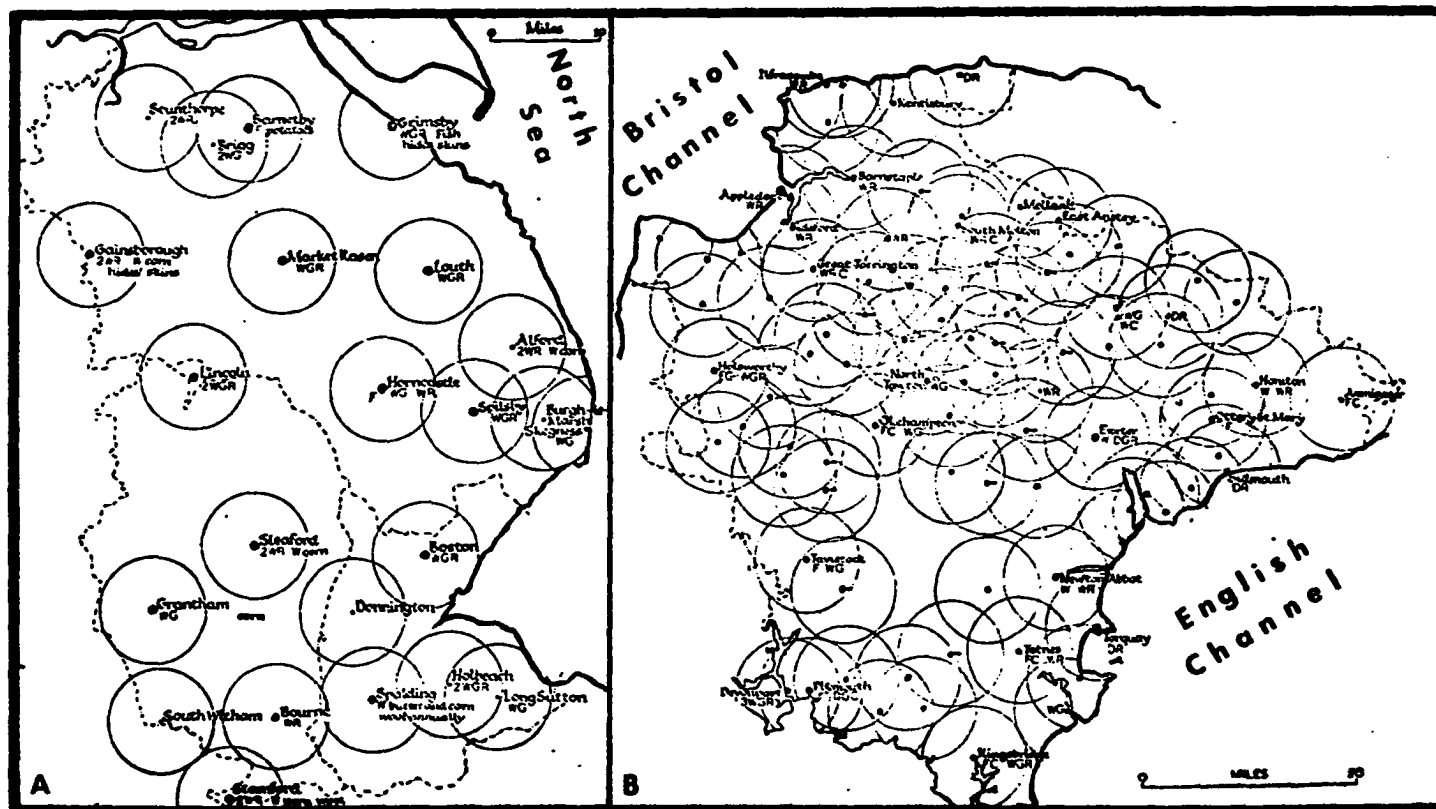


Fig. 6. -- Settlement patterns in the Midlands and the Southwest: A. Lincolnshire markets, B. Devonshire markets.

The generally dispersed pattern of towns that characterized most of England was overshadowed by the presence of several true urban centers. Perhaps the greatest of these was London, the capital of the British state. Its population in 1600 of over 224,000 was astronomical compared to regional towns and cities and amounted to almost six percent of the total population of England and Wales (Bridenbaugh 1968:164). Not only was it the political center of the government and the residence of the king, it was also the headquarters of the Archbishop of Canterbury, head of the state church. Much of London's growth and size, however, was due principally to its function as a major port and inland distribution center. Markets here were large, specialized, and continuously in operation. Unlike the town markets, business was directed toward a transient buying public from many parts of the country rather than the residents of a limited area (Holmes 1969:30). It was to London that much of the products of regional industries flowed for redistribution. The role of the Thames River in the transport of goods is attested to in the following quote by Harrison (1968:422).

. . . I could entreat of . . . the two thousand wherries and small boats, whereby three thousand watermen are maintained through the carriage and recarriage of such persons as pass and repass from time to time upon the same, beside those huge tide boats, tilt boats, and barges which either carry passengers or bring necessary

provision from all quarters of Oxfordshire, Berkshire, Buckinghamshire, Bedfordshire, Hertfordshire, Middlesex, Surrey, and Kent into the city of London.

Regional centers such as Exeter in Devon, replicated the role of London on a regional scale to a limited degree as political and religious centers as well as economic foci which occupied the apex of the local hierarchy of market towns (Shorter, Ravenhill, and Gregory 1969:131). These urban centers increased in size and importance throughout the Middle Ages as their role as catalysts of growing social, political, and economic integration paralleled the expansion of the national state in Britain.

Sociopolitical Organization in Sixteenth Century England

Rural England in the sixteenth century consisted of primarily farming settlements which were affiliated economically and politically with manors or large estates. The manor served as the means of support for the officials who composed the political hierarchy of the state. Following the Conquest in the eleventh century, King William redistributed much of the land to his nobles, while retaining ultimate ownership for the crown. This principle of holding authority over all land titles below was extended to the lands of nobles' estates which, in turn, were allotted to peasant cultivators in return for services. In a similar

manner the lords were obligated to services, often military in nature, to the Crown (Bean 1968:6).

Traditionally, the manor was divided into two parts, the demesne, or home farm, and the tenant's land, both of which provided income to the lord. The proportion of each varied greatly from one manor to another in response to environmental differences and differing patterns of land use (Postan 1972:91). In addition to the lay estates manors operated by religious orders existed until the sixteenth century. The nationalization of the Church of England and the confiscation of all church estates in 1539 was clearly a move toward centralization of power in London (Walker 1959:362). Beginning in the early fourteenth century, severe economic conditions resulting from bad harvests, recurrent plagues, and an initial decline in population had made large-scale cultivation by demesne land impractical, and a trend toward letting out of demesne land began. This breakup of demesne was prevented only in those areas where large-scale sheep grazing was initiated (Postan 1972:107). The letting out of land to leasers for a lifetime or a number of lifetimes was common in the late Middle Ages. By 1575 the ninety-nine year renewable lease was ordinarily given, and the leaseholders were for all practical purposes, owners (Hoskins 1954:91). This "bastard feudalism," involving the alienation of the land which weakened the series of dependent

relationships leading ultimately to the Crown, became codified in the sixteenth century, and it effectively ended what had become an unwieldy economic system (Bean 1968:302-303).

The village, though tied to the manor by a series of rights and obligations, itself formed an administrative unit. It collectively oversaw the seating of formal and informal bodies, courts, assemblies, and guilds which established and administered rules of husbandry, watched over local customs of tenure and inheritance, and enforced local peace and order. If these functions belonged to the lord, the village courts often acted as organs of manorial administration (Postan 1972:111-112). Not all villages of this period were affiliated with a manor, and perhaps as many as one-fifth of those in England were governed by an administration of freeholders (Laslett 1965:62).

The village population consisted of both tenants of the manor and a class of yeomen. The yeomen, as owners of land or employers of labor, ranked socially above the former (Williams 1956:115). The amount of land to which each tenant had access varied. Those whose holdings were below that necessary for subsistence supplemented their income as craftsmen and petty traders and as communal employees, laborers, and full-time servants for the lord (Postan 1972:133). The larger landholders utilized their land as a home farm to produce a marketable surplus of crops. They also

sublet land to other large landowners and sharecroppers and served as moneylenders to finance other villagers' land dealings. As the Middle Ages progressed, the average size of the holdings grew, indicating a general improvement in terms of subsistence for the peasant farmer (Postan 1972:142).

The family organization of rural England was adapted to the limited size of the arable land, especially in the Lowlands, where the latter was made up of strips scattered over the village's open fields. The household was made up of the head, his wife, and their immediate descendants. As the breakup of the holding was impractical in terms of maintaining a unit capable of subsistence, it was passed on through only one heir, usually the eldest son. Families were often large, but only unmarried children resided in the household. Daughters left to live with their husbands and sons to seek their fortunes elsewhere (Homans 1960:214). This mechanism appears to have had a decisive effect on the number of persons dwelling in the average household. Sixteenth and early seventeenth century population statistics indicate a mean household size of five persons (Laslett 1972:130). The incentive to retain children on the holding could be strong, as the many communal tasks associated with Medieval farming, particularly in open-field systems, required the periodic assembling of sizable numbers of workers in the fields. Laslett (1965:12) states that the household head

would often take on servants from outside the family for this kind of work, while sending out his own children as servants to other households. This dispersal of kin at an early age may have served as a mechanism for the eliminating of non-inheriting males, for upon marriage they would be separated from the household to which they were attached to work as day laborers. Other avenues available included the church, recognized as one offering excellent chances of upward mobility, the service of a nobleman, the military, or migration to the city. The last of these became increasingly important with industrial and commercial growth in the late Middle Ages (Homans 1960:135).

The stem family worked to maintain the population and to insure the stability of the landholding unit. The delimiting of the family within each generation is reflected in the kinship system in which closeness of kin was reckoned by degrees of descent from a single married couple. Distant kin were reckoned by simply adding prefixes to the terms for persons close to the small family (Homans 1960:216). In the Highland village of Gosforth, a similar phenomenon occurred with relatives being reckoned bilaterally in three categories of closeness: family, close relatives, and distant relatives. The family consisted of consanguinial relatives reckoned vertically. The other two categories contained both consanguinial and affinal relatives whose distance from

ego increased as the generational link of the connection to ego recedes (Williams 1956:70).

Both village and manor fell within the scope of the parish which formed the basic unit of local government. Originally an area of ecclesiastical jurisdiction in the Middle Ages, the parish served primarily to regulate activities falling outside the scope of the manorial courts, such as poor relief and road maintenance. The Reformation of the 1530's subordinated the church to the central government and effectively made the parish an extension of the state. The rector or the vicar was now confined to ecclesiastical matters, while the popularly elected churchwardens, as civil officers, were responsible to the legislature. Throughout the sixteenth century, Tudor sovereigns utilized the instrument of the parish government to keep the power of the feudal lords in check (Trotter 1968:2-3).

The county or shire served as a larger administrative unit. Like the parish, its officials were locally appointed but came from the nobility. The sheriff, his assistant, and the justices of the peace were all appointed by the king and were overseen by the Royal Council. As agents of the central government, they had authority to collect taxes, raise troops, regulate wages, and punish some crimes (Bouch and Jones 1961:161).

In summary, the sociopolitical system in sixteenth century England reflected both the traditional feudal pattern of the Middle Ages and the rapidly expanding central government of the state. England was still primarily a rural country with most of the population living in villages, hamlets, or scattered farms and practicing several types of agriculture. Some areas, particularly those marginal to agriculture, were beginning to gain importance as regional centers of industrial production for a national and international market. Regional centers grew in importance as exchange centers in a sociocultural system approaching increasingly more complex levels of integration.

The Trade and Communications Subsystem

Trade and communication as mechanisms of sociocultural integration are of special interest in the study of colonization, because they provide the primary link not only between the colony and the metropolitan area but also within the area of colonization as well. The trade and communications subsystem is crucial also to a consideration of the baseline culture, as it includes the means by which elements of the other subsystems are integrated within the larger system. Trends toward expansion, specialization, and centralization were all taking place in English culture throughout the sixteenth century. As the role of trade was closely tied

to these changes, the trade and communications subsystem would also be expected to have undergone a concomitant increase in complexity. In previous sections the influence of trade has been mentioned in regard to the other subsystems and to do so again here would be repetitive. For this reason the following discussion will be confined to a summary of internal trade with a somewhat expanded treatment of the development of overseas trade and the role it played in colonization.

Internal Exchange and Markets

In Medieval England internal trade was conducted on several levels. The lowest was infralocal trade which consisted of exchanges within the local group (village, manor, or town). The most basic form of infralocal exchange was the obligatory payments made by the tenant to the lord, the state, and the church. These agencies served in turn as redistributors to support non-food producers at the local level. Trade within villages also took place both for specialized products and food. The use of communal mills and bake ovens often belonging to the manor required all households to participate in exchange for food products, while the need for such nonlocally produced specialized goods as salt, pitch, tar, pepper, and textiles involved the whole village in this trade. In some areas shortages of fuel

prevented cooking by individual households and resulted in the exchange of prepared foods made by professional cooks, bakers, and brewers in the village. In addition much exchange was generated by villagers whose holdings were not capable of supporting them and who were consequently dependent upon laborer's wages for subsistence (Postan 1972:200).

Interlocal trade took place on a larger scale and consisted of exchanges of specialized goods and services between regions. The late Middle Ages witnessed the expansion of agricultural and pastoral activities as well as the rise of localized industries producing both raw and finished products. Although England, at the end of the sixteenth century, may not yet have had a national market, interlocal exchange and specialization were sufficiently advanced to be susceptible to commercial disturbance (Supple 1959:3). The regional fairs and markets of earlier times began to be replaced by more complex marketing systems associated with towns and cities where a greater volume and variety of trade might be concentrated (Thrupp 1951:292). The growth of London as a commercial center may be seen as an important factor stimulating both regional specialization and inter-regional dependence in the sixteenth century.

European Trade

Throughout the Middle Ages, England was linked to other parts of Europe by a factor similar to that which

joined regions within the country: the supply of specialized goods to an expanding market. A great volume of trade crossed the English Channel to the Netherlands and Calais, the latter of which remained an English possession until the sixteenth century. The Netherlands, Flanders, and Brabant contained a great concentration of industry to which English wool, grain, metals, and dairy products were transported and exchanged for wines, dyes, salt, building stone, linen, and herrings. Wool dominated the exports into the sixteenth century.

In addition to the Channel trade two other routes of exchange existed. The first connected England with the Baltic countries where raw materials for shipbuilding were obtained: hemp, flax, tar, and masts. The second route was through the Straits of Gibraltar to the Italian ports of Venice and Florence which controlled the exchange of Mediterranean and Far Eastern products in Europe (Flinn 1965:44).

In order to oversee the increasing complexity of expanding trade, organizations of traders were formed. In England these appeared first in the wool industry when merchants formed associations to canalize exports through a particular port known as a staple. These organizations were called "regulated companies" in that they were associations of individual traders or partnerships of traders, each carrying out their own trade under a common set of regulations.

Apart from the establishment of trading monopolies, the companies performed political functions as well, including the protestation of English trading interests and the collection of duties and taxes. Representing national trading interests, the regulated company functioned as a means to extend English influence overseas as well as to compete with similar organizations representing other European states. The struggle between the English merchant adventurers and the Hanseatic League, representing the trading centers of north Germany, did much to influence the success of English overseas trade throughout the sixteenth century. Despite the spectacular colonial ventures of European countries into Asia, Africa, and the Americas during this period, exchange was still basically intra-European and would remain so until the seventeenth century (Supple 1959:7).

The extension of trade outside of the European world following the voyages of discovery would require an organization different from the regulated companies. This was due chiefly to the fact that the expense and logistics of establishing and maintaining a trading center a great distance from home was far too great for the financial resources of an individual merchant. To overcome this problem, the "joint-stock" company was formed in which a number of merchants or stockholders pooled their resources and carried out trade not as individuals but as a group, employing

managers and a clerical staff. Unlike the regulated companies, the joint-stock companies had the ability to outlast the life-span of an individual merchant and so provide an enduring basis for trade. The large number of stockholders and the monopolies granted by the Royal Charter further helped to defray the risks involved in the overseas ventures (Flinn 1965:62).

In order to conduct trade in the New World, the joint-stock company was required to take on a new function, that of planting colonial settlements capable of producing raw and finished products for the company to import (Hariot 1955:389). The chartered companies accepted the feudal suzerainty of the English state and in turn were granted the power to grant fiefs in the traditional form (Coornaert 1967:226). Sir Walter Raleigh's 1584 Letters Patent for founding a colony in Virginia gave his company the rights to:

. . . all the soyle of all such landes countryes and territories so to be discovered or possessed . . . with rightes of franchises and Iurisdiccions . . . with full power to dispose thereof and of every parte in fee simple or otherwise according to the order of the lawes of England (Quinn 1955a:84).

It also gave the company:

Full and mere power and aucthority to correct punishe pardon governe and rule by theire and every or any of their good discrecions and polliccies . . . all such our subiectes as shall from tyme to tyme hereafter . . . inhabite any such landes countryes or territories . . . according to such

statutes lawes and ordinaunces as shalbe by him . . . devised or established for the better governmente of the saide people . . . So alwaies as the said statutes lawes and ordinaunces may be agreeable to the forme of the lawes statutes government or pollicy of England . . . (Quinn 1955a:87).

The policy of utilizing the company as an extension of the state was not confined strictly to the New World; however, for in the last decade of the sixteenth century James VI of Scotland (James I of England after 1603) used this method with limited success to expand Scottish dominion into the Highlands and Hebrides Islands to the north. Furthermore, England had attempted to establish Irish colonies at Ulster by feudal grant during the reign of Elizabeth I (MacLeod 1928:157).

Although Raleigh's Virginia colony failed, it was a joint-stock company, larger and with greater resources, that was chartered in 1606 to attempt to found a new settlement in North America. The Virginia Company of London was to be the association responsible for the planting of the colony at Jamestown.

In summary, the trade and exchange system in sixteenth century England operated at several different levels. Trade reflected the growing complexity of the English states, and associations formed to conduct exchange overseas were, in fact, quasi-political agents of the state with national monopolies in the regions where they conducted business.

PLEASE NOTE:

**This page not included in
material received from the
Graduate School. Filmed
as received.**

UNIVERSITY MICROFILMS

With the expansion of the English state into overseas areas, the trading companies formed organizations for the exchange of goods and for their production. The Jamestown colony was at attempt to establish a settlement in North America to develop raw materials for the English market. As such, it provided the basis for a settlement frontier in Virginia.

Virginia: Physiographic Description of the Frontier Area

The earliest English colonization along the Atlantic coast of North America took place on the Coastal Plain province of the present states of Virginia and North Carolina. The Coastal Plain is part of a sloping region which is partially submerged under the Atlantic Ocean. The submerged portion, which underlies shallow seas for distances up to several hundred miles is called the Continental Shelf province. Together these two provinces form the Atlantic Plain, a major physiographic division of the United States (Fenneman 1938:2).

The Coastal Plain is actually the emerged portion of the Continental Shelf. As the latter is composed of outward-sloping layers of eroded sediment, its exposed part is essentially featureless. In the past this surface has been uplifted and subjected to continual erosion. Because the sloping beds are rarely parallel to the land surface, outcrops are exposed at intervals from the sea, the oldest beds being the farthest inland.

Stream dissection has been the primary agent of erosion on the Coastal Plain. Its major streams are merely extensions of streams flowing from the older land mass to the west. Branching from these are numerous dendritic tributaries which dissect the intervening plain (Fenneman 1938: 12).

The Atlantic Plain is depressed as it runs northwest, resulting in a gradual submersion of the Coastal Plain and an accompanying widening of the Continental Shelf as the level of the sea rose late in the Pleistocene. This phenomenon is witnessed by the appearance of bays and estuaries north of Cape Lookout, North Carolina (lat. $34\text{-}1/4$ degrees) which contrasts with a more uniform edge formed by the gentle slope of the Coastal Plain to the south. These estuaries are primarily flooded river courses. Coastal rivers as far south as the James in Virginia are drowned to the Fall Line where the abrupt rise in altitude marks the western edge of the Coastal Plain. Rivers passing into the coastal plain often form falls along this transition zone.

The geographical area of the Coastal Plain, with which this study is concerned (Fig. 7) consists of uplands and the lowland. The upland is a highly dissected tableland composed of two terraces of Pleistocene age. They rest upon poorly stratified beds of sand, gravel, and clay as well as formations of earlier Eocene rocks, while loams with

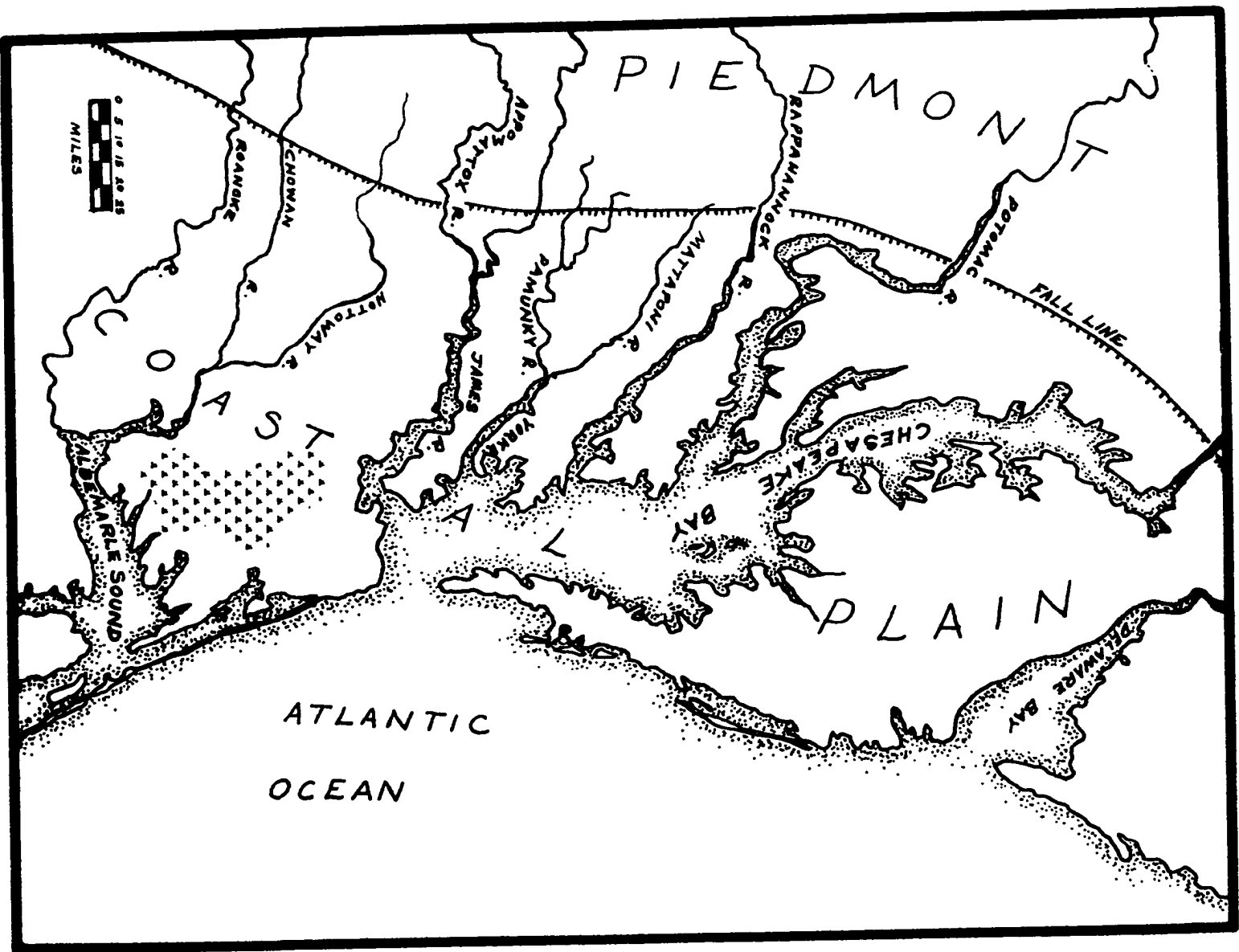


Fig. 7. — The Virginia Coastal Plain: general topographic features.

a high clay content predominate at the surface (Fenneman 1938:25). This water retentive type of soil prevents adequate drainage except for steep slopes. The tableland has been dissected by erosion to the extent that well defined cliffs occur along many of the rivers and steep-sloped ravines are associated with many of their tributaries (Wentworth 1930:9).

The lower Coastal Plain is much less eroded and is composed of four terraces. The soils are sandy, light textured, and well-drained with only a small amount of natural organic content. In contrast to the upland, these conditions cause the soils to warm up quickly in the spring and be less sensitive to damaging early frosts (Kearney 1901:346).

The rivers which play so large a role in the topography of the Coastal Plain in eastern Virginia are part of the Chesapeake drainage system. The submerged nature of the land together with the strength of tides has not only drowned the rivers as far as the Fall Line but also allows salt water and tides to penetrate far into the upper Coastal Plain (Wentworth 1930:19). This is due primarily to the fact that, unlike the Carolina drainage system to the south which is protected from the sea by a series of barrier beaches, the Chesapeake system opens directly into the ocean at the mouth of the Chesapeake Bay.

Along many of the principal rivers of the Chesapeake system, bars have formed at the mouths of tributary streams, as sediments from submerged beaches are pushed along the shoals. Jamestown Island on the north shore of the James River just below the mouth of the Powhatan Creek represents the remains of such an exposed shoal (Fig. 8). Within the past few thousand years, this shoal has developed to the extent that it closed off the normal mouth of the tributary and diverted the flow of the stream between the north bank of the James and the shoal itself for a distance of three miles. The shoal thus became a peninsula which was subject to constant erosion at its neck due to continual exposure to the currents of both Powhatan Creek and the James (Cotter 1958:3).

At the beginning of the seventeenth century, the peninsula was attached to the mainland only by a narrow strip of land approximately 2000 feet in length. Jamestown Island itself is two-and-three-fourths miles in length and varies from three hundred yards to one-and-one-quarter miles in width. It is made up of fine sand sediment topped with several feet of clay and silt which merge into humus at elevations of from twelve to sixteen feet above mean low tide. On the south side of the eastern end of the peninsula, new sand bar formations, collectively called "Goose Hill," were in the process of accumulating. Between these ridges, marshes arose

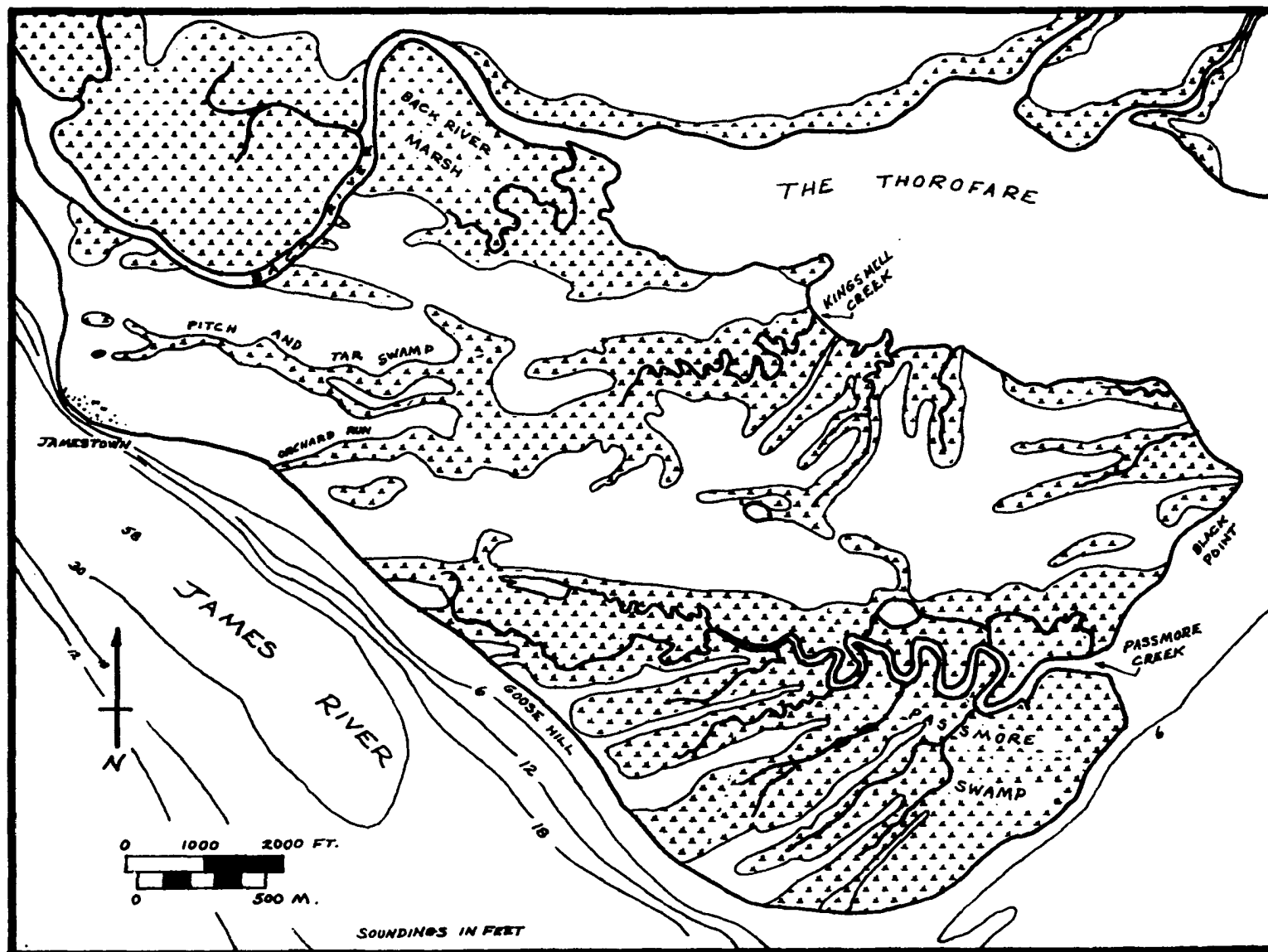


Fig. 8. -- Jamestown Island: general physiographic features.

in wet drainage channels. The southernmost portion of the peninsula, called Passmore Swamp, is drained by Passmore Creek, a sluggish, meandering outlet. On the north side of the peninsula, marshes developed along Powhatan Creek. The largest of these, the "Pitch and Tar Swamp," contained deposits of bog iron and were filled with reeds and marsh grasses. Pines and deciduous trees grew on the land between the marshes, while cypresses were common along the shore and edges of the marshes (Fig. 9). As the area of the peninsula was being increased at its downstream end, its head was subjected to erosion by the James River. This created a deep water approach to the west end of the peninsula. The process of erosion continued up to the twentieth century when the protective seawall was constructed in 1901 (Yonge 1904: 14). During this time, the narrow strip of land was washed away forming Jamestown "Island," and approximately 400 to 500 feet has been lost to the river along the southwest shore (Cotter 1958:6).

The proximity of the Coastal Plain to the Atlantic Ocean has a tempering influence on the climate of eastern Virginia, moderating both the summer heat and the winter cold. The general low elevation of the Coastal Plain above the sea and its relatively level surface result in the virtual absence of local peculiarities in climate, and changes out of the ordinary are due primarily to variations in

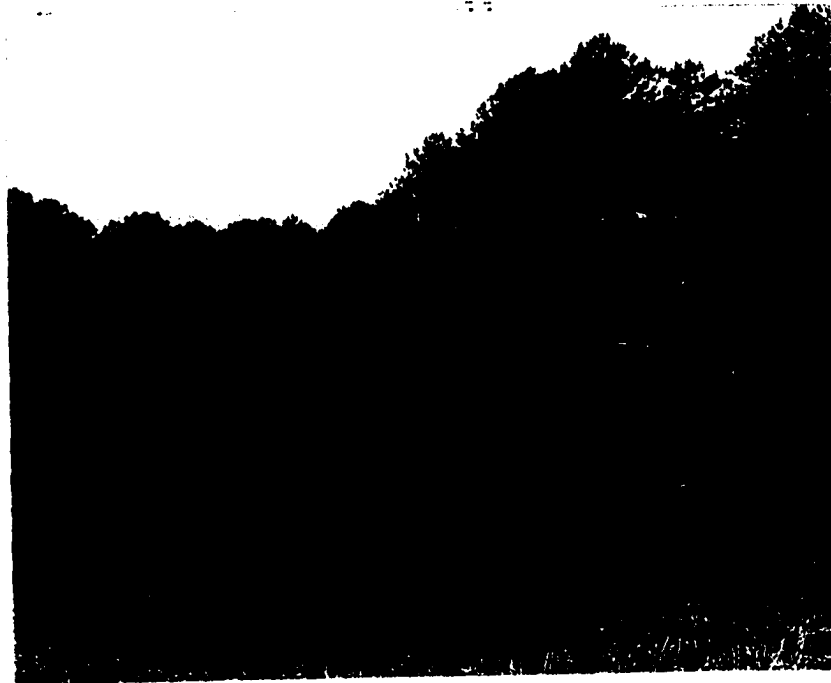


Fig. 9. -- Jamestown Island vegetation: above, woodland and marsh along the Pitch and Tar Swamp; below, mixed forest and salt water marsh along the north shore of the James River.

atmospheric pressure (Day 1920a:2). There is an average of 220 frost-free days over most of the region and a greater number in those areas adjacent to the Chesapeake Bay. The moderate temperatures and annual rainfall of just over forty inches produce a long growing season and make the area very favorable to agriculture, particularly the lower Coastal Plain (Hibbard 1941:1168).

Table 1 has been constructed to illustrate the annual variation in temperature and precipitation at four reporting stations along the lower James River in the vicinity of Jamestown. The last section indicates the average growing seasons in those locations. All data are from Day (1920a and 1920b).

The general impression gained from these statistics is echoed by a statement written in 1612 by William Strachey, an early visitor to the area.

The summer here is hot, as in Spayne, the winter cold as in France, and England; The heat of Summer is in Iune, Iuly, and August; but commonly the Coole Breeses aswadge the vehemency of the heat; the chief of winter is half December, Ianuary, February, and half March . . . The temperature of the country doth well agree with the english constitutions, being sometymes seasoned in the same (Strachey 1953:37).

The coastal region of Virginia falls within the temperate deciduous forest biome of the Southern and lowland areas of the United States (Shelford 1963:56). As it lies next to the Atlantic Ocean, it includes a variety of habitats

TABLE 1
CLIMATIC DATA FOR EASTERN VIRGINIA
MONTHLY MEAN TEMPERATURE

Reporting Station	Length of Record (yrs)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann. Mean
Hampton	29	36.9	40.4	48.3	58.3	68.5	74.5	79.2	80.2	72.2	63.5	52.0	43.7	58.8
Newport News	17	41.1	39.8	47.9	56.9	67.5	73.4	78.0	77.2	71.8	62.1	50.2	41.5	59.0
Fort Monroe	59	39.7	41.1	46.6	55.4	65.6	74.4	78.4	77.4	72.4	61.1	50.7	42.7	58.8
Williamsburg	27	38.9	40.5	48.4	56.8	65.2	72.2	76.8	75.6	69.4	60.1	48.2	40.4	57.7

MONTHLY MEAN PRECIPITATION

														Ann. Total
Hampton	31	2.89	3.92	3.90	3.14	3.76	3.78	4.96	4.85	2.89	3.13	2.54	2.94	42.70
Newport News	22	3.07	3.51	4.01	3.09	3.56	4.87	6.15	5.54	2.76	2.91	2.22	3.67	45.36
Fort Monroe	55	3.06	2.99	3.57	3.12	3.67	3.68	4.63	4.76	3.67	3.02	2.96	3.47	42.60
Williamsburg	21	3.37	3.51	4.18	3.64	3.82	5.04	5.64	5.46	2.99	2.89	2.06	3.83	46.43

146

FROST DATA AND GROWING SEASON

	Length of Record(yrs.)	Ave. Date Last Frost	Ave. Date First Frost	Ave. Growing Season(days)
Hampton	20	Mar 24	Nov 17	238
Newport News	22	Mar 28	Nov 6	223
Williamsburg	20	Apr 9	Oct 29	204

which support a number of floral and faunal communities. This section will attempt to summarize the resources that are present in the area encompassed by the Coastal Plain in terms of four floral zones (Fig. 10). The term "zone" here is used to collectively denote those communities that are present in the particular habitat.

The zone closest to the sea is that of marine coast vegetation which is found along the fringes of Chesapeake Bay. It contains four floristic communities: the beach and outer dunes, the middle open dunes, the inner open dunes, and the strand pine woods (Kearney 1900:268). The open areas are characterized by water ditch grass, and the salt meadows support several species of sedges and saltwater grasses. Marsh nesting birds are found in this region and feed on marine invertebrates exposed by the tides (Shelford 1963: 63). The more forested areas are dominated by the loblolly pine, Pinus taeda, while along the forest edges shrub-like forms occur.

Saltwater marshes characterize the second zone. They are found as narrow bands bordering rivers as far inland as the water remains brackish. They occur along the partially submerged river terraces which are common on drowned rivers subject to tidal action such as the James. The saltwater marsh zone contains several communities composed mostly of many species of grasses, but none of the

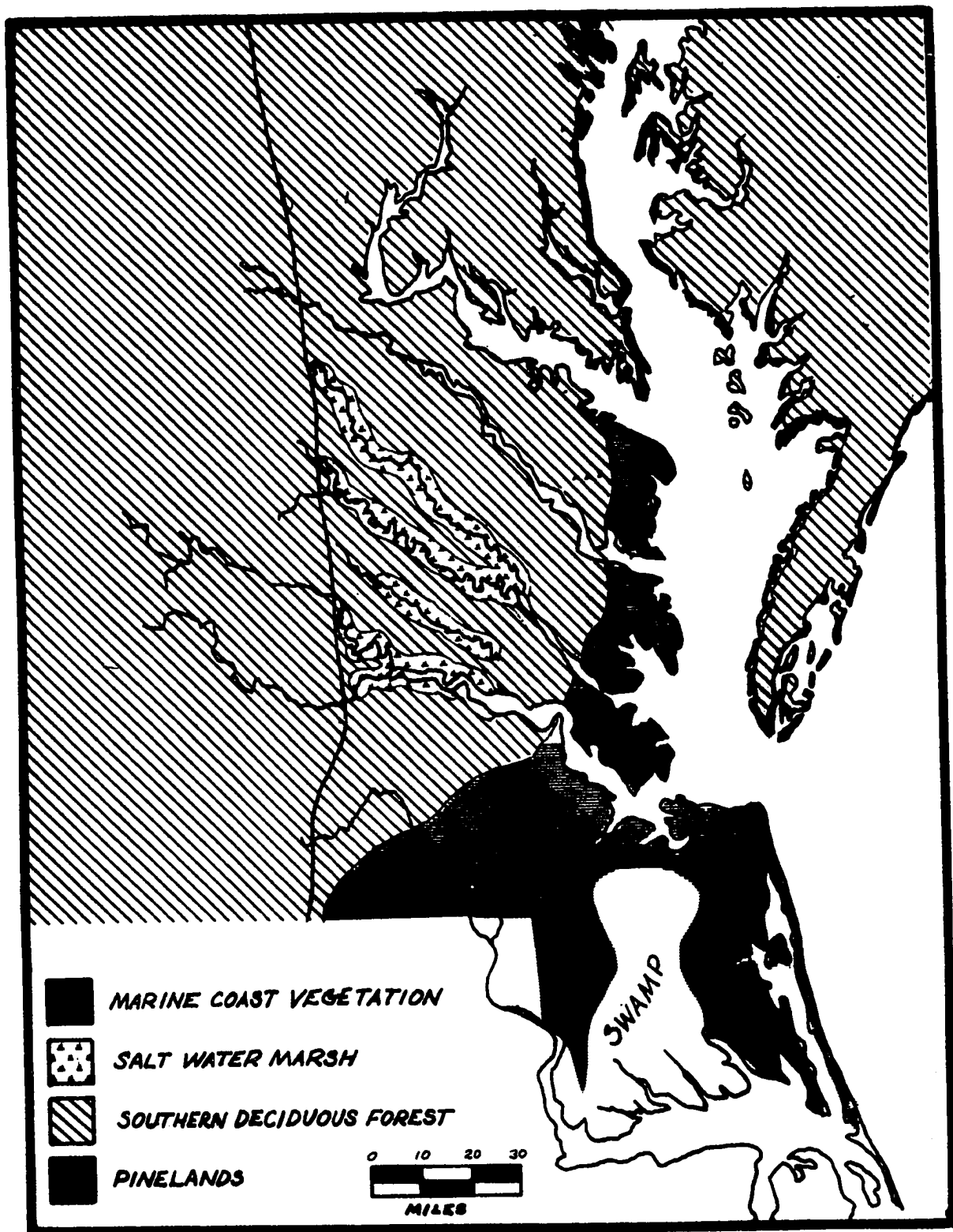


Fig. 10. -- Floral zones of coastal Virginia.

plants can be identified as edible forms (Binford 1964:14). The saltwater "swamps" of Jamestown Island are an example of saltwater marshes.

The three remaining floral zones may best be viewed in terms of the relationship of two faciatiions of the temperate deciduous forest biome; the oak-hickory forest and the magnolia-maritime forest. These two faciatiions form two zones which parallel the southeast coast and are separated by an ecotone which forms a third zone composed of pinelands (Shelford 1963:56). The coastal region of Virginia lies near the northern border of the oak-hickory forest and the pineland ecotone. This geographic feature allows two of these forest zones to be present in a rather narrow area. The magnolia-maritime forest zone occurs to the south along the North Carolina coast.

The southern deciduous forest zone is the third of the five zones. It is located on the upper Coastal Plain, and several communities may be recognized within it. In the lowland areas, white oak, Quercus alba, is the dominant species over the widest area with black oak, Quercus velutina, Spanish oak, Quercus digitata, and post oak, Quercum minor, being of secondary importance. Because of its proximity to the pineland ecotone, pines occur in small numbers. Pinus virginiana is the most prevalent species found in this zone. The oak-hickory communities appear on the uplands

with white oaks and black oaks dominating (Shreve, et al. 1910:21). In some regions a sub-climax community occurs in which at least nine species of trees are extremely common. This suggests that the final climax forest would take the form of a mixed forest (Shelford 1963:62).

Animal constituents of the oak-hickory forest include: white-tailed deer, Odocoileus virginianus; fox squirrel, Sciurus niger; grey squirrel, Sciurus carolinensis; black bear, Enarctos americanus; raccoon, Procyon lotor; opossum, Didelphis marsupialis; striped skunk, Mephitis mephitis; golden mouse, Peromyscus nuttalli; white-footed mouse, Peromyscus leucopus; eastern chipmunk, Tamias striatus; and cotton mouse, Peromyscus gassypinus; as well as such carnivores as: the wolf, Canis lupus; bobcat, Lynx rufus; and grey fox, Urocyon cinereo argenteus. Birds of the deciduous forest include: turkey, Meleagris gallopavo; several species of hawk, Buteo; owl, Bubo virginianus; crow, Corvus brachyrhynchos; and ruffed grouse, Bonasa umbellus. Numerous reptiles and snakes are also present (Shelford 1963:59).

A variation of this zone is formed by several hydrophytic communities found within the deciduous forest. These are located along rivers in the lower Coastal Plain. The first is the riparian swamp, the water content of which fluctuates seasonally, producing a wide variety of plant life. Sweet gum; river birch, Betula nigra; or swamp oak, Quercus

bicolor, are usually dominant here (Shreve, et al. 1910: 25). Cypress swamp communities occur infrequently adjacent to large rivers and consist primarily of stands of bald cypress, Taxodium distichum (Shelford 1963:75). Cypress is mentioned as being present in great abundance on the James River in 1625 by George Percy (1967:19), and several trees are found along the southern side of Jamestown Island today (Yonge 1904:13).

The pine forest ecotone is the fourth zone. Unlike the deciduous forest, it does not represent a climax form of vegetation but rather a sub-climax stage. It is distributed roughly over the lower Coastal Plain. Longleaf pine, Pinus palustris, is the principal dominant with shortleaf pine, Pinus echinata; loblolly pine; water oak, Quercus nigra; southern red oak, Quercus falcata; sweet gum; and mochernut hickory, Caryo tomentosa, comprising the other less common canopy species. Shelford (1963:86) sees this xerosere as approaching a deciduous forest climax with an oak-hickory climax being most probable. In certain areas a fire sub-climax forest occurs where fires, either natural or deliberately set by aboriginal peoples, have destroyed shrubs and young deciduous trees. This resulted in a forest composed of long-leaf pines as well as other species of pine and a forest floor covered with grass and green forbs. Komarck (1968: 184) views the role of natural fires as extremely important

in preventing the development of a deciduous forest in the pinelands. The fire resistant nature of the southern pine forest may also be seen as an adaptation to conditions favorable to natural fire, a constant danger in the Coastal Plain which has the highest incidence of thunderstorms of any region in North America.

Animal constituents recorded as appearing in pine forests are timber rattlesnakes, Crotalus horridus; bobwhite, Colinus virginianus; white-tailed deer; gray fox; fox squirrel; eastern cottontail, Sylvilagus floridanus; gray wolf; and mountain lion, Felis concolor. Those animals common to both oak-hickory and oak-pine forests are: bobcat, eastern chipmunk, grey squirrel, raccoon, white-footed mouse, opossum, black bear, and turkey (Shelford 1963:87-88).

The pineland ecotone community here seems to provide an unusually rich environment, as it contains organisms characteristic of communities adjacent to it as well as certain species that are restricted to it. As is common in most ecotones, the number of species and the density of some species are greater in the ecotone than in the communities flanking it. Odum (1955:278) has termed this tendency for increased variety and density in ecotonal areas the "edge effect." He explains the concept of the edge effect as follows:

Communities frequently change . . . rather abruptly . . . in which case a transition zone would be expected between two competing communities. What may not be so evident from casual observation is the fact that the transition zone often supports a community with characteristics additional to those of the communities which adjoin the ecotone. Thus, unless the ecotone is very narrow, some niches and, therefore, some organisms are likely to be found in the region of the overlap which are not present in either community alone. Since well developed ecotonal communities may contain organisms characteristic of each of the overlapping communities plus species living only in the ecotone region, we would not be surprised to find the variety and density of life greater in the ecotone. Organisms which occur primarily or most abundantly or spend the greatest amount of time in junctional communities are often called "edge" species (Odum 1955:278).

In terrestrial communities the concept of edge effect is applicable to populations of certain species of animals (e.g., deer) which exploit the number of niches present in an ecotone; however, many organisms (e.g., particular types of trees) show the reverse to be true. It is interesting to note that man's clearing of forest lands for habitation or agricultural purpose usually creates a "forest edge" ecotone, resulting in the increase of certain edge species of weeds, birds, insects, and mammals in the newly created habitat (Odum 1955:280).

The presence of aboriginal man-made clearings is attested to by the following passage written by John Smith

in 1612. It describes the activities by which the inhabitants of the James River area created such clearings.

Their houses are in the midst of their fields or gardens, which smal plots of grounds . . . Some times from 2 to 100 of these houses are situated togither, or but a little separated by groves of trees. Neare their habitations is little small wood forest, or old trees on the ground, by reason of their burning of them by fire (Smith 1907b:101).

In addition to their burning the forest to clear land for agriculture, fire drives were utilized as a hunting technique. Often the circles of enclosure were up to five or six miles in circumference (McCary 1957:21).

The extent of such pre-contact forest clearing is uncertain. Maxwell (1910:78) considers aboriginal man's impact on the forests to have been extensive; however, the climax or sub-climax or much of the forests suggests it was not overly destructive to the woodlands as a whole.

Among the vegetation that grew in cleared areas were the following described by Smith (1907b:91-92) in a passage written in 1612:

They have Cherries, and those are much like a Damsen; . . . Of vines, great abundance in many parts, that climbe the toppes of the highest trees in some places, but these beare but few grapes. But by the rivers and Savage habitations where they are not overshadowed from the sunne, they are covered with fruit, though never pruned nor manured . . . During the somer there are either strawberries which ripen in April; or mulberries which ripen in May or June, . . .

The distribution of mulberry trees appears to have been influenced by these clearing operations, for Smith (1907b:92) found them growing in the vicinity of habitations, often in groves.

Of particular interest here is Smith's (1907b:94) mention of the wild turkey ". . . as bigge as our tame," an animal found in greatest abundance in upland forest-prairie edge habitats. Stoddard (1963:5) has pointed out that the weedy growths common to abandoned "old fields" in the process of reverting to pine forest are optimum conditions for the turkey as well as bobwhite and probably also deer.

To estimate the availability of edible plants in the various communities of the Coastal Plain, Binford (1964:33) has plotted the relative abundance of five food types throughout the year.

Smith suggests that the aboriginal inhabitants may have, in fact, relied heavily on wild plants:

In Aprill they begin to plant . . . and so they continue till the midst of June. What they plant in Aprill they reape in August, for May in September, for June in October . . . When all their fruits be gathered, little els they plant, and this is done by their women and children; Neither doth this long suffice them: for neere 3 parts of the years, they only observe times and seasons, and live of what the Country naturally afforteth from hand to mouth &c (Smith 1907b:96-97).

In addition to the edible wild food plants, a number of domesticants were grown on the Coastal Plain by aboriginal inhabitants. Early observers noted a number of plants.

In May also amongst their corne [Zea mays], they plant Pumpeons [Cucurbita], and a fruit-like unto a muske millen, but lesse and worse; which they call Macocks . . . They plant also Maracocks [Podophyllum peltatum] a wild fruit like a lemmon . . . They also plant pease . . . Their beans [Paseolus vulgaris] they much esteeme for dainties (Smith 1907b:96-97).

Several varieties of corn, or maize, were grown, including dent, flint, pop, as well as at least two types of beans. Sunflowers, Helianthus annuus, were grown for their seeds, and tobacco, Nicotiana rustica, was cultivated for ceremonial purposes (McCary 1957:19).

In addition to the numerous floral resources available in the Coastal Plain of Virginia, many faunal resources also existed in this region. These resources may be discussed in terms of three basic habitats: the terrestrial woodland, the freshwater tidal, and the saltwater habitat of the Chesapeake Bay.

The coastal waters of the Chesapeake Bay area abounded in both marine and anadromous fish. Of the first category, Hildebrand and Schroeder (1927:14) list twelve species caught commercially in the bay in the early twentieth century. Of these, only the white perch and the eel remain in the bay during the winter, and all but three species can

be taken on a line. Several of these species were exploited aboriginally and were reported by early European observers to that area, including flounder and mullet noted by Harriot (1972:20) and winter flounder (buttes), mullets, eels, and flounder (plaice) mentioned by Smith (1907b:95) in 1612.

Three species of anadromous fish are present. Alewife, Pomolobus aestivalis, and sturgeon, Acipenser oxyrhynchius, were recognized in 1588 by Harriot (1972:20), and shad, Alosa sapidissima, are mentioned by Smith (1907b:95) in his report of 1612. All of these species are most plentiful in a period from March through June, while marine fish tend to be present in large numbers from March through November (Hildebrand and Schroeder 1927:17-32).

Shellfish include oyster, Ostrea virginica; hardshell clam, Venus mercenaria; softshell clam, Mya arenaria; scallop, Pecten inadians; and several species of saltwater mussel (Baylor 1895). Most of these may be gathered by hand at low tide from the exposed shell mounds (Wharton 1957:41). The Chesapeake Bay blue crab, Calappa sapidus, is also abundant as are shrimp and crayfish. The last three types and oysters were recognized by Strachey (1953:128) in 1610.

Early accounts listing several types of sea mammals appear in Harriot's (1972:20) 1588 description speaking of porpoises "which we have taken and eaten," and Strachey

(1953:128) includes both "porpoys" and seals in his list of animal resources of the Chesapeake Bay area.

Turtles also seem to have provided an important economic resource to the aboriginal inhabitants of coastal Virginia. According to Harriot (1972:21):

There are many Tortoyses both of lande and sea kinds, their backes & bellies are shelled very thicke; their head, feete, and taile, which are in appearance, seem ougly as though they were members of a serpent or venomous; but not withstanding they are very good meate, as also their eggs.

These included two species of turtles and two species of terrapin (Pope 1939).

The freshwater tidal habitat occurs in the Chesapeake drainage in the area west of the confluence of the Mataponi and Pamunkey Rivers forming the York and on the James west of the mouth of the Chickahominy. The second location is only a little over five-and-one-half miles upriver from Jamestown Island. Fourteen species of freshwater fish are commonly found in this habitat (Fowler 1945). It is difficult to determine the extent to which these species were represented in the early seventeenth century, for few can be identified in the documents; only the bass, perch, garfish, and catfish are mentioned by Strachey (1953:128). In addition to the presence of these freshwater fish in all seasons, the yearly migrations of anadromous species to

their spawning grounds make the freshwater tidal habitat rich in potential resources of fish.

Six species of turtles occur in the freshwater tidal habitat. All are edible, but there is no evidence of their having been consumed regularly in historic times (Pope 1939).

A number of fauna have already been mentioned in the description of the major floral zones of the Coastal Plain. For this reason the animal resources of the terrestrial habitat will be treated in a single section. Because the animal population has certainly been subject to changes in the time that has elapsed since the seventeenth century and the time of the work of recent biological surveys, an emphasis will be placed on historical accounts of observations made at the time of the early European contact.

Perhaps the earliest account of fauna was written in 1584 by Amadas and Barlowe (1904:299) who explored the coast and islands of Albermarle Sound. They noted the presence of "many goodly woodes full,of Deere, Conies (European rabbit), Hares, and Fowle, even in the midst of summer in incredible abundance." Harriot (1972:19-20), who visited the area a year later, reported the animals mentioned above as well as: "Squirels which are of a grey colour . . . and . . . Beares which are all of black colour . . . The inhabitants sometime kil the Lyon [Felis concolor] . . . and . . . their Wolves or wolvisch Dogges, which I have not set downe for good meat."

The first account of the James River area is that of George Percy (1967:20) who wrote that the country contained "great store of Deere both Red and Fallow. There are Beares, Foxes, Otters, Bevers, Muskrats, and wild beasts unknowne." Perhaps the most extensive description of seventeenth century fauna is provided by John Smith who had personally conducted explorations throughout much of the lower Chesapeake Bay region. He wrote:

Of beastes the chief are Deare, nothing differing from ours . . . In the deserts toward the heads of the rivers, there are many, but amongst the rivers few. There is a beast they call Aroughcun (raccoon), much like a badger . . . Their Squirrels some are neare as greate as our smallest sort of wilde rabbits . . .

A small beast they have, they call Assapanick, but we call them flying squirrels [Glaucomys volans], an Opassom hath . . . a bagge wherein shee lodgeth, carrieth, and sucketh her young. Mussacus [muskrat, Ondatra zibethicus], is a beast of the forme and nature of our water Rats, but many of them smell exceedingly of muske. Their Hares no bigger than our Conies, and a few of them to be found.

There is also a beast they call Vetchunquoyes in the form of a wilde cat [Lynx rufus]. Their Foxes are like our silver haired Conies, of a small proportion, and not smelling like those in England. Their Dogges of that country are like their Wolves, and cannot barke but howle; and their wolves not much bigger than our English Foxes. Martins fisher [Martes pennanti], Powlecats [skunk, Mephitis mephitis], weessels [Mustela frerata], and Minks [Mustela vison] we know they have, because we have seen many of their skins . . . (Smith 1907b:93-94).

Several early references to the presence of the eastern bison, Bison bison, occur in the explorers' accounts. The first is in a description of Virginia published by Hakluyt (1947) in 1609. He speaks of:

. . . the multitude of Oxen, in there was such store of them, that they [Indians] could keepe no corne for them: and the Indians lived upon their flesh. The hairs of these Oxen is likewise said to be like a soft wooll, betweene the course and fine wooll of sheep: and that they use them for coverlets, because they are very soft and woolled like sheep: and not so onely, but they make bootes, shooes, targets, and other things necessarie of the same.

Four years later, Samuel Argoll, while exploring the country west of Chesapeake Bay, noted ". . . great store of Cattle as big as Kine . . . [which] . . . are very easie to be killed, in regard that they are heavy, slow, and not so wild as the other beasts of the Wilderness" (Argoll 1906:92).

Smith also listed those birds he observed in this region.

Of birds, the Eagle [Haliaeetus leucocephalus], is the greatest devourer, Hawkes, there be of diverse sorts as our falconers called them, Sparrowhawkes [Falco sparverius], Lanarets, Goshawkes [Accipiter gentilis], Falcons [Falconidae], and Ospreyes [Pandion haliaetus]; but they all pray most upon fish. Pattridges [Colinus virginianus] these are little bigger than our own Quailes, wilde Turkeys are as bigge as our tame. There are woosels or blackbirds [Agelaius phoeniceus], with red shoulders, thrushes [Hylocichla mustelina, and others], and diverse sorts of small birds . . . In winter there are great plenty of swans [Olor columbianus], Craynes

gray and white with black wings [sand hill crane, Grus canadensis pratensis], Herons [Ardea herodias], Geese [Branta], Brants, Ducke [Aythya sp.], Wigeon [Mareca americana], Dotterell [plover, Charadrius], Oxeles [sandpipers], Parrots [the extinct Carolina parakeet], and Pigeons [Ectopistes migratorius, the extinct passenger pigeon]. Of all these sorts great abundance, and some other strange kinds unknown by name (Smith 1907b:94).

To them, Strachey (1953:128) added mallard, Anas platyrhynchos platyrhynchos, and teal, Anas discors, and later observers noted the owl (barn owl, Tyto alba, and screech owl, Otus asio) and mockingbird, Mimus polyglottos (Force 1847:17).

Smith (1907b:95) was aware of the absence of birds in the summer months and described the period from September to November as a time of "feasting and sacrifice" when "fish, fowle, and wild beastes were exceedingly fat." These observations suggest that the majority of the birds frequented this area during the winter migratory season when they would be drawn to the rivers, marshes, and sounds of the Coastal Plain region by the plentiful crustacea and lush aquatic vegetation of that area.

In summary the Coastal Plain region of eastern Virginia lies along the southern edge of the oak-hickory faciation of the southern deciduous forest and includes a portion of the pineland ecotone that separates it from the magnolia-maritime forest of the Carolinas. The presence of such an

ecotone and the accompanying phenomenon of the edge effect results in the presence of not only a larger diversity of flora and fauna in this region but also a greater density of species, providing a natural abundance of potentially exploitable resources. In addition to lying on the boundary of two major forest communities, the Coastal Plain lies adjacent to Chesapeake Bay and the Atlantic Ocean and is dissected by several large tidal rivers. This physiographical diversity provides a variety of resource zones, each containing an abundance of living forms. Generally, the forests are the richest zones in terms of edible natural flora and also provide a large number of fauna. In contrast comparatively few types of floral resources are present in the marsh and riverine zones, yet edible fauna abound here in great numbers in the form of marine and freshwater fish which might be taken throughout the year as well as anadromous fish and migratory waterfowl which are seasonally plentiful.

In addition to natural sources of food, the forest lands of the Coastal Plain proved very adaptable to aboriginal cultivation, utilizing extensive swidden techniques. Indeed, the results of such burning may have contributed to the formation of five subclimax forests in some areas. The firing of land also effected an increase in the variety of flora and fauna present in these areas. The growing of crops in aboriginal times was greatly influenced by the

temperate climate, moderated throughout the year by the proximity of the sea. A combination of climate and soil makes the area ideally situated for the growing of aboriginal crops as well as many of those utilized by seventeenth century Englishmen.

In terms of its natural resources, the Coastal Plain of Virginia appears to have been ideally suited to colonization by a sixteenth century European power, providing not only the means of maintaining ample subsistence but also the raw materials for the incipient industries of the period. It is highly likely that an area offering this potential would support a successful colony following initial contact by a complex state system such as that of Great Britain as long as the colonists could retain communication with and support from the mother country.

Virginia: The Potential for English Expansion

Inherent in the maintenance of support and communication is the accessibility of all parts of the area of colonization to the transportation system of the intrusive society. Accessibility may be viewed in terms of both positive and negative features of the environment. The latter would consist primarily of barriers to movement, the presence of which tend to limit the expansion of the colony and consequently restrict its success. Positive features, of course,

are those which actually aid such movement, such as a pass between two hills. Although the hills would not represent an impassible barrier, the pass provides a means by which to facilitate movement over them by eliminating the necessity of ascent and descent.

Naturally, a discussion of communication must be couched in terms of the capabilities of the transportation and communications subsystems of the intrusive culture, that system which involves all activities associated with travel by any components of the entire cultural system.

In the late sixteenth century internal transportation and communication in England was still basically confined to methods developed in the Middle Ages. Numerous sociocultural changes were taking place in Western Europe during this period, however, resulting in a virtual reorganization of the distribution of goods and services on a much wider and more complex scale than before. Tied intimately to this phenomenon, of course, is the expansion of Europe and its exploitation of the products and resources of Africa, Asia, and the Americas through external trade. Unlike transportation within England itself, methods of external communication were undergoing fairly rapid change and, for this reason, will be considered separately.

External communication in overseas colonies is usually confined to movement between the colony and the metropolitan

area. Hence, the question of accessibility of the parts of the area of colonization may be viewed primarily in terms of internal transportation. Its potential for development must be measured according to its ability to incorporate those means of transportation and communication in use within England itself at this time.

Flinn (1965:129) lists three principal methods of transportation in the sixteenth and seventeenth centuries in England: by road either on foot, horse, or horse-drawn vehicle; by river where the depth of water permitted; and by coastal navigation. Most internal movement depended on the first method. Sixteenth century roads were notoriously poor, as the deteriorated Roman system of main roads constituted the majority of the improved roads in England. Roads constructed during the Middle Ages consisted mainly of cobbles or broken stone laid on a loose foundation of sand to create a roadbed that could expand and contract with heat and cold, was easily repaired, and could withstand the traffic of packhorse, wheel barrow, and cart without much wear (Goodchilde 1956:526). Even so, those roads that existed declined rapidly in the fifteenth and sixteenth centuries with the advent of increased wheeled traffic brought about by the growing complexity of technology and the distribution of resources and products. It was not until the beginning

of the eighteenth century that the improvement of roads was begun in England and Europe in general (Forbes 1958:520).

The flat land of the Coastal Plain of Virginia offered no obstruction to the unimproved roads required by English transportation of that period. Even the forests formed anything but an impenetrable barrier of solid woods. In 1612 Strachey described the area of colonization in the following manner:

This part is not mountainous, wee sometymes meet with pleasant Plaines, smale rising hills, and fertile vallies, one crossing another, and all watered conveniently with brookes, and Springs: . . . conteyning some 20. some 100. some 200 acres, some more, some lesse, other plaines there are fewe, but only where the Salvadges inhabite, but all overgrowne with trees and woodes (Strachey 1953:39).

The recognition of the adaptability of the Coastal Plain in general to road construction may be inferred from a statement contained in the Virginia Company's 1621 instructions to the governor and council of state in Virginia. In reference to the "espetiall care taken both of generall and particular survaies" the order suggested that: " . . . itt may be fitting and moste usefull to posteritie to cast an imaginarie eye and view, wher and which way the grand highewayes may bee like to strike and passe through the dominions; . . ." (Bemiss 1957:120).

River navigation would perhaps be a suitable means of travel in the Coastal Plain due chiefly to the presence of

the deep, drowned tidal rivers and their tributary streams. In a report of 1616 John Rolfe states that ". . . for faire navigable ryvers, and good harbors, no Country in Christendom in so small a circuit, is so well stoored" (Rolfe 1951: 2). Early settlers in the area were well aware of the navigability of most of the major rivers flowing into Chesapeake Bay (Strachey 1953:42). Captain Babriel Archer, one of the first to explore the James River, reported that it "extends it self 160 myles, 131 into the mayne land betweene two fertile and fragrant bankes, two miles, a mile, & where it is least a quarter of a mile broad, navigable for shipping of 300 tunn 150 miles" (Archer 1969:99). Smith (1907b:97) noted that the waters of this river "are full of safe harbours for ships of warre or marchandize," and Percy (1967: 16) observed in 1607 that ships could lie in six fathoms (thirty-six feet) of water while moored to trees along the erosion-cut shore of Jamestown Island. The similarity of the coastal Virginia waterways to the commercial rivers of Britain is perhaps best revealed in a statement by William Strachey (1953:37) comparing a settlement located on the James to "London upon the Thames," one of the most important commercial centers of Britain.

The unique capabilities of the river system in the Coastal Plain of Virginia would appear to offer the easiest route for movement into the immediate interior. Indeed, it

seems safe to predict that, once a "frontier town" settlement was established, subsequent expansion would likely take place along the network of inland watercourses. The use of the rivers would be even more likely if unforeseen obstacles to land movement, such as the presence of hostile aborigines, were encountered.

In summary the Coastal Plain of Virginia appears to be extraordinarily suited to the movement of men and material both by land and by water. The presence of continuous dry land which was not heavily forested together with a river drainage system composed of deep, drowned rivers and their tributaries provided the potential avenues of movement best suited to the common means of English overland transportation of the time: foot, horse, and cart traffic on unimproved or poorly improved roads and water traffic by boat. By early seventeenth century standards, the Coastal Plain offered a physiographic situation ideal to the transportation and communication needs of an expanding colony.

Indigenous Inhabitants of the Jamestown Frontier:
The Powhatan

The area in which the English colonists hoped to settle was inhabited principally by one ethnic group, the Powhatan, who occupied the region of the James, Appomattox, York, Mattaponi, and Pamunkey Rivers from the coast of the point beyond the Fall Line, that is to say, the entire width

of the Coastal Plain (Fig. 11). Another group, the Chickahominy, lived within the Powhatan area along the Chickahominy River, a tributary of the James. It is the purpose of this section to briefly summarize these groups in terms of the sociocultural system they possessed. This information provides a means by which to compare this system with that of the English colonists described above. In a situation of successful colonization, it is imperative that the sociocultural system of the intrusive society exhibit a greater degree of complexity than that of the indigenous group.

The organizational differences between the ways in which the exploitative rights to the strategic resources of the environment are distributed in the competing sociocultural systems is directly related to the complexity of each (Fried 1952:410). The system having the greatest restriction of such resource rights will tend to be hierarchically arranged with the greatest complexity of organization. Therefore, systems of this type may be seen to possess an advantage over those with a less restricted access to such resources if both are in competition for the same environment and its resources. If the James River area is to satisfy this precondition of the frontier model, then the sociocultural system of the English colonists must possess a greater complexity than that of the Powhatan Indian inhabitants.

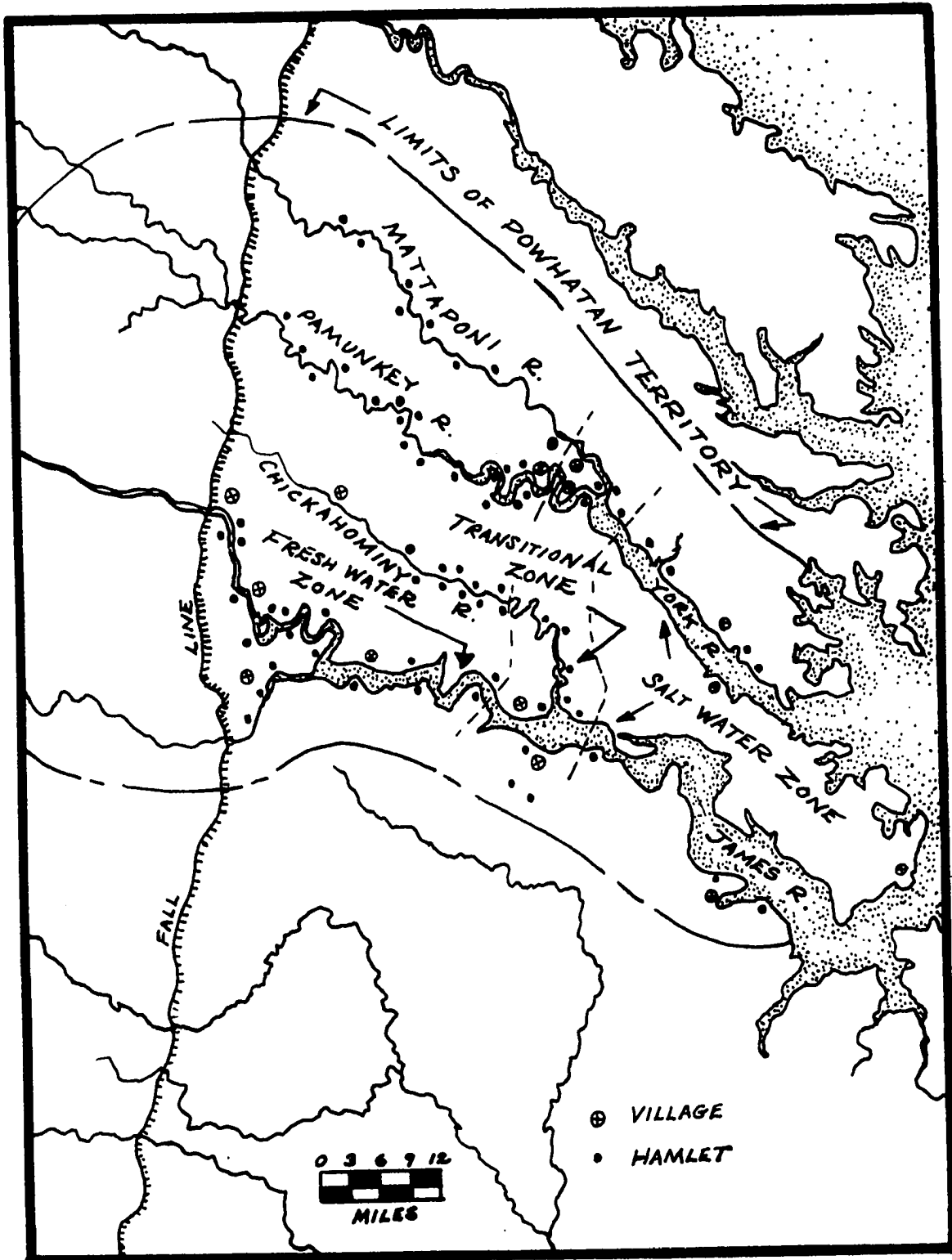


Fig. 11. -- Distribution of Powhatan settlements in 1607.

Since the frontier model does not attempt to deal specifically with the relationship of the intrusive and indigenous societies, it is not necessary here to discuss the sociocultural system of the latter to the degree that the former has been treated. For this reason the following analysis will seek only to define a level of sociocultural integration without attempting a detailed description of Powhatan culture per se or the effects of acculturation upon it.

Perhaps the most concise treatment of the Powhatan and allied groups in an anthropological sense may be found in Lewis R. Binford's (1964) discussion of the cultural diversity of the aboriginal cultures of coastal Virginia and North Carolina. His intent in this study is to investigate the degree of functional specialization and structural differentiation extant within the various ethnic groups without attempting to describe any of the sociocultural systems in its entirety. The data have been analyzed in such a way as to allow the system to be grouped in broad categories on the basis of sociocultural complexity representing levels of evolutionary development (Binford 1964:70). An analysis of this type is very apropos to the purpose of this section, and the following discussion will be heavily dependent upon his conclusions.

The Powhatan apparently consisted of a number of separate communities tied to one another in a single

sociopolitical system. John Smith (1907b:84-85) identified the following communities as belonging to the Powhatan confederation: Kecoughtan, Paspahegh, Weanock, Arrohattoc, Powhatan, Appamatuck, Quioucohanock, Warrasqueoc, Youghtand, Mattapani, Pamunkey, Werawocomoco, Orapaks, and Chiskiack. The Chickahominy, though living in the midst of this area along the river of the same name, apparently were not a direct part of this political entity.

The subsistence base of the Powhatan, like most other aboriginal groups living in the Coastal Plain, was primarily hoe agriculture based on corn, beans, and squash; although hunting and gathering techniques were also employed during certain seasons of the year. The location of the Powhatan villages along several of the major rivers of the Coastal Plain would certainly give the group access to all of the main resource zones of the area, providing a potential for extensive exploitation of the natural environment of the Coastal Plain region.

The Powhatan were an internally ranked society with three status levels: non-chiefs, chiefs, and the paramount chief and his immediate family. A ramified social system seems to have prevailed, allocating status to individuals in order of their proximity in direct line of descent to an ancestor at the apex of the system. District chiefs in the towns were in this manner linked to one another as well as

to the paramount chief while at the same time being ranked in order of their geneological distance to his lineage. This hierarchical arrangement of statuses was also intimately tied with the administrative levels of a system for the redistribution of goods and services. District chiefs, as heads of local lineages, served to funnel products from their respective regions to the paramount chief, whose function was to collect, store, and reallocate them. Goods passing up the hierarchy were also utilized to support religious functionaries as well as the ceremonial consumption associated with the chiefly status.

The Chickahominy were a much smaller and less socio-culturally complex group than the Powhatan, occupying thirteen settlements along the Chickahominy River. They are described as Powhatan's enemies prior to English contact (Strachey 1953:59). Binford (1964:102) sees this group, which was organized differently than the Powhatan and yet was encompassed by although not fully incorporated within the sociopolitical system of the larger group, as having only recently been brought within the Powhatan sphere of influence by conquest. The expansion of the Powhatan chiefdom by recent conquest is evidenced by Smith's (1907b:113-114) statement that, out of fourteen districts controlled by the paramount chief, all but six were brought within the sociopolitical system by conquest in his lifetime.

The location of the Powhatan chiefdom on the transitional zone between the freshwater and the saltwater habitats along rivers of the Coastal Plain with access to woodland habitats inland suggests an ecological basis for the development of a redistributive network capable of supporting settlements in a great number of different resource zones (Fig. 11). Binford (1964:165) contends that, among the aboriginal groups of the Virginia-North Carolina Coastal Plain, there is a strong correlation between the level of socio-cultural complexity and the gross productivity of the region in which each was situated. The gross productivity, in turn, is closely correlated with the variety of resources and the spatial differentiation between points of availability. This suggests that those areas closest to the greatest number of resources are those which would provide some sort of selective advantages to the development of internally ranked societies.

Binford (1964:493-494) has proposed a model of cultural evolution to explain this phenomenon in ecological terms. He sees the introduction of agricultural techniques as providing a subsistence base for the development of localized sociocultural units in more restricted areas as well as a general population increase. This accelerated growth, however, is limited to the extent to which nondomesticated resources can be exploited without exhausting them. Inter-group competition for places where such resources were

available would also tend to favor increased sociocultural complexity. Evolution to more complex forms of sociocultural systems (chiefdoms) is seen to have occurred when gross productivity had become sufficiently high to support inter-group competition and to provide for a growing population. It is further indicated that the variety of resources and the society's exploitation of them had reached a degree of complexity great enough to serve as the basis for subsistence specialization among population segments of a sociocultural system.

In a sense the increased sedentation permitted by agricultural subsistence may be seen as a deviation amplifying mechanism allowing population growth. Positive feedback in the form of sustained change would be expected to result until a point of "diminishing returns" was reached and negative feedback mechanisms effected a new state of equilibrium at a higher level of complexity (Renfrew 1972:36). The ongoing competition of the Powhatan with other Coastal Plain groups witnessed by early explorers (Smith 1907b:105-106) is evidence that such change was taking place. Indeed, the competition for resources by European settlers intent on remaining in the Coastal Plain area probably accounts for the almost unanimous hostility shown them by the aboriginal inhabitants once this intention was fully known to them. The presence of less complex, smaller groups such as the

Chickahominy, who were not fully incorporated into the larger sociopolitical system further suggests the incompleteness of the process of evolution throughout the Coastal Plain region.

The Contact of Cultures:
The English and the Indians of Virginia

The contact between the English colonists who landed at Jamestown Island in May, 1607, and the native inhabitants of eastern Virginia was not a freak or unplanned occurrence, for it may be viewed as the culmination of a long progression of earlier contacts between Europeans and North Americans. The earliest evidence of such trans-oceanic visits were those of the short-lived Norse settlements in Newfoundland in the tenth century. These, however, were only transitory ventures, maintained only by tenuous lines of support with the Atlantic colonies. Their position was worsened even further by sporadic and violent exchanges between the Europeans and the native inhabitants (Jones 1968:303). The decline of the Norse trade and exploration two centuries later, brought about by a combination of climatological, political, and economic factors, effectively ended deliberate contact with the New World at least until the late fifteenth century (Morison 1971:61).

European expansion across the Atlantic was closely tied to the growing complexity of the exchange networks of

the European and Mediterranean world in the first part of the fifteenth century. The increasing lucrative trade in spices and other luxury items from Asia prompted the exploration by other European states for alternate sources of supply or alternate routes to the present sources which were being so profitably exploited by the monopoly of the Italian merchants (Parry 1963:61).

The early success of Atlantic voyages by Spain and Portugal prompted the English to turn their attention to the search for a northern sea route to the Indies and resulted in two voyages by an Italian entrepreneur, John Cabot, in 1497 and 1498. Though sent to establish a trading monopoly with the inhabitants of any western land he should discover, Cabot made no contact with the inhabitants of those parts of coastal Newfoundland which he investigated. His disappearance on his second voyage effectively ended British exploration of North America for almost a century. Sporadic contacts were probably made by the French and English fishing fleets that began to extensively exploit the Grand Banks of Newfoundland just after the turn of the sixteenth century (Morison 1971:180).

The success of Magellan's circumnavigation of the globe in 1521-1522 seems to have again awakened Europe's interest in the search for a "northwest passage" to the Far East. As the area of the Atlantic coast of North America between the present states of Maine and Georgia remained

unknown, this region seemed to many to hold the last hope of yielding such a passage (Morison 1971:279). Voyages in search of this route to the Orient were to result in the first recorded contact with native peoples in this area, and strikingly enough, the initial contact occurred not far from the site of the future English settlements in Virginia.

The first landings, however, were not made by the English, but by Giovanni da Verrazzano, a Florentine mariner in the employ of Francois I of France. Backed by Italian bankers in the French silk center of Lyon, he left Dieppe in 1524 and attempted to follow Columbus' route across the Atlantic in hope of discovering a shorter route to the sources of his investors' raw product. Blown off course, he made landfall off Cape Fear, North Carolina. He described his meeting with the natives of this land as follows:

. . . wee discovred a new land, never before seen of any man, either anncient or moderne, and at the first sight it seemed somewhat lowe, but beeing within a quarter of a league of it, wee perceived by the great fiers that wee sawe by the sea coaste that it was inhabited: . . . at length, beeing in despaire to finde any port, wee aste anker upon the coast, and sent our Boat ashore, where we sawe great store of people, which . . . and seeing up approache they fled away . . . but afterwarde . . . some of these came to the Sea side, seeming to reioyce very much at the sight of us, . . . shewed us by sndry signes where we might most commodiously come a land with our Boat, offering us also their victuals to eate. We coulde not learne of this people their manner of living, nor their particular custoes, by reason of ye short abode we made on the shore, . . . (Verrazzano 1850:56-57).

Following this brief but friendly contact, the explorer sailed northward along the Outer Banks and up the eastern seaboard as far as Maine before turning back to France. As he never sighted the coast of the mainland from the Outer Banks, Verrazzano assumed the latter to represent the isthmus between the Atlantic and Pacific Oceans, a myth long perpetuated by sixteenth century mapmakers (Morison 1971:295).

The Spanish, who had already established settlements in east Florida to protect the passage of shipping from Central America, were also interested in this country to the north. Now well aware that it represented more than an isthmus, they dispatched reconnaissance expeditions and missionaries northward in an attempt to extend their control further up the Atlantic coast. In 1561 a Dominican mission actually landed in the Chesapeake Bay (Bahia Santa Maria) area only to be turned back by a storm (Shea 1854:55). Nine years later Jesuit missionaries moved overland into eastern Virginia, but they had only limited success establishing mission communities there. The massacre of these Jesuits in 1571 was enough to prompt Spanish officials to abandon the mission field altogether (Gannon 1965:34).

It was not until the late 1570's that British interests in this area again began to bear fruit. In 1578 Sir Humfrey Gilbert, speculator, soldier of fortune, and longtime member

of Queen Elizabeth's court, received letters patent
 ". . . to discover, finde, search out, and view such remote,
 heathen, and barbarous lands, contreys and territories not
 actually possessed by any Christian prince or people . . .
 with all commodities, jurisdictions and royalties . . ."

(Hakluyt 1904a:17). Gilbert's grant to all lands between
 Labrador and Florida passed with his death in 1583 to his
 half-brother, Walter Raleigh (Hakluyt 1904b:290) who, the
 following year, sent an expedition under Philip Amadas and
 Arthur Barlowe to reconnoiter this vast area. Taking a
 southern route, they made landfall of the Outer Banks near
 Cape Fear and explored Pamlico Sound, Verrazzano's "western
 sea." Contact with native people was made during explora-
 tions at the northern end of the sound at "an Island, which
 they call Raonoak." Of the inhabitants the explorers com-
 mented: "We found the people most faithfull, voide of all
 guile and treason, and such as live after the manner of the
 golden age" (Amadas and Barlowe 1904:305).

The success of their voyage resulted in the first at-
 tempt to establish a permanent colony in Virginia, as this
 part of the North American continent was now called. In
 July, 1585, six shiploads of colonists landed at Roanoke
 Island where they were to remain for an uncertain period.
 Relations with the Indians deteriorated rapidly, and due to
 almost constant hostilities and an inability of the colonists

to successfully carry out subsistence activities, the first Roanoke colony was abandoned barely a year after its founding (Quinn 1974:303).

Raleigh, undismayed by this failure, launched a second colony in the summer of 1587. Following the advice by the governor of the first colony, their destination was the Chesapeake Bay area to the north, where deep water harbors for commerce, islands for defense against hostile attack, and arable land less swampy than that in the Carolina sounds offered a greater potential for success (Morison 1971:656). The colony differed from the earlier one in that it attempted to transplant a feudal community intended to be self-supporting and self-governing. For the first time families were included among the colonists. Due to the incompetence of their pilot, the colonists' fleet again ended up at Roanoke, where old animosities soon brought the colonists and local inhabitants into conflict.

War between England and Spain flared in 1588-1589, discouraging all efforts to contact or resupply the Roanoke colony until 1590 when a relief expedition found no sign of the colonists or the "Cittie of Raleigh" (Morison 1971:677). Although there was no evidence to indicate the precise fate of the colony, it may be assumed that without the necessary resupply of provisions, tools, and personnel, it could not

survive as a separate social unit. The hostility of the aboriginal inhabitants would only hasten its demise.

Thirteen years later an English captain, Bartholomew Gilbert, attempted to explore the area in the vicinity of the entrance to the Chesapeake Bay and was repulsed by Indians who apparently had, by this time, become wary of the European intruders (Canner 1906:335). Nor was the hostility one-sided, for John Smith reported in 1608 that, soon after arriving in Virginia, he was informed by a leader of one of the local Indian groups that a year before (1606?) Europeans exploring the Rappahannock River had slain several inhabitants of the area in spite of the friendly treatment they had received at the hands of the latter (Smith 1907a: 47).

The expected hostility of the native people is reflected in the Virginia Company's Charter of 1606 which authorized the Company to "make habitacion, plantacion and . . . deduce a colonies of sondrie of our people into that parte of America commonly called Virginia" (Bemiss 1957:1). The charter not only stressed the necessity of fortifying the settlements for defense but also accepted for the company the task of attempting to "bring the infidels and salvages living in those parts to humane civilitie and to a settled and quiet governmente" (Bemiss 1957:2-3). Clearly the settlers who were to found the colony at Jamestown not

only anticipated contact with Indians living in the area but appear to have had no misgivings about the nature of the relationship between these people and the English colonists.

Contact with the aboriginal inhabitants of the Chesapeake Bay area occurred almost simultaneously with the first landing of the Jamestown colonists in April, 1607. Upon anchoring just within the mouth of Chesapeake Bay, the shore party was attacked by Indians who came "creeping upon all four from the hills like bears, with their bows in their mouths and charged . . . very desperately" (Percy 1967:8). The reception of the Englishmen was somewhat less hostile as they proceeded up the James into the interior. Smith (1907a: 33) noted that "the people in all places kindly intreating us, daunsing and feasting us with strawberries Mulberries, Bread, Fish, and other their countrie provisions whereof we had plenty." Barely two weeks after the landing at Jamestown Island, however, Smith noted a marked change in the attitude of the Arrohattoes, a group with whom he was visiting. Suspecting trouble, presumably from the Paspaheghs who occupied the territory in which the colony was settled, he immediately returned downriver to Jamestown to learn that the settlement had been attacked and several casualties inflicted (Smith 1907a:35). The founding of the Jamestown colony was faced with at least mutual distrust and at most open hostility between the members of the two societies that

came into contact. This antagonism must not be viewed as a spontaneous occurrence resulting from the meeting of two cultures on the James River in 1607 but rather the culmination of a relationship derived from over a half century of European exploration and intrusions.

In summary European contact with North America had taken place sporadically for six centuries at the time of the establishment of the colony on the James River, but interaction with the native peoples of the Coastal Plain region of the present states of Virginia and North Carolina had taken place for less than 100 years. Intense contact came as late as the 1570's. On the surface the nature of the relationship between the Europeans and the Indians appears to have varied with the intensity of contact. Early meetings appear to be of a sporadic nature, perhaps accompanied by brief exchanges, but not of duration long enough to allow difficulties to arise. Only when the Europeans came as potentially permanent residents, as in the case of the Jesuit missions and the colonies of Roanoke and later, Jamestown, did antagonism and hostility develop. Indeed, by the close of the sixteenth century, the Indians of eastern Virginia and the Carolinas appear to have developed a generally hostile attitude toward Europeans either through direct contact or communication with other groups (Lueir 1959:35).

CHAPTER V

THE ENGLISH IN VIRGINIA: THE CHARACTERISTICS OF THE FRONTIER MODEL

The purpose of this chapter is to develop hypotheses concerning those changes expected to have occurred within the English sociocultural system as a result of its exposure to the influence of the Virginia environment and the attenuating nature of its position relative to the English homeland at the turn of the seventeenth century. This analysis involves an examination of each of the eight characteristics of the frontier model (discussed in Chapter II) with regard to the structure of the total culture. The four subsystems previously examined will serve as the base line for the anticipated changes. Predictions will be made in the case of each as to the particular changes that should take place if the characteristics of the model are followed. These predictions may be considered hypotheses concerning the systemic change of cultural phenomena in the past. The

changes should be observable to both the ethnographic researcher and the archaeologist.

The historical events surrounding the colonization at Jamestown are well known owing to the significance of the site in the early settlement of British North America. Parallels between its historical development and the frontier model are quite obvious to even the most casual observer. For this reason it is not necessary to establish the presence of the characteristics of the model at this time. Instead, a summary chapter will present documentary evidence demonstrating historically those changes abstracted from the frontier model in the form of the hypotheses to be described.

The hypotheses developed in this chapter will form the basis of the archaeological test implications to be considered in the following chapter. If we assume that the changes indicated by the hypotheses here represent the actual historical course of events, then the ability of the investigator to substantiate the hypotheses with archaeological method will demonstrate the utility of this method in the study of culture change.

Nineteen hypotheses have been formulated to outline those changes postulated to have taken place within the English sociocultural system. They are grouped into

categories based on the four subsystems. It will be noted that each characteristic of the frontier model does not necessarily involve change in every subsystem. Hypotheses pertaining to one subsystem may also tend to overlap into others somewhat, because the components of the latter are not mutually exclusive. The process of frontier change is so profound and the structural disorganization it entails so widespread that it is unlikely that any of its characteristics are confined within one particular subsystem to the exclusion of the others.

Six hypotheses concern changes in the subsistence subsystem. They are: (1) Native subsistence items and/or techniques associated with their use should have been adopted by the intrusive English culture. Its early survival so far from the metropolitan area may actually have been dependent upon the ability of the colonists to utilize subsistence items of the indigenous peoples; (2) A diversification of generalized subsistence techniques would be expected as an immediate adaptive response to the frontier environment. The presence of a number of distinct ecological zones in close proximity to the site of the colony offered a wide variety of resources obtainable by hunting, fishing, and gathering techniques; (3) A breakdown of the specialized farming systems of the metropolitan area would

have taken place. The adaptive advantage offered by both short-term fallow and infield-outfield techniques would not have been suited to extensive, thinly-populated forest lands, and it is probable that these older subsistence adaptations would have been retained; (4) Although present to some extent in all components of the frontier system, subsistence activities would have tended to be confined to those settlements outside of the frontier town; (5) As the colony expanded and the roles of the settlements varied according to the colonization gradient, the degree to which subsistence played a part in the activities of the settlement would have similarly changed. This would have been true especially when a nuclear settlement assumed the role of a frontier town; (6) Despite the diversification of the subsistence base of the colony, the number of primary subsistence products utilized would have been fewer than in the metropolitan area. These would very likely have included native cultigens such as maize, beans, pumpkins, and squashes as well as other plant and animal products from the New World. The role of the colony in the exchange market of the metropolitan area is also important here and may have resulted in the production of valuable non-edible cultigens of the period such as tobacco and indigo.

Five hypotheses deal with changes in the economic subsystem. They are as follows: (7) Products of native technology and their methods of manufacture may have been accepted by the English, particularly during the infancy of the colony when access to the products of the metropolitan area was most restricted. Due to the overall superiority of sixteenth and seventeenth century English technology, the acceptance of native items should have been limited to those situations in which the European counterpart was either unavailable or non-existent. Conversely, the adoption of English items by native cultures would have been more rapid and extensive; (8) Closely related to the interruption of the technological processes would have been an increase in the number of small-scale technological activities such as brickmaking, glassmaking, smithing, boatbuilding, brewing, pottery-making, etc., within the area of colonization. These would have been necessitated by the need for products normally obtained through interlocal and intrafocal trade within the metropolitan area; (9) Due to the "horizontal" organization of sixteenth century English technology involving the interrelationship of a number of small and often dispersed activities, only incomplete segments of complex industries should have been present in the area of colonization. That

portion most likely to have appeared would include the earlier stages of the manufacturing process characterized by the production and preliminary treatment of raw materials; (10) In contrast to subsistence activities, technological activities, especially those of a specialized nature, would tend to have been concentrated at the focus of the frontier system, the frontier town; (11) The shift of such activities through time would indicate the development of new frontier towns as the area of colonization expanded and the settlements within it assumed different roles within the colonization gradient.

Changes in the social subsystem are defined in the following five hypotheses: (12) The social subsystem should have been characterized by a reduction in the number of hierarchically-arranged status positions present in the metropolitan area. The dispersed character of the settlements within the area of colonization would have been conducive to the concentration of power at lower levels. It follows that older hierarchies designed to administer a much more highly complex, densely organized society in the metropolitan area would no longer have been adaptive and may have broken down in parochial conflict.

This process is seen as a reverse of "promotion," which is simply the evolutionary mechanism by which an

institution rises from its place in the control hierarchy to assume a position at a higher level. It often moves from a "special purpose" to a "general purpose" role accompanied by an increase in internal differentiation within the system as a whole (Flannery 1972:413).

The simplified social system of the frontier would have been tied to a loss of differentiation. The accompanying phenomenon of control, having been assumed by lower level institutions, would reflect an overall reduction of sociocultural complexity. Russell-Wood (1974:188) has proposed a model of "converging structures" to explain this phenomenon. Briefly, he assumes that an expanding frontier society would inherently have tended toward greater specialization and greater differentiation in terms of organization, personnel, jurisdiction, and function among its component parts. Concurrent with this would have been a convergence of jurisdiction and authority on the part of the administrative organ of the colony. This process should have resulted in a tendency toward either separatism or functional cooperation between the parts of the organ but would probably not have led to revolution unless the concentration of power became maladaptive in terms of the existence of the sociocultural system of the colony;

(13) The pattern of specialized settlement types (nucleated

villages, market towns, industrial centers, etc.) associated with the complex socioeconomic organization of sixteenth century England would have been absent in the area of colonization; (14) The principal frontier town should have assumed the role of sociopolitical center of the area of colonization. As such, it would have been the location of the highest status positions in the colony; (15) Despite the marked differences between the frontier town and the dispersed settlements, there should be evidence of their sociopolitical unity; (16) The focus of sociopolitical activity first centered in one or several frontier towns should have shifted inland to other centers with the passage of time.

Finally, three hypotheses may be set forth to establish those changes associated with the trade and communications subsystem: (17) As the contact of indigenous cultures is not likely to have been continuous, trade between them would tend to have been limited in nature. Initially, trade with adjacent peoples would have been reciprocal, often taking place on an individual basis. The items involved in the exchange might have been prestige artifacts as well as those of a utilitarian nature. More extensive trade, usually in the hands of professional traders, is more likely to have involved peoples not

directly in contact with the area of colonization; (18) The frontier town would have served as a focus of trade and redistribution within the area of colonization and formed a major link with the metropolitan area. All the components of the frontier system should exhibit evidence of having participated in a trade and exchange system of which the frontier town was initially the center; (19) As new frontier towns arose with the moving frontier, the settlements which were to fulfill this role would have become the foci of trade and communications within their respective areas. In time they should have replaced the older frontier towns in this role.

In summary nineteen hypotheses have been deduced from the information provided in the preconditions outlined in the previous chapter. Each hypothesis indicates an expected change in the four subsystems which have been extracted from the total sociocultural system of sixteenth century England. These hypotheses may be seen as test implications for the process of change described in the frontier model as it is generally applied to English colonies of this period. In order to define this process in terms of the particular case of the Jamestown frontier, however, it is necessary to further deduce a series of test implications for each hypothesis. These test

implications will describe the specific types of evidence one would expect to find in an English colony in Virginia. This evidence should also be reflected in predictable variations in the patterning of the archaeological data at the sites of the actual colony. In the following chapters the hypotheses developed here will be subjected to an archaeological analysis of this nature.

CHAPTER VI
THE ARCHAEOLOGICAL SITUATION AT JAMESTOWN:
RECOGNITION OF THE FRONTIER MODEL

Introduction

This chapter will be divided into two sections. The first deals with the nature and extent of the archaeological investigations conducted at the site of Jamestown and the immediate vicinity over the past half century. This section will include a brief summary of the history of the work accomplished here as well as the goals toward which it was directed. In many cases, the Jamestown data clearly reflect the problems which the various investigators were trying to solve.

The second section is devoted to an examination of the archaeological data in order to demonstrate the validity of the hypotheses outlined in the previous chapter. For each hypothesis a series of archaeological test implications based upon historical and ethnographic analogy will be set down and the data compared to them. This section will

constitute the main test of the utility of archaeological methodology in allowing an investigator to perceive the occurrence of a particular process of sociocultural change.

Summary of Archaeological Investigations
in the Jamestown Area

Archaeological investigations have been conducted intermittently at the site of Jamestown itself over a period of nearly sixty years (1901-1957). Prior to this time the townsite and the entire island had lain virtually abandoned since the end of the seventeenth century. Its post-1700 occupations were associated primarily with the river plantation dominated by the Jaquelin-Ambler house, a structure dating from 1710 (Fig. 12). Jamestown Island was briefly visited by military forces during the American Revolution and later during the American Civil War. The Jaquelin-Ambler house was burned on both these occasions, and several Confederate earthwork fortifications were constructed on a part of the old townsite in 1861 (Tyler 1906: 23).

Although relatively undisturbed by man in the last two-and-one-half centuries, the island has been subject to extensive erosion along its western shore (Cotter 1958:21). Samuel H. Yonge (1904:14) of the United States Engineer Department reported the abrasion rate to be approximately four feet per year. He estimated the rate to have been



Fig. 12. -- The Jaquelin-Ambler house on the site of Jamestown, 1710 - 1895.

about half this prior to the extensive use of side wheel steamboats around 1860. Before the erection of the protective seawall under Yonge's direction in 1900-1901, about 481 feet of headland had been lost to wave action. Shoreline abrasion also eliminated the narrow passage of land connecting Jamestown Island to the northern shore of the James River. This isthmus was present as late as 1748 but had been inundated at the time of the Revolutionary War. By 1856 it had been completely obliterated, and the peninsula had become an island (Meade 1857:111). Despite nineteenth century attempts to bridge the widening gap, nearly 1600 feet of water separated the island from the north shore in 1900 (Tyler 1906:25). It must be taken for granted that shoreline erosion has destroyed all evidence of seventeenth century occupations on this particular part of the island. If we assume that the earliest settlement was near this river shore, then we may expect the absence of some archaeological material representing this period due to the extensive abrasion of the early shore.

In 1898 the Barney family, the last owners of Jamestown Island, donated twenty-two-and-one-half acres located at the west end of the island to the Association for the Preservation of Virginia Antiquities (A.P.V.A.) so that the site of several visible early ruins might be maintained for

public use. Three years later the first deliberate attempts were made to investigate the site through the use of excavations (Cotter 1958:1). The work, conducted by John Tyler, Jr., was centered around the brick church tower and nearby cemetery (Yonge 1904:47). The excavations also included the disturbance of a number of graves by A.P.V.A. members in search of geneological information (see Cotter 1958:220-225). In 1903 Yonge investigated the foundations of a row house uncovered near the eastern end of the sea-wall (Yonge 1904:66-69). A third area, another row house structure, was briefly examined by the Barney family in 1901 and later by George C. Gregory in 1932 (Cotter 1958:45).

The National Park Service acquired most of Jamestown Island as part of the Colonial National Historical Park in 1934. The remaining portion is still administered and maintained by the A.P.V.A. as the Jamestown National Historic Site (Hatch 1957:53). Beginning in 1934 the National Park Service initiated a broad program of historical research directed at determining the physical appearance of the Jamestown site during various stages in its development. This involved not only archaeological excavations but also extensive documentary research (Harrington 1952:338). Despite its wide scope, much of the work of the 1930's was never fully integrated into a comprehensive

study. This situation led John Cotter (1957:21-22) to characterize this period as one in which, aside from the initiation of preliminary studies, "relatively little scholarship of anthropological or historical interest" took place.

The failure of this early work is due to a number of factors which served to interrupt the investigations before the data could be properly analyzed. The termination of the Civilian Conservation Corps cut the labor supply, and two major wars involving the United States diverted attention from the Jamestown project, effectively deferring the completion of site reports, museum recording, and the integration of historical and archaeological data. Archaeological work during this period was conducted by Henry Chandlee Forman and after 1935 by J. C. Harrington. Charles E. Hatch, Jr. was responsible for much of the extensive historical research and J. Paul Hudson contributed much information to the study of post-medieval artifacts and their accompanying technology which was a part of the culture of the early English colonists (Cotter 1958: 2).

Following World War II, limited excavations were carried out at Glasshouse Point by J. C. Harrington of the National Park Service. The twenty-five acre site, lying

on the mainland opposite the north end of Jamestown Island at the confluence of Powhatan Creek and the James River was investigated in the fall of 1948 (Harrington 1948).

In 1954 the National Park Service began a series of twelve projects designed to complete the archaeological investigations begun two decades earlier. The federal Jamestown-Williamsburg-Yorktown Celebration Commission and the State of Virginia 350th Anniversary Commission assisted the Park Service in this work. The excavations, consisting primarily of test trenches, covered thirteen acres of the townsite and were based upon a fifty-foot interval grid tied to the base of Tricentenary Monument. This point marked the north 10,000-east 10,000 foot juncture of the grid so as to place the 0-0 point well to the south and west of the island, thus allowing all measurements in the site to be made in a single quadrant of the grid.

Although primarily confined to the town area directly to the east of the A.P.V.A. grounds (Fig. 13), excavations were also conducted on the mainland at the "Neck of Land" north of Jamestown Island. This work was associated with the construction of the Colonial Parkway onto the island. Exploratory excavations were made in the A.P.V.A. area, in the river off the southwest shore of the island to search for evidence of early occupations located on land since lost to river erosion, and along those areas to be disturbed

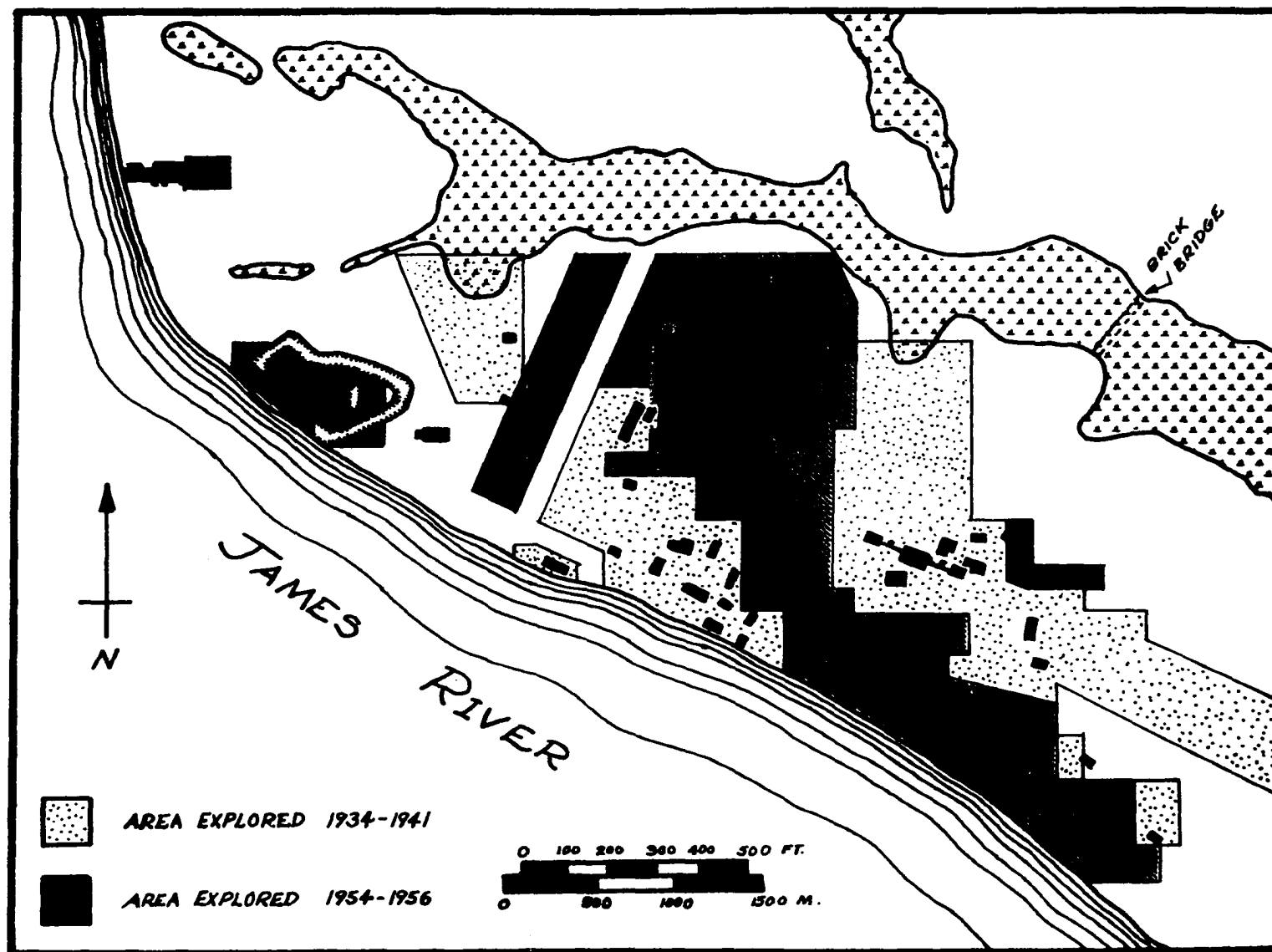


Fig. 13. -- Locations of archaeological investigations at Jamestown.

by town roads and other construction associated with the development of the site as an interpretive exhibit. The fieldwork ended in 1956 and was subsequently reported by John Cotter, the principal investigator during this two-year period. His Archeological Investigations at Jamestown (Cotter 1958) remains the definitive work on the National Park Service activities there. Following the close of these activities, no further archaeological studies have been undertaken on Jamestown Island.

A frontier area of colonization along the James River would, of course, be much more widespread than the extent of Jamestown Island, and in order to investigate other parts of this area, it is necessary to look for evidence in the surrounding area of the Virginia peninsula.

Perhaps the greatest amount of concentrated archaeological work in this area has been concentrated in the vicinity of Williamsburg, five miles northeast of Jamestown midway between the York and James Rivers (Fig. 14). Like Jamestown, Williamsburg has been the focal point of efforts to investigate and preserve colonial period remains contained within its boundaries. As early as 1889 the A.P.V.A. acquired several buildings for the purpose of restoration (Reps 1972:192). In 1928 John D. Rockefeller lent his backing to the project and agreed to finance the entire program of restoration. The newly formed

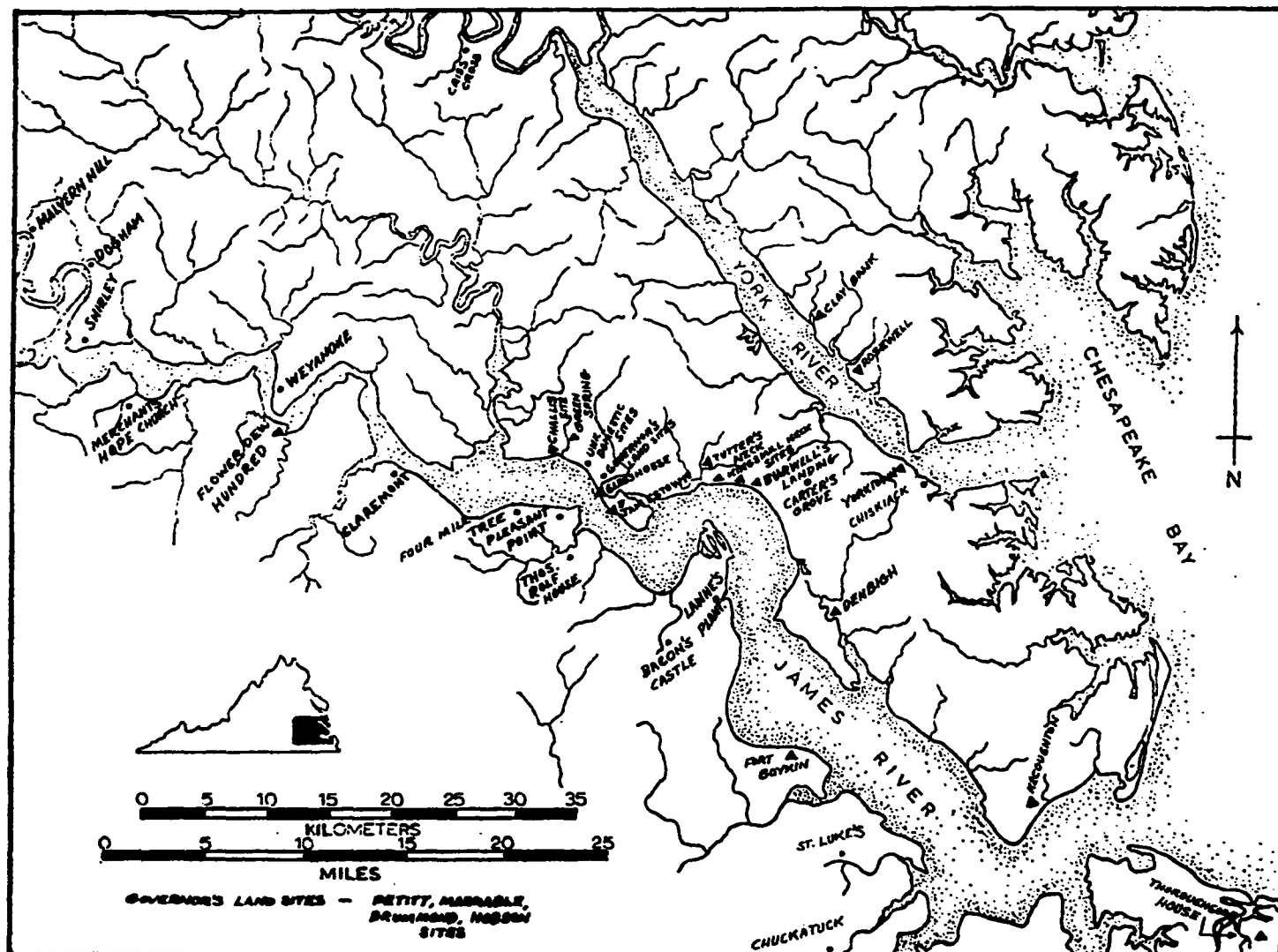


Fig. 14. -- Locations of archaeological sites in the James - York River area.

▲ Sites excavated • Sites known

organization, Colonial Williamsburg, Incorporated, acquired the properties owned by the A.P.V.A. and expanded its activities to encompass an area closely approximating that of the colonial city. By 1963 a total of eighty-three buildings had been restored and more than 400 structures reconstructed (Noël Hume 1963:88).

Archaeological research has been an integral part of the organization's work since 1928 (Wertenbaker 1954:454), and in the late 1960's a permanent center for historical archaeology was established at Williamsburg (Noël Hume 1968:105). In addition to the work associated with Williamsburg itself, the Colonial Williamsburg Foundation has conducted archaeological investigations at several other locations on the Virginia peninsula. Many of these sites were excavated in collaboration with the Smithsonian Institution in the early 1960's, particularly Rosewell plantation and the Clay Bank sites in Gloucester County (Noël Hume 1962b and 1966a), the Tutter's Neck site about three miles southeast of Williamsburg (Noël Hume 1966a), and the Challis site, a pottery kiln located three miles west of Jamestown (Noël Hume 1964:53-54). The foundation also participated in the excavation of Denbigh plantation in Newport News (Noël Hume 1965). There is virtually no archaeological evidence concerning Middle Plantation, the

seventeenth century settlement on the site of Williamsburg (Noël Hume, personal communication).

In addition to the archaeological investigations conducted by the National Park Service and Colonial Williamsburg, a number of early historic sites have been excavated by other agencies or individuals. Chief among these is the work completed at Green Spring plantation in 1955 by the Jamestown-Williamsburg-Yorktown Celebration Commission and the Virginia 350th Anniversary Commission (Caywood 1955 and 1957). The site is situated about three miles north and slightly west of Jamestown (Fig. 14).

Several other sites may also be mentioned (Fig. 14). The Kecoughton site near Hampton was excavated in 1941 by Joseph B. and Alvin W. Brittingham (1947). The Helmet site was investigated and subsequently reported by Floyd Painter (1956). It lay east of Jamestown. The Lightfoot site, located three miles west of Williamsburg, was excavated in the winter of 1964-1965 by William M. Kelso (1966). More recent excavations in the Kingsmill Neck area east of Jamestown by the Virginia Historic Landmarks Commission have uncovered a large plantation, a small settler's house, and a small, late seventeenth century settlement, while the College of William and Mary has carried out work at Flowerdew Hundred, an early seventeenth century site on the south side of the James, which has

so far yielded a house and fort (Kelso, personal communication). Both these projects are current and as yet have not been reported. A survey of sites in the Governor's Land area west of Jamestown has revealed twenty seventeenth century sites along Powhatan Creek and the James River (Virginia Historic Landmarks Commission 1971). Of these, only the Petitt site, representing a mid to late seventeenth century domestic occupation, has been investigated (Virginia Gazette 1974). The site of an eighteenth century landing, containing the remains of a warehouse, tavern, and other structures, was investigated archaeologically in 1973. It lay on the north shore of the James River in the Kingsmill area to the east of Jamestown (Virginia Historic Landmarks Commission 1974:14). Limited archaeological testing was conducted at the site of the Thoroughgood house in Norfolk (Painter 1965) and excavations at nineteenth century Fort Boykin on the south shore of the James revealed a seventeenth century well (Painter 1970:153).

In summary, a number of archaeological sites have been excavated on the Virginia peninsula. Although investigations have not disclosed the locations of all seventeenth century settlements in this area, they seem to have uncovered a fairly extensive sample representing the early

European presence here. Of particular interest are the intensive excavations conducted at Jamestown and Williamsburg. These have yielded a tremendous amount of data concerning not only the settlements themselves, but also the development and change which took place within the period of the early colonization of Virginia. The intensity of archaeological investigations on the Virginia peninsula has resulted in the accumulation of a greater amount of available data than exists perhaps in the case of any other area of initial colonization. It should be possible to extract from this veritable mountain of information the type of data necessary to recognize the characteristics of the frontier model which have been set forth in the form of the previously defined hypotheses.

The Recognition of the Model in the Archaeological Data

In Chapter V a series of hypotheses are deduced. These represent the changes expected in the English socio-cultural system were it to undergo the modifications stated in the frontier model. The remainder of this chapter consists of a comparison of the archaeological data to these hypotheses. In the case of each hypothesis a number of archaeological test implications will be presented. Each set of test implications should specify the particular

types of observations necessary to confirm or deny the hypothesis. Every set should also contain what Hill (1972: 83) has termed "crucial tests." These are test implications which, if present in the data, will definitely substantiate the particular hypothesis under consideration. In order to demonstrate the utility of archaeological methodology in recognizing the characteristics of the frontier model, it is necessary that all of these hypotheses be confirmed.

For the most part Jamestown data were not collected with the types of problems considered by this study in mind. For this reason it is possible that the available data may not provide the most compelling evidence to support or negate a particular hypothesis. This situation, however, should not prevent a priori the use of the data. The information needed to test a given hypothesis usually consists of many and diverse kinds of observations, and if the data are poorly preserved or improperly collected, at least a few of the test implications are likely to be discernible. Although the limited scope of the original fieldwork may narrow the limits of the potential data extracted from its observations, it need not in all cases impair the overall accuracy of the results of subsequent study (Clarke 1972:803). It is upon this last assumption that the reliability of the Jamestown data is based.

The Subsistence Subsystem

Hypothesis 1. The adoption of aboriginal subsistence items or techniques by the English colonists may be determined by examining the archaeological data with regard to three test implications. The first involves perhaps the most direct types of evidence for cross-cultural borrowing, the presence of botanical remains of New World subsistence products in the context of early settlements. Borrowing would most likely deal with cultigens which could be easily substituted for the European grains upon which much of the English subsistence was based. The use of other resources such as land animals and fish might easily be made without the intercession of a second party, for the techniques of obtaining them were not unknown to the English. Chief among the native domesticants were maize, beans, and squash as well as other minor plants. Unfortunately, it is difficult to determine the extent to which botanical remains of any sort are present; because no systematic sampling of the soil was conducted at any of the sites excavated, and the reported floral remains are confined to a few grains of charred maize (Bailey 1937: 496) which do indicate borrowing of at least one native cultigen.

The second test implication seeks indirect evidence of the acceptance of aboriginal subsistence products. This

test may be especially helpful in the case of early North American colonization due to the markedly different subsistence technologies employed in aboriginal Virginia and in England. In each case the crops grown were adapted to the use of the horse and oxen-drawn plow in cultivation. The absence of draft animals in the New World and the consequent lack of the plow resulted in a much different adaptation, one centered upon the use of the digging stick and the hoe. It would seem that the adaptation of New World crops by the European settlers would be due in part to their inability to immediately establish an agricultural system comparable to that found in Europe. This may have been due to several factors: the inadequate provision of seed grain from England, the difficulty in clearing arable land, or the lack of draft animals. Certainly, it was not due to the inability of the English crops to grow in Virginia, for two of the major English grains, wheat and barley, have in more recent times played an important part in crop rotations on Virginia soils (Bennett 1921:20). In the absence of the basic elements of European farming, the colonists would very likely adopt aboriginal methods of agriculture and with them, the New World crops. Consequently, the diffusion of aboriginal subsistence items should be represented archaeologically by an abundance of tools designed for their cultivation and an absence of those tools characteristic of

Old World plow agriculture. These tools need not necessarily be of aboriginal design, but they will very likely be tools of European origin adapted to large scale farming of New World crops.

The characteristic European farming implements were the hoe, mattock, scythe, reaping hook, spade, and wooden plow with iron point and share (Carrier 1957:4). The plow may be eliminated here as it alone is particularly adapted to European grain farming and is not necessary for the cultivation of New World domesticants. It is, therefore, most probable that a diffusion of aboriginal subsistence items at Jamestown will be attested to by its absence in the presence of the others, at least during the earliest period of colonization.

An examination of the archaeological data from Jamestown (Cotter 1958) shows a nearly complete absence of plow parts as do the data from Clay Bank (Noël Hume 1966: 21-23), the Lightfoot site (Kelso 1966:106), the Helmet site (Painter 1956), the Thoroughgood house (Painter 1965: 135), Kecoughton (Brittingham and Brittingham 1947:12), and the Challis site (Noël Hume 1963:218). This stands in marked contrast to the presence of hoes, spades, and scythe blades at all of these sites. The abundance of these hand tools compared to the few harrow parts and plowshare fragments (Hudson 1956:10) indicates a greater emphasis upon

hoe agriculture as opposed to the use of heavy farming implements. The scythes are probably associated with mowing hay rather than harvesting grain, for it was not until the eighteenth century that the scythe replaced the sickle as the principle tool used in cutting grain (Steensberg 1943:238). Both Diderot (1959: Plate 3) and Hassall (1962:16, Plate III) illustrate the separate uses of these two tools. The association of the scythes with other land-clearing items such as axes, saws, and brush hooks suggests their use in cutting grass as part of land clearing. The presence of hoes and the absence of plow parts in sites occupied at least through the first three quarters of the seventeenth century indicate that the hoe must have played a significant role in agriculture throughout this period.

Finally, the adoption of aboriginal crops may be marked by the presence of special items or configurations of items associated with their preparation. Maize, unlike European grains, does not require extensive processing once it has been harvested. Mills were utilized elsewhere for grinding both grain and maize into meal, but such specialized activities are not evident at Jamestown. Other tools associated with maize processing would also not likely be recognized either, since items such as the wooden mortar

would deteriorate or since, like those used in the shelling of maize, they were not specialized tools (Earle 1898:139-140). One artifact recovered from the Lightfoot site (Kelso 1966:166) indicates the use, although not the processing of another native cultigen. This object is a round iron tobacco container with a hinged lid. A copper tobacco lid embossed with an owl smoking a pipe was found in excavations at the Pettus site east of Jamestown (Virginia Historic Landmarks Commission 1973:3).

In summary, the greater part of the evidence supporting the adoption and use of aboriginal subsistence products such as maize and tobacco is primarily of an indirect nature. Only a few actual grains of charred maize attest to its cultivation by the English at Jamestown. The archaeological data from Jamestown and other seventeenth century sites on the Virginia peninsula denote the extensive utilization of hoe farming, a method of cultivation to which New World domesticants were particularly adapted. It would seem that, unless the early settlers were continually attempting to raise grains normally requiring a plow-prepared seed bed in this manner, this shift would very likely entail the adoption of crops normally producing high yields with hoe cultivation.

Hypothesis 2. The second hypothesis states that there would have been an expansion of subsistence activities

by the intrusive culture. Although many of the activities involved here may be innovative in nature, they, for the most part, will involve the adoption of those activities which are either participated in to a limited degree in England or which may comprise the specialized adaptations of particular regions. As most of England in the early seventeenth century practiced agriculture as the primary means of subsistence, it is likely that, beyond the acceptance of new crops, a diversification of the subsistence system would include hunting, fishing, or collecting activities, or perhaps all three. The abundant potential natural resources offered by Virginia for such activities have been discussed in Chapter IV.

Two types of evidence may be expected to substantiate this hypothesis. The first is the presence of the refuse of the activities themselves, the remains of the products procured by hunting, fishing, or collecting. These should indicate the relative importance of these activities in the overall subsistence of the colonists.

Animal bones, either domestic or wild, are not especially numerous at the Jamestown site, for many of those recovered in early excavations went either unrecorded or unidentified (Cotter 1958). Wild animals comprise about fourteen percent of the total bone count of identified species. Of these, deer are the most common. Other remains

consist of wolf, bear, and unknown types of birds. Of course, oysters, the shells of which were used in the manufacture of mortar, were collected from banks in the James River (Bailey 1937:496). At Clay Bank (Noël Hume 1966a:12) deposits of oyster shell are present. At the Helmet (Painter 1956) and Lightfoot sites, both of which represent isolated settlements, wild animal remains tend to be more common and varied. In addition to deer, there were found squirrel, fox, racoon, duck, goose, turkey, woodpecker, and box turtle remains along with the shells of oyster, blue crab, scallop, clam, and periwinkle. All of the bones were disarticulated, and many have been split to extract the marrow. Domestic animal remains were in all cases confined to cow and pig with occasional horse and dog bones present. It is interesting to note that the pig mandibles all exhibited long lower tusks suggesting that the pigs may have run wild after their introduction from the Old World (Kelso 1966:107). The faunal material from these sites indicates a substantial dependence upon wild food products. A similarly large dependence on wild foods is indicated by the sample from the Edward Winslow house in Marshfield, Massachusetts, a mid-seventeenth century structure representing an early intrusive English occupation at Plymouth (Olsen and Penman 1972:23). The Winslow sample is

significant in that it represents one of the few complete analyses of faunal remains from an early American colonial site.

The second form of evidence for a broad subsistence base is the occurrence of the artifacts associated with these subsistence activities. Hunting activities are indicated by the presence of firearms and fowling ammunition. The parts of matchlock, wheel lock, snaphance lock, miquelet lock, doglock, and flintlock arms were recovered. Such weapons were used for both hunting and military purposes. These specimens represent the evolution of firearms during the seventeenth century (Peterson 1949 and 1956:30). The ammunition at Jamestown consisted almost entirely of goose shot but also included a few musket balls. Gun parts and shot were also recovered in excavations at Kecoughton (Brittingham and Brittingham 1947:12) and the Thoroughgood house (Painter 1965:132).

Fishing activities are indicated by the presence of fishhooks of various sizes, fish gigs, fish spears, lead fish net, and line weights of several sizes (Wharton 1957 and Hudson 1957:56-57). Diderot (1959:Plates 44-49) illustrates a wide range of weighted nets used in catching fish and oysters. Bones of unidentified species of fish were

recovered at Kecoughton together with fish gigs and hooks (Brittingham and Brittingham 1947:12).

There is no evidence either in the form of actual remains or of processing equipment for flora that might have been collected as food. The abundant evidence for the utilization of wild resources in the form of fish, birds, and animals, however, indicates the postulated expansion of a normal subsistence pattern based upon grain and domesticated animal products to one encompassing a wide variety of wild fauna.

Hypothesis 3. The movement of an English colony into the Virginia of the early seventeenth century would have been accompanied by the breakdown or failure to replicate the specialized farming systems of the Old World. When faced with a favorable environment, particularly one which offered access to an apparently unlimited extent of land, a tendency toward dispersal should have occurred, resulting in a number of marked departures from the earlier adaptation to a different ecological situation. This change should be indicated by two types of evidence, field patterns and settlement patterns.

The crucial test of this hypothesis, then, is that the field systems that existed in England would not reappear on the Virginia frontier. The two basic types of field systems are, of course, the open field and the

infield-outfield. Each is an adaptation to particular environmental conditions, and each is characterized by a unique type of settlement patterns. By comparing the environmental situation in the James River area with that present in England, it should be possible to show any variations in the field systems present on the frontier. The first test implication of this hypothesis is that the settlement pattern associated with the field patterns of the Virginia frontier will vary from those of England.

In order to relate settlement pattern to field pattern, the concept of "catchment area" will be used. Briefly, catchment area describes the notion of dependence upon resources contained within a limited area about a settlement. Applying this concept to agricultural settlements, Chisholm (1962) has found that the intensity of land use diminishes as the distance from the farm to the settlement increases. He has determined that:

Any distance up to about a kilometer from the dwelling is of such little moment for any but specialized systems of irrigation and garden farming that little adjustment is called for in either the pattern of settlement or of land use. Beyond about one kilometer the cost of movement becomes sufficiently great to warrant some kind of response; at a distance of 3-4 km. the costs of cultivation necessitate a radical modification of the system of cultivation or settlement -- for example, by the establishment of subsidiary settlements -- though adjustments are apparent before this point is reached. If the distances involved are actually greater than this, then it is necessary

to look for some very powerful constraining reason which prevents the establishment of farmsteads nearer the land (Chisholm 1962: 131).

Ellison and Harriss (1972:916) have argued that a two kilometer radius circle will most closely represent the ideal catchment area except where drastic topographical variation results in distortion. In that the areas of movement around a settlement tend toward circulation, the circle is seen as best representing the land use exploitation unit.

The resources most crucial to English agriculture were water, arable land, pasture, feed, and building material. The physical structure of the Midlands distributed these resources quite evenly, and as a result, the settlement pattern here consisted of nucleated villages usually spaced not less than one (1.6 kilometers) nor more than two and a half miles (4.02 kilometers) apart (Everson and FitzGerald 1969:13). In addition the abundance of these resources was sufficient to support the moderately high density of population present in these villages (Fig. 15). Conversely, the structure of much of highland Britain was marked by a much more uneven distribution of such resources. Not only could a much thinner population be supported here, but also one whose geographical placement was greatly varied. This is the hamlet-farmstead pattern characteristic of the Southwest.

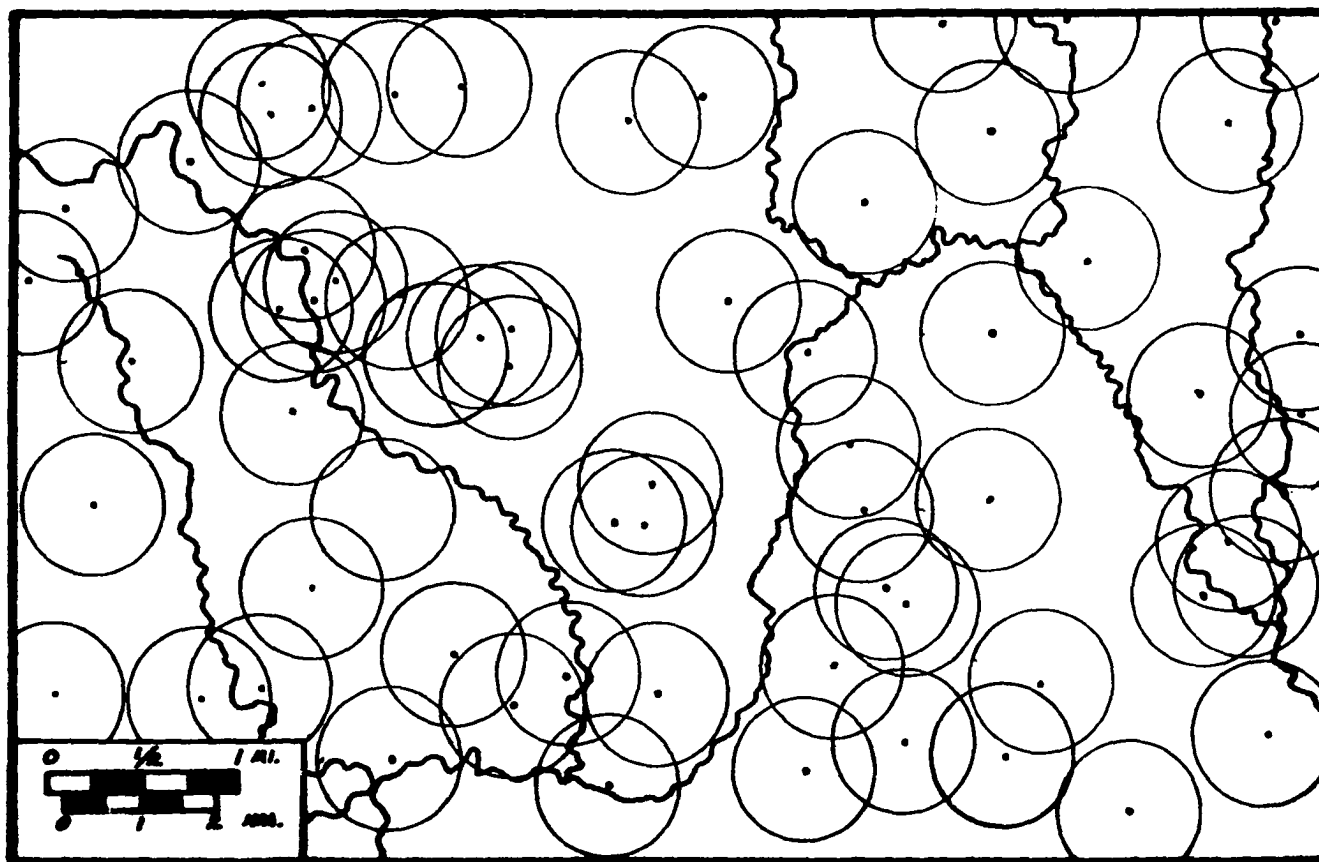


Fig. 15. -- Settlement pattern of the English Midlands with 2 km. catchment areas indicated.

The natural resources of the Virginia peninsula may be said to much more closely resemble the even distribution of lowland England. The extensive forests growing on well-watered, rich alluvial soil cut by a number of large streams and their tributaries offered a situation capable of supporting a settlement pattern composed of closely-spaced nucleated villages. If indeed the field system of the Midlands is to be found here, it should be accompanied by this type of settlement pattern.

An examination of assumed catchment areas of settlement sites located on the peninsula and James River area and dating from the last half of the seventeenth century (Fig. 16) shows a pattern that differs from this in several ways. Without seeking to analyze the function of the particular settlements at this point, one striking feature emerges; there is but one site that may be considered to be a clustered settlement, Jamestown. The others consist almost entirely of single structures suggesting homesteads of an isolated nature.

The boundaries of the town have been defined on the basis of Ellison and Harriss' two-kilometer catchment area model. By describing two-kilometer circles around those structures on Jamestown Island, it is noted that the catchment area of each would overlap those of all other structures. For this reason it must be assumed that the

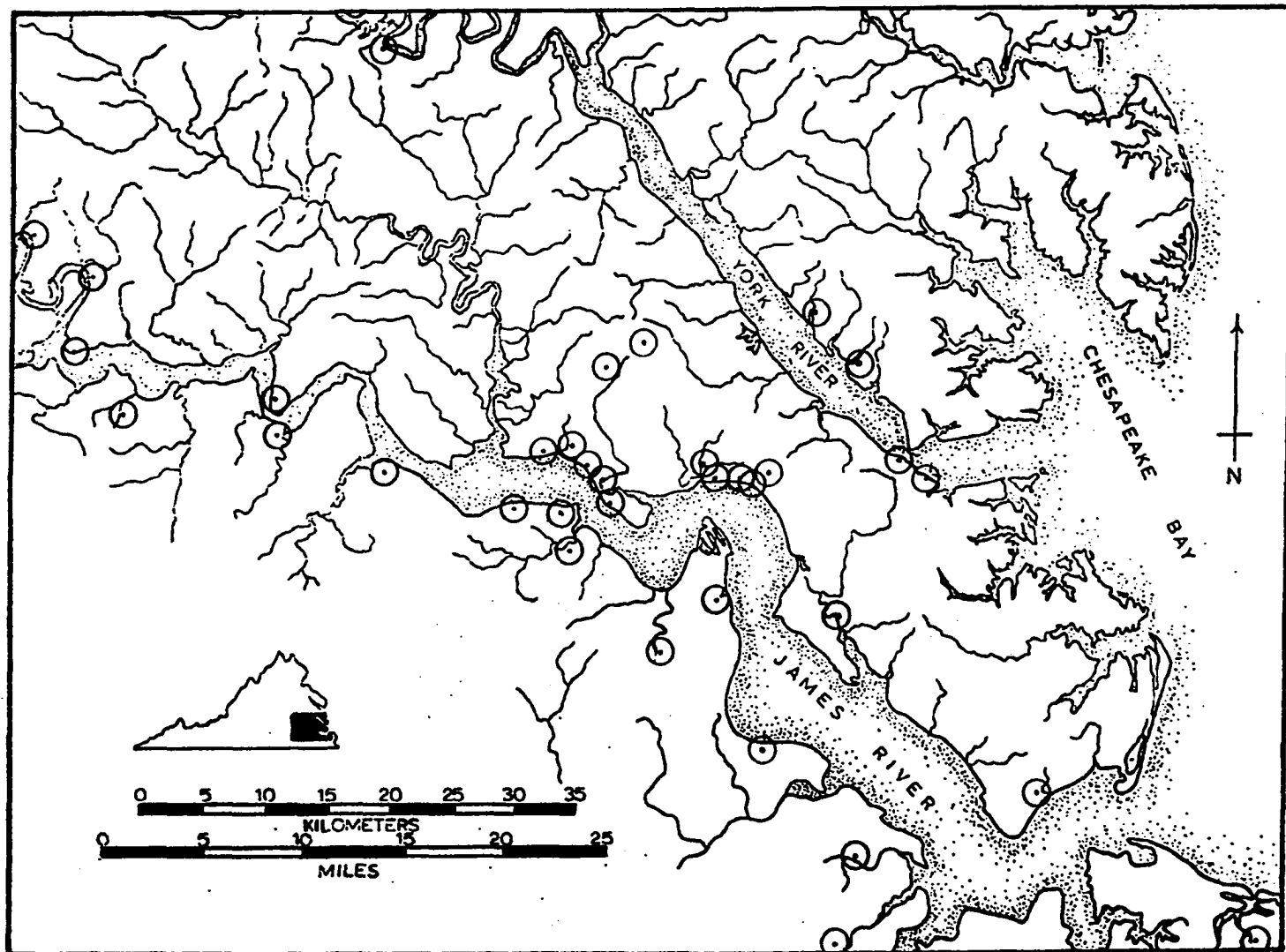


Fig. 16. -- Settlement pattern of coastal Virginia with 2 km. catchment areas indicated.

Jamestown Island settlement represents a single unit in terms of subsistence, and its catchment area should ideally fall within a two-kilometer radius of its center. In contrast the other sites in coastal Virginia consist mainly of isolated structures. Each appears to lie well outside of the proposed two-kilometer catchment areas of the others. The dispersed nature of the settlement suggests that either some agent has acted to disperse settlement beyond the bounds of immediate contact between fields or that the nature of cultivation is such that it was necessary to utilize a much wider area than normal (Fig. 16). The occurrence of the farmer is noted by Thompson (1970:36-37) in Bolivia in which case the primitive transportation network and the large size of the holdings have resulted in a dispersed settlement pattern. Clearly, the settlement pattern in the James River area is unlikely to be indicative of a cooperative open-field system. The environmental components of an infield-outfield system were not present.

Henshall (1967:451) has noticed a definite relationship between subsistence methods, population, the extent of arable land, and individual productivity. It may be expressed in the following formula:

$$u = \frac{sv}{p}$$

Here "u" expresses the productivity, "s" the amount of land

exploited, "v" the potential of the type of agriculture practiced, and "p" the size of the population. In a colonization situation, a readaptation to new environmental conditions, including the use of new cultigens, may result in a temporary reduction in the potential of the subsistence methods. In this case it is necessary to increase the amount of land cultivated (s) or reduce the size of the population (p) in order to keep the productivity per individual (u) constant. On the frontier both are likely to occur, resulting in the dispersed pattern observed both in ethnographic situations and here on the James River.

The second feature is the geographical pattern of the sites' placement. Although the map (Fig. 16) represents only those sites reported, a definite pattern emerges. The settlement pattern model (Fig. 17) is also characterized by the proximity of most of the settlements to navigable waterways. In a frontier area it would seem that with an immediate lack of roads such a network of rivers and streams would provide an adequate network of transportation. The catchment area of these sites would then include a large area of land, only a part of which may have been cultivated at one time, and a river- or stream-front area by which it was linked by ship to other settlements. Critical resources here seem to have been relatively dry forest land, which could be cleared for farming, and access to navigable

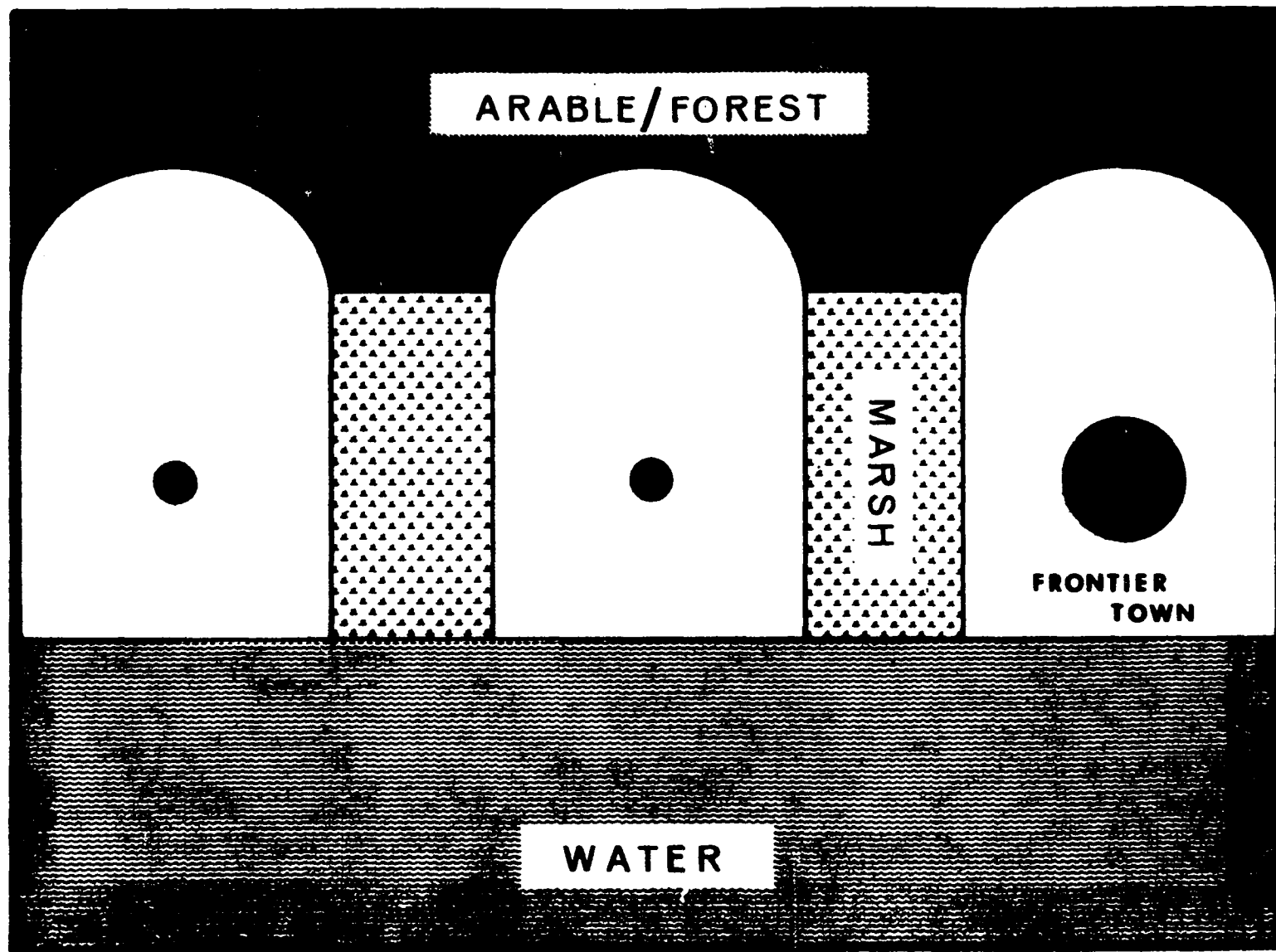


Fig. 17. Settlement model for coastal Virginia.

water. Inland sites and those in low or marshy areas seem to have been avoided on the whole, and the settlement pattern reflects an expansion along the James and York Rivers to take advantage of areas where the two critical resources were available.

The distinct geographical distribution of habitation sites in coastal Virginia may be illustrated through the application of the nearest neighbor analysis to the present data. This is a method by which the deviation of the distribution of a population in space is measured toward either an anticlustered or a clustered pattern (Washburn 1974: 322). The measure of deviation (R) has a limited range from $R=0$, indicating maximum aggregation, to $R=2.149$ for a distribution which is as evenly and widely spaced as possible. $R=1$ signifies a random distribution (Clark and Evans 1954:477).

Given the even distribution of resources crucial to open-field farming in both Midland England and coastal Virginia, one would expect both these regions to exhibit similar settlement distributions if the resources were similarly exploited and different distributions if they were not. In the Midlands the sites appear to be distributed evenly, indicating a utilization of all available land, while the distribution of settlement in Virginia suggests a clustering along the rivers with much of the

hinterland left unoccupied. Applying the nearest neighbor analysis to the two areas, the following values for the measure of deviation occur. For the Midlands the measure is $R=1.43$, indicating a strong tendency toward even distribution, while the value $R=.73$ for the Virginia coastal plain shows a marked tendency toward clustering. For the derivation of these values, see Appendix A.

The strikingly different patterns of habitation site distributions in the two areas is clearly reflected in this analysis. Despite the incomplete sample of Virginia sites and the often great distances between several of them, their association with the riverine locale is still obvious.

From the above evidence it is plain that the settlement pattern present in the James River region of the seventeenth century contrasts vividly with that in areas of England which offered roughly the same distribution of resources. Not only is the placement of settlements on the landscape dissimilar, but the physical form of the settlements themselves differs in that the Virginia settlements consist primarily of single, isolated farmsteads. These differences would appear to denote the absence of the open-field pattern characteristic of Midland England.

The second test implication is that of actually plotting visible physical evidence of seventeenth century

fields in Virginia. Unfortunately, it is impossible to verify the actual field patterns themselves with aerial photographs due to the densely wooded nature of most of the peninsula region and to the destruction of the historical landscape by the spread of urban areas along the coast. There is also no physical evidence of boundaries of the kind utilized in Britain to demarcate field boundaries. It is likely the earthen balks or ditches (Kerridge 1973: 15) would remain as they do in undisturbed regions of Britain and that recent surveys of sites would have uncovered them. Although actual scattered field furrows have been observed in now wooded areas as late as the nineteenth century (Yonge 1904:35), seventeenth century field boundaries have not been reported outside of Jamestown itself. Within the area of the town itself, a number of ditches are present (Fig. 18), and these are generally interpreted as marking the boundaries of properties here (Forman 1938:134 and Cotter 1958:166). Many of these are difficult to date, and most were only partially exposed by excavations. The pattern of the ditches seems to suggest the division of land into a number of small tracts which presumably surrounded either dwellings or small fields (Reps 1972:48). As these ditches certainly indicate small enclosures, the possibility of the presence of an open-field system or one

based on large farming enclosures of the type developing in England may be ruled out.

The absence of evidence provided by both aerial and ground surveys neither supports nor denies the conclusion reached as a result of the examination of the settlement pattern, namely that the adaptation to cultivation on the James River frontier was unlike that found in those sections of seventeenth century England where similar environmental conditions occurred. The marked dispersal of settlement, however, would have made the utilization of open-field systems impractical here, and the farming system would have to have consisted of a subsistence adaptation different than that found in the Old World.

Hypothesis 4. This proposition states that within the area of colonization the bulk of subsistence activities would have been conducted in areas outside of the frontier town. Obviously, this hypothesis must take into consideration the continual evolution of the frontier, for with temporal change the roles of the various frontier settlements would change. By dealing with a period within the seventeenth century in the James River area, it is possible to define one clustered settlement which we may tentatively identify as the only settlement likely at this time to have fulfilled the role of the frontier town. This is the original site of Jamestown. We may assume that all those

settlements apart from this were "nonfrontier town" settlements and would, for this reason, reflect a greater concentration of subsistence activities than would the frontier town.

For the purposes of this analysis, an arbitrary temporal period will be defined so that the archaeological evidence examined will represent a static stage in the development of the colony. The span of 1650-1690 has been chosen arbitrarily as the period for investigation. The sites occupied during this period are well represented archaeologically and clearly show a marked cluster at only one point, suggesting the presence of a single frontier town and its outlying settlements. The sites are illustrated in Figure 14. Many of the archaeological sites may be placed within this period through the use of two methods of determining mean dates of occupation. These are (1) Binford's pipestem regression formula (Binford 1962) and (2) South's ceramic frequency formula (South 1972) (see Appendix B). Each of these is based upon the assumption that cultural materials exhibit certain relationships in the organization of cultural dynamics. The first assumes that a regular trend toward smaller holes in English white clay pipestems occurred throughout the seventeenth and eighteenth centuries, while the second reflects the well-known archaeological axiom that the popularity of

ceramic types through time will follow a unimodal distribution curve (see Ford 1962:39-40). Where the use of either of these methods is impossible due to the nature of the sample, sites will be placed according to the temporal span of the artifacts.

The roles played by the 1650-1690 period James River settlements may be seen in several types of evidence. The first test implication of this hypothesis is that there should be a greater concentration of artifacts associated with a subsistence technology in the outer settlements than in the frontier town. In order to measure this, a simple comparison of functional artifact types will be made between those structures within and those without the presumed boundaries of the frontier town. As agriculture was usually a family activity in post-medieval England, we can assume that the subsistence activities will reflect the behavior pattern of family units within the community. The artifacts associated with agricultural subsistence there may be seen as a number of household subassemblages (see Deetz 1967:116) which will be examined and compared with one another.

During the period under consideration, thirty-eight known structures were occupied within the limits of Jamestown Island (Fig. 18). Since some of these structures

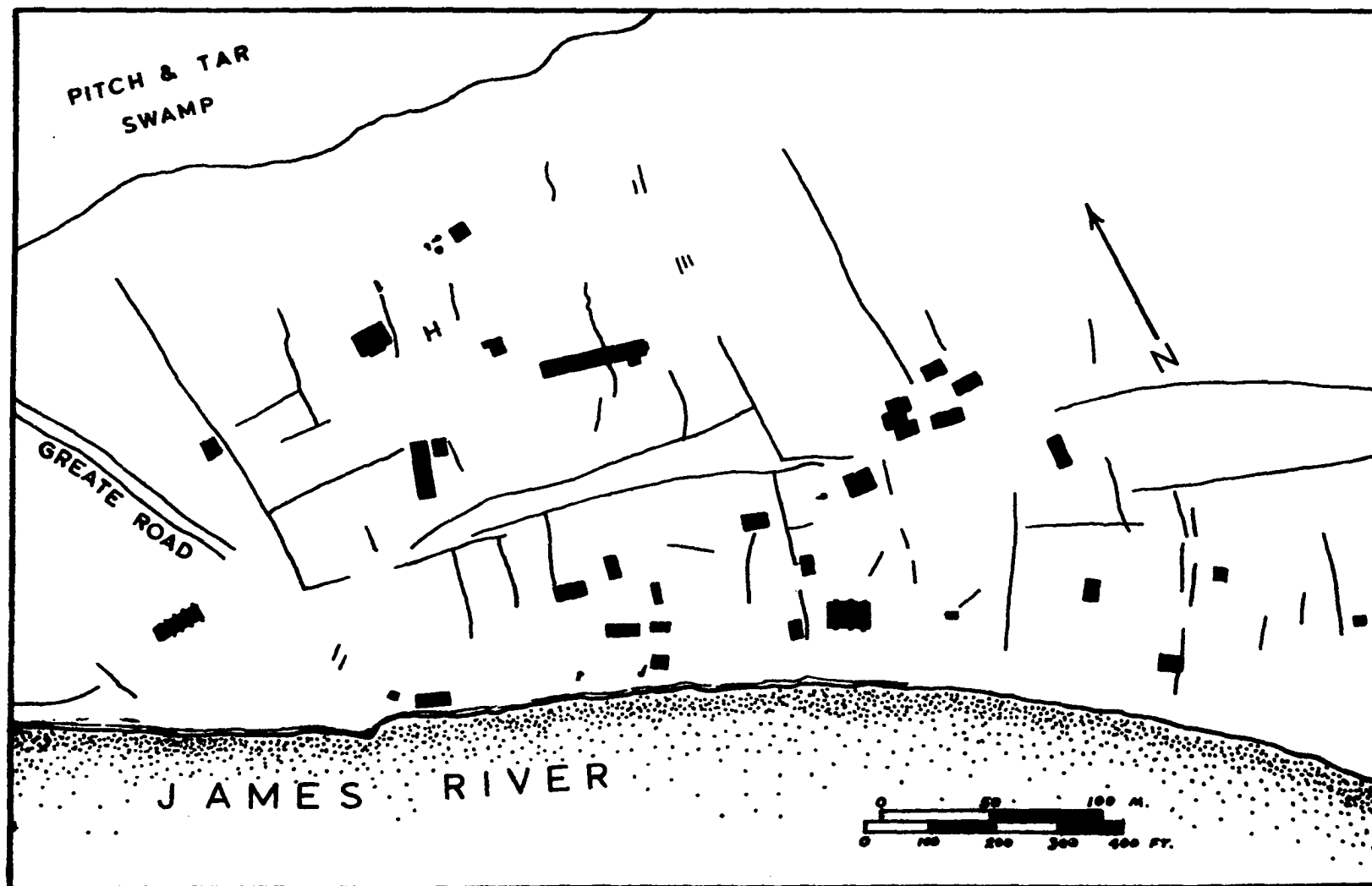


Fig. 18. -- Map of settlement at Jamestown, 1650 - 1690.

appear to represent multiple dwellings and others non-dwellings, the total number of family units represented here may be closer to thirty-two, as opposed to twelve non-subsistence units, making a total of forty-four units. Family units are here defined as enclosed structures with at least one fireplace hearth and evidence of domestic activities. If the units are contiguous, they have no passages through the communal walls and opened only to the outside (see Forman 1938:109). The functional assignment of structures is here based upon the conclusions drawn by Cotter (1958). For purposes of comparison the boundaries of the town are based upon the criteria discussed under the third hypothesis.

Archaeological evidence for structures outside of Jamestown during the 1650-1690 period is varied in nature. It consists of domestic sites that may be divided into the following categories: those excavated, those in the process of excavation and not reported, those reported in site surveys, and intact structures (Fig. 14). Of these only sites of the first category have yielded the type of data necessary to determine the presence of agricultural subsistence technology. Adequate samples of artifacts are available from the following sites: Kecoughton, Clay Bank, Green Spring, the Lightfoot site, and Tutter's Neck. The

Challis site and Glasshouse site apparently were industrial sites and did not yield domestic living areas.

The subassemblages from structures within the limits of Jamestown will first be compared to determine the degree to which subsistence activities played a part in life within the community. Perhaps the types of artifacts most obviously associated with subsistence have been discussed under Hypothesis 1 and 2 in a general way. These include implements such as hoes, scythes, etc., wagons and carts for hauling (Hoskins 1957:160), and assorted tools such as axes, adzes, mattocks, saws, and pitchforks (Campbell 1942:183). A comparison of the percentages of these types of tools with other metal artifacts is presented in Appendix C.

Probably the most striking feature of those subassemblages within Jamestown is that only seven of the twenty family-unit structures for which the artifacts have been reported (Cotter 1958) contained subsistence affiliated items. In all but four of these the subsistence tools amounted to less than three percent of the metal artifacts recovered. The total percentage of subsistence artifacts to other metal artifacts in Jamestown is two percent. These data argue for the occurrence of some agricultural subsistence activities with Jamestown itself. Those structures having the highest percentage of artifacts were located on the eastern edge of the settlement. Possibly,

these sites represent semi-rural homesteads situated at the edge of the densely populated area.

An investigation of those sites outside of Jamestown has yielded a much higher percentage of subsistence items found in association with the individual subassemblages (Appendix C). Subsistence related tools here comprised an average of fourteen percent of the total metal items. It is obvious that subsistence artifacts are present in each of the sites in comparatively substantial quantities, much more so than in those structures located within Jamestown. The two statistics representing the occurrence of subsistence tools in those sites outside and those inside of Jamestown may be tested for similarity utilizing a χ^2 formula. The assumption in this test is that the probability of both populations being similar is equal. If the test statistic possesses one degree of freedom, and a risk of error of .01 is chosen, the hypothesis of equality will be rejected if χ^2 is greater than 6.635. In this case the value is 183.342, well above the limit for rejection. See Appendix D for the derivation of this value.

The second test implication for this hypothesis is that the types and arrangement of structures in Jamestown and outside will indicate the same variation in function suggested by the distribution of subsistence artifacts. On the whole the structures or clusters of structures outside

of Jamestown should represent units related almost entirely to subsistence, while those within the town should represent a mixture of units having a variety of functions. As we are here interested solely in structured types related to subsistence or farms, it is necessary to examine the Old World farm prototypes.

Sixteenth and seventeenth century English farms varied in a number of respects. For example, construction materials ranged from the lavish use of timber in the abundantly-forested southeast to stone in East Anglia, the Midlands, and the Southwest. Walls were stone, flint, clay, brick, or half-timber and plaster. In Devon "cob houses" were characterized by walls made of a mixture of mud with straw, chalk, gravel, or other loose material. Roofs were still predominantly thatch in the late sixteenth century, though tile was beginning to be used in the south (Campbell 1942:224-225). The size of the houses varied, and many English farms grew with time, usually expanding from the original structure (Hoskins 1968:98). If the house had a kitchen, it may or may not have been contiguous with the main house structure. Integral with the farmhouse was the barn, either a separate building set apart from the house or annexed to it as was often the practice in the Highlands. In some parts of England, most notably Yorkshire, barns were located some distance from the farm house so that they would be well situated to store hay from the surrounding

meadows for fodder (Hartley and Ingilby 1971:29). Figure 19 illustrates two farmhouse configurations of the seventeenth century. In addition to the farmhouses, the cottages of farm laborers were present in areas where the servants did not "live in." These were usually small, often poorly constructed, two-room buildings with a loft (Hoskins 1968:102). At the other end of the scale were the country farms or manors of the country gentry, much more spacious and often incorporating recent architectural innovations, yet retaining the same basic components as the yeoman's farm.

An examination of the excavated sites outside of Jamestown yields inconclusive results. Of the six reported sites, only the excavations of Green Spring and perhaps those at Denbigh plantation were extensive enough to have explored for outbuildings. Clay Bank yielded only the cellar hole of a structure measuring twenty-seven by eleven feet (Noël Hume 1966a:14). The seventeenth century occupations of Kecoughton, Tutter's Neck, and the Lightfoot site consist solely of refuse pits. Current excavations on Kingsmill Neck, east of Jamestown Island, have uncovered two structures, a large country house and a smaller settler's house, but analysis of these sites is incomplete (Kelso, personal communication). Of the sixteen seventeenth-century structures still standing in the James River area, fourteen

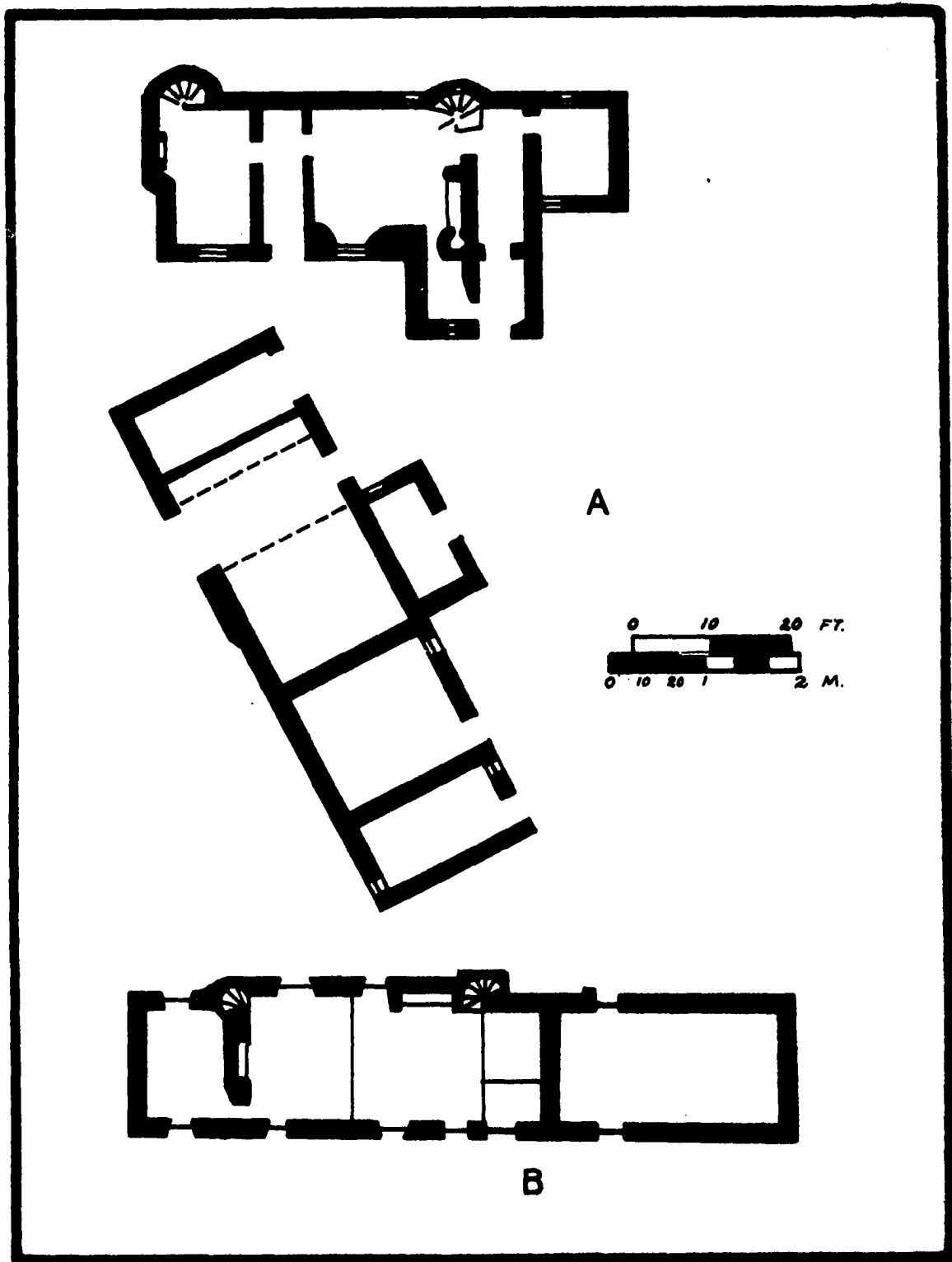


Fig. 19. -- Plans of seventeenth century English farm types:
 A. Non-contiguous barn and farmhouse, B. Farmhouse with contiguous barn.

represent at least portions of single family dwellings. The remaining two are churches (Farrar 1957). Thus the evidence for the presence of farm structures outside of Jamestown is inconclusive. Although no actual farming complexes appear, the remains do not suggest the presence of any extensive non-subsistence activities. The excavations at Green Spring (Fig. 22), while yielding clear evidence of farming activities, also revealed not only the existence of farming architecturally similar to a typical sixteenth century English country manor house but also several outbuildings commonly associated with a "self-sufficient" country manor, including a nursery, a bakehouse, a blacksmith shop, and even a pottery kiln (Caywood 1955:25 and 1957:82). Excavations at Denbigh plantation likewise revealed the remains of another large country house together with evidence of a contiguous dairy and related blacksmithing activities (Noël Hume 1965:8).

Within the clustered settlement at Jamestown, several types of structures are present. Of thirty-one separate complete or nearly complete structures, Cotter (1958) has identified nineteen as dwellings, two as kitchens associated with dwellings, one as a barn, and nine as other types of structures. The latter will be discussed more fully later under the economic subsystem. Unlike the majority of excavations outside of Jamestown, those within

its area have been extensive enough to have uncovered the foundations of outbuildings if these had not been destroyed by subsequent occupations. Aside from the single barn, no other clusters of farm structures are present; although many of the houses examined would not be of noticeably different construction types from those isolated structures. None of the specialized activities associated with Green Spring or Denbigh were found in close proximity to any of the Jamestown dwellings. Three particular buildings: structures 17, 115, and the Ludwell-Statehouse group, represent multiple dwellings (Fig. 34). Structure 17 consisted of three units, and its foundations correspond closely to those of mid-seventeenth century English urban houses (Forman 1938:111). Structure 115 included four separate family dwelling units (Cotter 1958:127), and the Ludwell-Statehouse group is a contiguous cluster of perhaps five units (Yonge 1904:66). Cotter (1958:25) has noted the remarkable similarity between a section of the Ludwell-Statehouse and structure 115, suggesting that both originated as similar urban dwellings.

Finally, the apparent lack of association of large fields with the Jamestown settlement indicates that agricultural subsistence activities probably did not form a large part of the activities of the inhabitants of this frontier

town. Conversely, the isolated nature of the sites outside Jamestown might easily have allowed access to more extensive fields.

Examination of the archaeological evidence indicates that, on the whole, subsistence activities tend to be concentrated in that part of the area of colonization outside of the frontier town on Jamestown Island. Not only are farming implements more abundant but the types of structures and their isolated nature further suggest an association with farming activities.

Hypothesis 5: Unlike the five hypotheses previously examined in this section, the one considered here involves change through time. It assumes that the role of subsistence became less in relation to other activities, in a settlement which loses the role of frontier town, as the area of colonization expands. Conversely, subsistence activities should have assumed a greater role in these older frontier towns which are in the process of becoming abandoned.

The test implication for this hypothesis involves the old frontier town, Jamestown. It should show a marked and perhaps abrupt increase in subsistence-oriented activities as the new settlement pattern of the townsite becomes much more dispersed than that of the frontier town previous to this time.

If archaeological investigations have uncovered remains of a secondary frontier town closer to the edge of the frontier and of a later period, just the opposite should be evident. Abruptly, and at nearly the same time as the decline of the old frontier town, a sudden concentration of settlement should occur at a location further inland toward the presumed edge of the unfolding frontier. The cluster of structures here should be indicative of a concentration of population in this particular area and of a concentration of non-subsistence activities. It will not be necessary in this study to deal extensively with this new frontier town, for its establishment may be seen as the end point in one of a continuing series of cycles in the expansion of the area of colonization. If this study were carried out into another cycle, presumably a similar series of events would again take place involving this and still another frontier town and so on until the area of colonization becomes integrated on the same level as the metropolitan area.

The decline in size and population of Jamestown may be seen by comparing a map of those structures in existence prior to 1690 (Fig. 18) and one illustrating those remaining after the turn of the century (Fig. 20). It will be noted that of the thirty-one structures appearing on the former

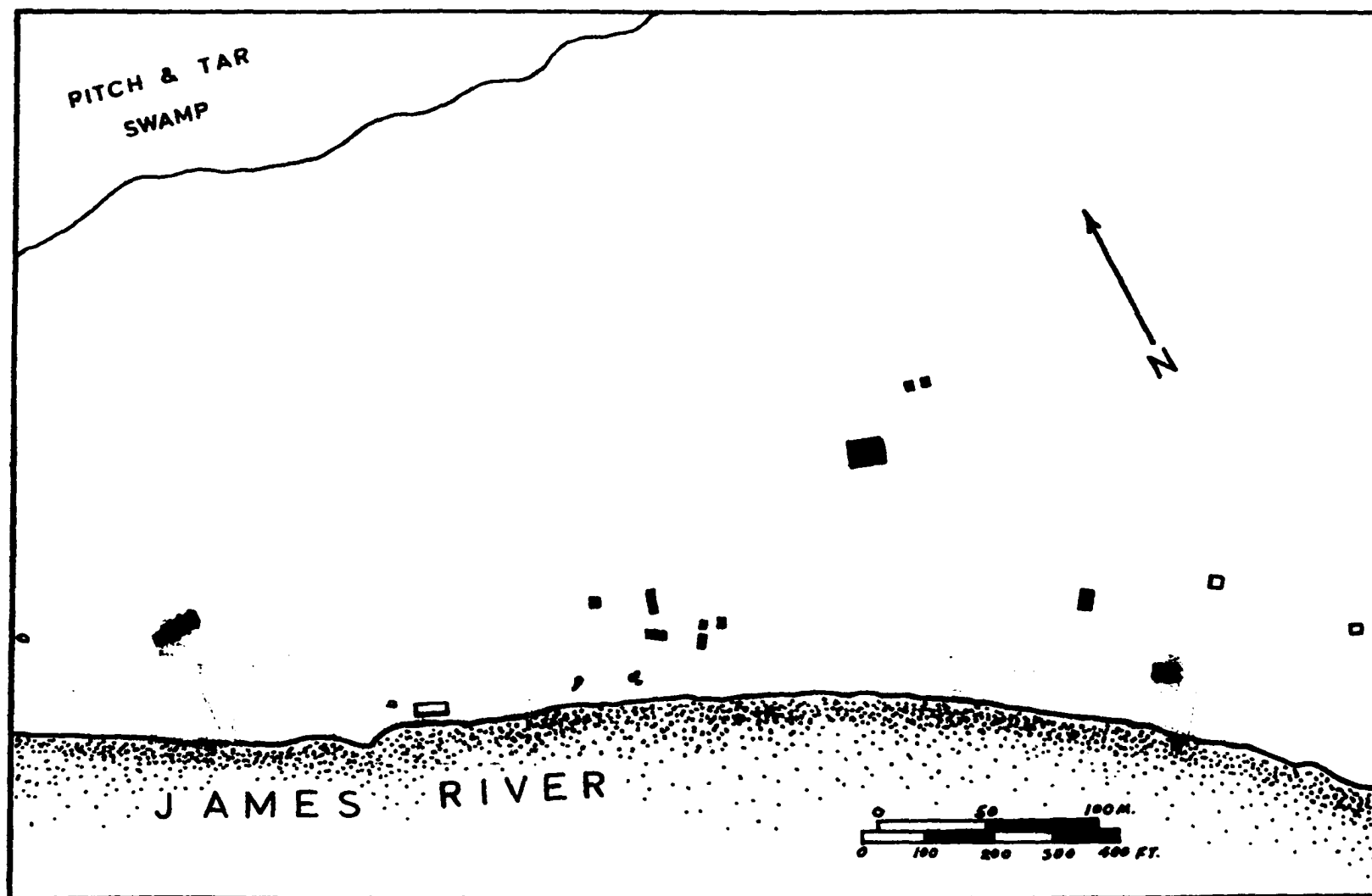


Fig. 20. — Map of settlement at Jamestown, post 1700.

only six remain on the latter. Nine other structures are also present at this time. Of the total of fifteen structures, eleven represent dwellings. Two are outbuildings of the large, newly-erected Jaquelin-Ambler house, one is the old church, and the fourth is an industrial site of minor importance (Cotter 1958). The structures are somewhat more scattered in general than was the case in the late sixteenth century except for a small cluster of six houses near the river's edge. It is possible that these may have been a remnant of the town associated with the function of Jamestown as a port, but there is no archaeological evidence to support this assumption. It is, however, pertinent to note that by the mid-eighteenth century, only the enlarged Jaquelin-Ambler house and affiliated structures, a single house near the river, and the church remained standing. The latter was to remain until its abandonment in the third quarter of the eighteenth century (Tyler 1906:125).

In less than a generation the settlement of Jamestown underwent a decided decline in population as the number of structures dropped to half, leaving the remaining buildings scattered. Of these, only two may be classified as non-family units devoted to subsistence activities. This contrasts to the numerous non-subsistence activities operating in Jamestown in the late seventeenth century. By the

middle of the eighteenth century, a single large farm or plantation structure and its outbuildings dominated the site of the old town when the island became a river plantation (Tyler 1906:84). The house was occupied throughout most of the nineteenth century. The gravel roads, brick garden walls, and brick drains relating to this late plantation complex were explored during the course of the 1934-1941 archaeological investigations (Forman 1938:116 and Cotter 1958:28-31).

The rapid abandonment of Jamestown at the end of the seventeenth century is accompanied by the appearance of a new nucleated settlement approximately five miles to the north and inland from the old town. The site is that of Williamsburg or, before 1699, Middle Plantation. Unlike Jamestown it was not totally abandoned, and many of its structures remained into the twentieth century.

The relationship of Williamsburg to the moving frontier may be illustrated by an examination of the dates of seventeenth century sites excavated in Virginia. Figure 14 shows that all sites known archaeologically are situated along the James and York Rivers from a point west of Jamestown to the confluence of both rivers in Chesapeake Bay. Of these sites, Jamestown, the Glasshouse site, the Governor's Land sites, Green Spring, the Kingsmill Neck sites,

Denbigh plantaion, the Thoroughgood house, and Kecoughton all date from the first half of the seventeenth century. Flowerdew Hundred and Saint Luke's church also date from this period. Their locations directly on the James suggest that the initial extent of the area of colonization was confined to the territory adjacent to the lower part of that river. The sites situated outside of this area are of a later date. They are located either inland on the peninsula, as in the case of Tutter's Neck and Williamsburg, or on the York, as are Clay Bank, Rosewell, and Yorktown. The other sites along the James are known primarily through existing structures which were occupied in the later part of the seventeenth century. Criss Cross on the Pamunkey River was also constructed after 1650.

The area of colonization in coastal Virginia appears to have been first confined to the territory surrounding those sites along the lower James River. It later expanded upriver and inland from both shores of the James while at the same time encompassing the lower York River. The position of Williamsburg in relation to the distribution of other sites would have been ideal for the location of a new frontier town. Not only was it situated in the newly-occupied interior of the peninsula, but it was also convenient to both the older settlements on the James and the newer

ones on the York. It appears much closer to the edge of the enlarged area of colonization which had emerged by the beginning of the eighteenth century than the older settlement of Jamestown. Its assumption of the functional role of the older town should indicate its ascendancy as a later frontier town.

Perhaps because of the concentration of research on the later settlement, little data concerning the earlier seventeenth century occupation has come to light archaeologically. Several structures have been dated by stratigraphic association as being earlier than the eighteenth century foundations above them, but artifactual evidence dates them earlier than 1710 (Noël Hume, personal communication). These earlier foundations were also oriented on a skew to the formal right-angled layout of the eighteenth century town (Noël Hume 1963:77). The absence of further evidence of the Middle Plantation period settlement, despite the extensive, long-term archaeological excavations carried out at Williamsburg, indicates that prior to the end of the seventeenth century the settlement pattern of this area was one of scattered structures, including a small brick church erected in the 1680's and later deliberately razed (Whiffen 1958:75). Although there is no evidence to identify the precise nature of the other structures, none

exhibit morphological characteristics or artifacts which would indicate non-dwellings. The future site of Williamsburg does not appear to exhibit either the dense settlement pattern of specialized non-subsistence activities characteristic of a frontier town.

The establishment of this new frontier town was rapid but, unlike Jamestown, involved more careful planning in advance. The town was laid out on a gridiron plan with the grounds divided into rectangular sections (Reps 1972: 163). Archaeological evidence indicates the appearance of a number of structures early in the eighteenth century. These included farms as well as other subsistence units and a number of buildings designed specifically for non-subsistence activities. It is beyond the scope of this study to discuss in detail the changes undergone by this settlement during the course of the eighteenth century. The growth and development of Williamsburg is treated thoroughly in a number of comprehensive works, including those by Noël Hume (1963, 1969a, and 1969b), Reps (1972), and Whiffen (1958 and 1960). It is sufficient here to note that the establishment of a concentration of non-subsistence activities at this place concurrent with their disappearance from Jamestown clearly indicates a change in the organization of the subsistence subsystem within the area of

colonization. This phenomenon is associated with the movement of the frontier town in response to ecological pressures precipitated by the advance of the frontier further inland.

In summary, archaeological evidence from seventeenth century sites in the James River indicates that a number of changes in the subsistence subsystem of the intrusive English culture took place during this time. First, the adoption of agricultural items is apparent in the use of the hoe as opposed to the plow as a primary cultivation tool. Floral remains consist of maize, and the use of tobacco is indicated by the presence of a tobacco container. Second, the expansion of the subsistence base in the area of colonization is attested to by the occurrence of substantial numbers of wild animal remains and the appearance of fishing and hunting items. Third, the breakdown of the European patterns of farming on the frontier is indicated by marked shifts in settlement pattern from the nucleated village to a dispersed arrangement centered upon the frontier town of Jamestown. Fourth, a comparison of subsistence technology in structures and in structural types within and without the clustered settlement on Jamestown Island indicates that subsistence activities played a larger role in those areas of dispersed settlement. Fifth, botanical remains and a

general absence of processing equipment associated with a wide range of agricultural products suggests that the primary subsistence products here may have been fewer than those in Europe. Finally, the changing role of the frontier town as it declined with the advance of the expansion of the frontier is evidenced by the virtual abandonment of Jamestown and the employment of those few remaining inhabitants in subsistence activities. This development is paralleled by quite the reverse at an inland location where a dispersed settlement, Middle Plantation, rapidly acquired the dense settlement pattern and concentration of non-subsistence activities characteristic of a frontier town. The confirmation of these six hypotheses affirms the general changes in the subsistence subsystem predicted by the frontier model.

Hypothesis 6. The fifth hypothesis states that the major subsistence products of the area of colonization should have been fewer in number than those of the metropolitan area. It is important to emphasize that we are here concerned with primary sources of agricultural subsistence as opposed to the wide range of subsistence products utilized during the initial period of adjustment to the new environment.

Two test implications for this hypothesis are; first, the presence of direct evidence for particular subsistence

items or their processing and, second, the absence of evidence for the occurrence of as wide a variety of items as was found in England at this time.

As is indicated in the first hypothesis, only scanty botanical evidence exists to substantiate the presence of any crops, namely charred grains of maize. Indirect evidence presented earlier indicates that the agriculture practiced here was of a type in which the use of the hoe predominated over that of the plow. The implication of hoe agriculture is that it favored the cultivation of New World crops such as maize, which were adapted to the use of the hoe, rather than Old World crops which were adapted to plow and broadcast sowing. This does not mean that any or all other European grains might not also have been grown, but it does seem to denote that their quantities may have been much less than in Europe. The absence of other grain processing equipment tends to support the assumptions that much of early subsistence must have been based upon New World cultigens. The apparent absence also of open-field cultivation systems may also have limited the number and types of crops grown. Many of those crops cultivated in a rotating field system were crops necessary to the restoration of soil fertility and would be unnecessary in the fertile soils of the Virginia coastal plain.

Evidence is lacking to indicate that a wide variety of subsistence products were grown on the James River frontier. On the contrary the limitations on methods of farming and the type of field system employed strongly indicated that the crops grown would be those particularly well adapted to hoe agriculture. The fairly extensive inventory of English crops, many of which were cultivated to complement each other in a rotating field system, would, on the other hand, be maladaptive to hoe agriculture and, therefore, would not likely have played a very large role in early Virginia agriculture. In either case, considering the complexity of sixteenth and seventeenth century English agriculture, that practiced in the James River area seems to represent an attenuated form of its counterpart in the metropolitan area.

The Economic Subsystem

Hypothesis 7. The first hypothesis concerns the effects of contact between the intrusive and indigenous cultures. It states that in the case of both there may have been borrowing of technology or technological items from the other. The extent to which this borrowing occurred is dependent upon the size of the gap between the levels of technological development possessed by each group and to a lesser degree upon special conditions existing in the natural environment to which adjustment by the intrusive culture is necessary.

As the environment of coastal Virginia did not differ appreciably from that of Europe, it did not necessitate the outright adoption of new technological methods to ensure the survival of the English. It has been noted that structures in the area of colonization were similar to those occupied in England at this time. All of the tools and manufactured products present here have European prototypes, and even those actually fabricated in the New World did not differ appreciably from contemporary English items of similar function. Rather than an obstacle necessitating the adoption of a new technology, the natural environment must be viewed as one factor of many which limits or determines the manner in which the old technology is utilized. The

extent to which this occurred on the Virginia frontier will be discussed more fully in Hypothesis 8.

Because of the potentially wide adaptability of semi-industrialized European technology to the Virginia environment, the value of adopting elements of aboriginal technology would necessarily be reduced. The situation was made even more extreme as a result of the great technological disparity between the two sociocultural systems. The obvious advantages inherent in metal for the manufacture of artifacts, the superiority of large-scale production, and the expediency of seventeenth century transportation would seem to have precluded the adoption of a primarily neolithic aboriginal technology on a large scale. Even the heavy reliance upon the use of native subsistence techniques was accompanied by the use of tools which were in common use by Englishmen at home. It is very probable, then, that direct evidence of the employment of aboriginal artifacts or techniques of manufacture will be unlikely at least on a regular basis.

Only two types of artifacts bearing evidence of aboriginal techniques of manufacture are found in context with European cultural deposits in the James River area. These are brown clay pipes and a ceramic ware exhibiting European forms but of aboriginal composition which Noël

Hume (1962a) has termed "Colono-Indian" pottery. Originally adopted from New World peoples and introduced into England as early as the third quarter of the sixteenth century (Oswald 1961:55), tobacco pipes were an integral part of English culture at the time of the establishment of the Virginia colony. The pipes manufactured at a Jamestown pottery kiln, while probably the work of European craftsmen, followed aboriginal forms (Cotter 1958:146) and may be considered an adoption of a product of native technology. While the pipes may be seen as an adaptation of an aboriginal form to European ceramic technology, the Colono-Indian pottery very likely represents an application of a European form to an aboriginal technology (Baker 1972:16). The makers of both these items are not clearly identified at Jamestown, but their use by Europeans is sufficient to indicate the borrowing of native items by the intrusive culture. These two items are quite widespread, and the pipes are reported from Jamestown (Harrington 1951), Clay Bank (Noël Hume 1966a:25), Tutter's Neck (Noël Hume 1966b:57), the Lightfoot site (Kelso 1966:107), and the Helmet site (Painter 1956). Colono-Indian pottery is extremely common in late seventeenth and early eighteenth century settlements in Virginia, and Noël Hume (1963:149) has suggested that it was manufactured for sale to low

status Europeans and plantation slaves. However, its common occurrence on many later sites suggests a far more widespread use by the Europeans. Similar adaptations of European ceramic forms have been noted in seventeenth and eighteenth century Spanish sites in Florida (Goggin 1951:186 and Smith 1951:129) and coastal Georgia (Kelso 1968:14) and have led Baker (1972:16) to suggest that the manufacture of such artifacts was a common component of acculturation of remnant Indian groups in the Southwest. It represents an adaptation forced by the necessity of entering into the economic subsystem of the intrusive culture.

In contrast to this lack of extensive borrowing by the Europeans, the acceptance of their items by the Indians should be much more wide spread, due primarily to the inherent superiority of European technology. To confirm this statement, the data should indicate the replacement of aboriginal items by their European functional equivalents as well as the appearance of totally new artifacts. The presence of items manufactured especially for the Indian trade is also expected in English colonies such as that at Jamestown. Smith (1956:105) has noted that this phenomenon is due primarily to the fact that in the seventeenth century the use of metals in the material culture of England and

northern European countries was much more extensive than was the case in the Iberian countries. The utilitarian advantage of metal artifacts combined with the ability of England to supply them led to the widespread use of such items in trade.

Perhaps the most direct evidence of the acceptance by the Indians of English material culture is the presence of such items in burial contexts. Three historic Indian burials occur at Jamestown, and each is associated with European artifacts (Cotter 1958:24). Neumann (1958:216) states that taxonomically the cranium from the only fully analyzed burial compares favorably with those of prehistoric and early historic Siouan populations of the area.

An incomplete survey of protohistoric sites in the James River area has yielded a wide variety of European items (Binford 1964:346-347) including ceramics, metal containers, clothing items, pipes, and glass fragments which were often reworked into implements. A number of items manufactured as trade goods were also found in aboriginal sites as well as at Jamestown. These include Venetian glass beads, bells, hatchets, knives, and small brass pans (Cotter 1958:106 and Hudson 1957:29). Similar beads also occur at the Thoroughgood house site (Painter 1965:134). Among the more unusual trade items encountered are brass

casting counters, normally used in Europe for making mathematical calculations (Cotter 1958:191).

While cultural borrowing occurred on the Virginia frontier, the archaeological evidence indicates that it involved the English primarily as donors rather than receivers. The technological advantages of the Europeans allowed them to adapt their economic subsystem to the frontier without the extensive incorporation of aboriginal artifacts or technical processes. The much less extensively developed native technology, on the other hand, was seen to be inferior by its users and, for this reason, was supplemented by heavy borrowing of European items and techniques.

Hypothesis 8. As colonial technology is necessarily an attenuated form of that found in the metropolitan area, it is most likely that the industrial activities of the James River area differed from those of the metropolitan area. It is assumed here that within the area of colonization such activities consisted primarily of small scale operations designed to provide products not obtainable from England or at least to supplement supplies from the homeland. The small size and limited production of these industries would seem to have precluded their supplying goods for widespread distribution. In a sense they would function in

a manner similar to the village industries of the Old World but differ in that they represented a variety of activities in a single location.

The first test implication is that settlements of the area of colonization will be characterized by specialized industrial structures distinguished by the presence of subassemblages associated with technological activities. A number of such specialized activity areas are distinguishable in the James River area (Fig. 21). The most common industrial activity area is the pottery kiln. Four kilns are reported from Jamestown (Cotter 1958), one from Green Spring (Caywood 1955:12-13), and the Challis site (Noël Hume 1963:216) consisted entirely of a pottery kiln. The probable site of a kiln was investigated at Kecoughton (Brittingham and Brittingham 1947:7) but is not described.

The four pottery kilns at Jamestown represent three types. The first type is represented by two kilns located together near the northern border of the town (Fig. 21). Both of these kilns are rectangular in shape and were dug into a sloping surface. The first had a singular trough-like firing chamber with a clay bottom and sides and a single brick flue. Dressed stones from this kiln's floor yielded glazed imprints of round objects, presumably pots fired there. The second kiln had two narrow parallel firing

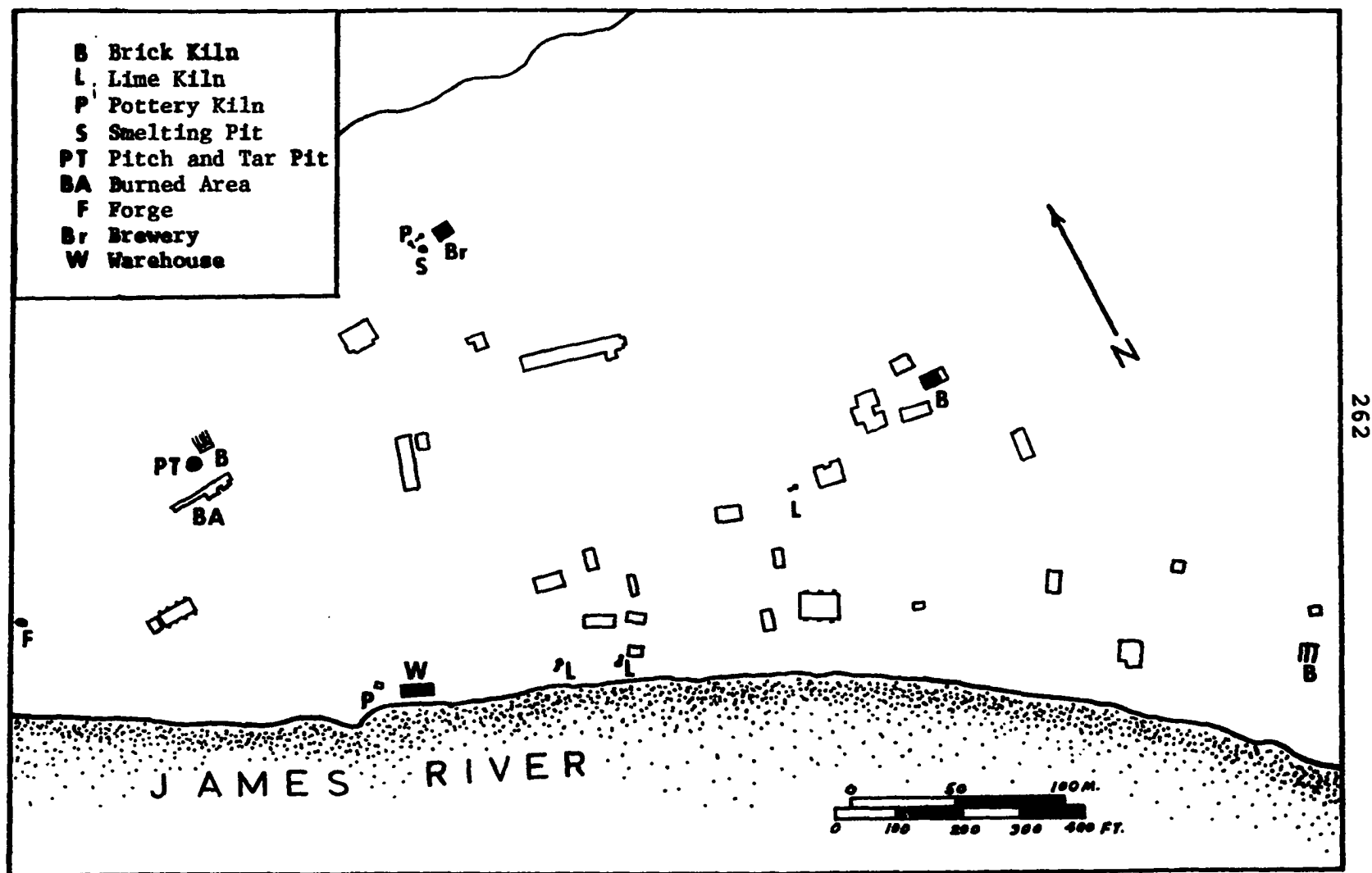


Fig. 21. -- Location of industrial areas at Jamestown, 1607 - 1690.

chambers, and like the first, it contained a single flue. A probable third kiln near these is indicated by a round depression with a baked clay lining. The remains of this kiln directly rested above an earlier smelter. The kiln is associated with glazed-covered floor stones and 246 pieces of flat roofing tile. All three kilns are associated with a clay barrow pit which had been filled in part with pottery wasters (Cotter 1958:111-112). The fourth kiln was constructed of brick and is situated by itself in the southwestern part of Jamestown near the present shoreline (Fig. 21). It contained a long central firebox with an arched opening and three firing chambers to either side. The kiln rested on a layer of sand. The function of this kiln is readily identified by the large number of wasters representing floor tiles and locally-made pipes. Associated artifacts identify all of these kilns as having been in operation by mid-century (Cotter 1958:67).

The pottery kiln at Green Spring (Fig. 22) was located on a small hill to the east of the main house. It was rectangular in shape with an arched roof. As in the kilns at Jamestown, tiles had been used as rests for the pots during firing and were frequently covered with the glazed imprints of pottery. Associated with this kiln were large quantities of wasters, including large jars with sausage-

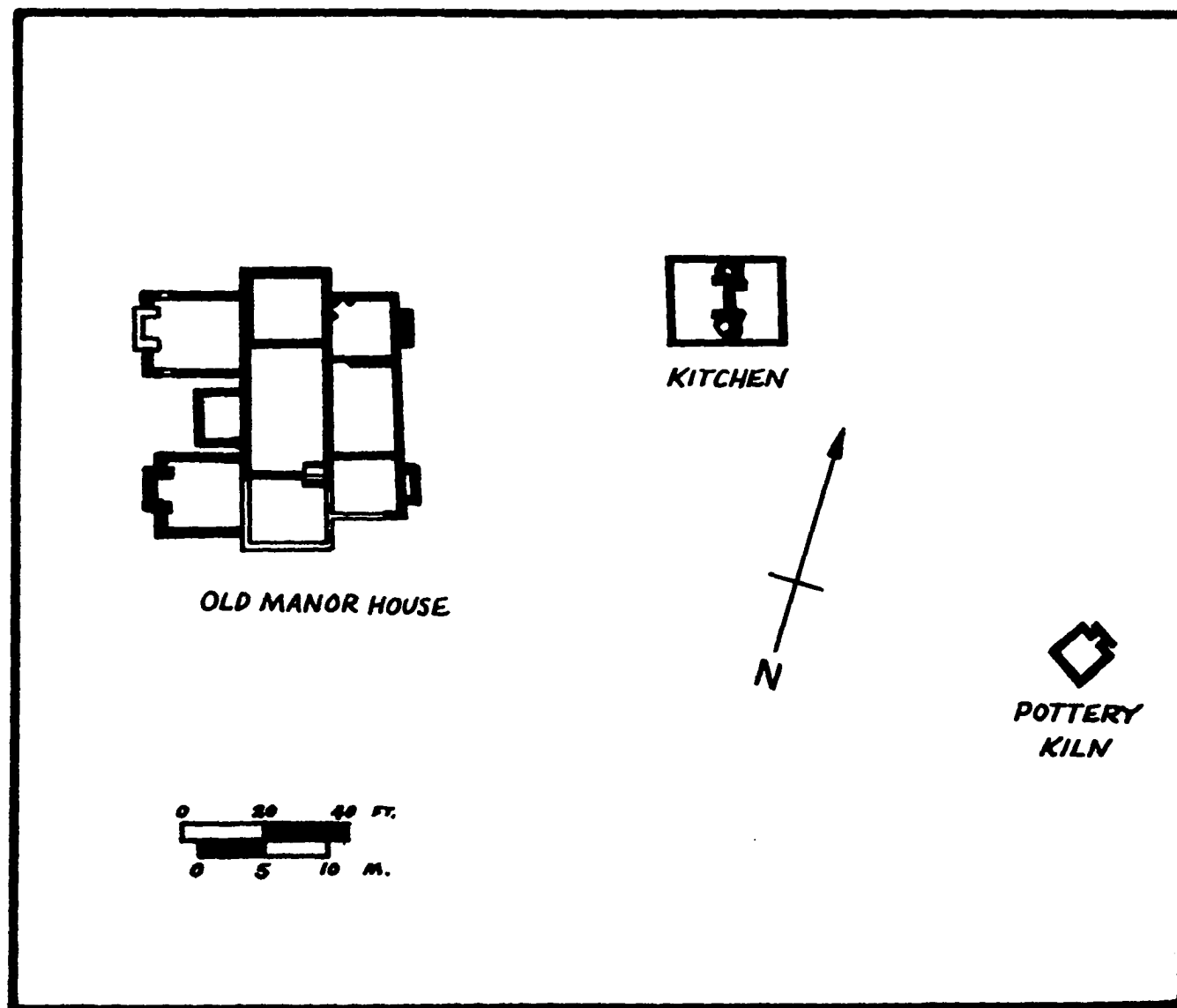


Fig. 22. -- Plan of structures at Green Spring.

like handles, brown glazed dishes resembling English "chargers," and a single delicate candlestick (Noël Hume 1963:220). The kiln dates approximately from 1660 to 1680 (Caywood 1957:80).

Finally, the Challis site kiln (Fig. 14) has been identified only by the presence of waster piles and sandstone slabs bearing marks of glazed pots. A wide variety of vessels including jars, pans, bowls, pipkins, jugs, dishes, colanders, and cups were produced here during the 1690-1730 period of operation (Noël Hume 1963:215-216).

The kilns share similarities with English kilns of the same period (see Mayes 1969:64-68 and Bartlett 1972). The brick or stone structure, clay or sand bases, and arched tops tend to be typical, although the English kilns were also round in shape. The nearby waster dumps are, of course, typical, and the use of worn-out clay pits as places of their deposition has also been observed in England.

Three brick making kilns were uncovered at Jamestown (Fig. 21). The first is a small kiln situated in the extreme southeastern portion of the town. It was built within a rectangular pit and contained two parallel firing chambers within which the bricks were set on permanent benches. Two arched holes at the south end of the kiln led

to a second pit and provided access of draft and fueling. There is evidence to indicate that brown clay pipes were also fired at this kiln. Associated artifacts date the kiln within the first quarter of the seventeenth century (Cotter 1958:145).

A second larger kiln is situated to the west of the cluster of three pottery kilns (Fig. 21). Like the first, it was constructed in a pit and contained permanent benches, but it differed in that it had fired brick sidewalls and a brick base. The bricks were fired between five arched firing chambers. There is no direct archaeological evidence to date the period of the kiln's use; however, Harrington (1950:25) compares it with English kilns in use during the second half of the seventeenth century.

The third kiln, located in the eastern section of Jamestown near the Jaquelin-Ambler house (Fig. 21), consisted of only fragmentary remains either of several small kilns or one large kiln with as many as five firing chambers. No datable artifacts were associated with this kiln (Harrington 1950:19).

Three lime kilns were constructed at Jamestown and one partial kiln was built at Kecoughton. The latter is not described. Two of the Jamestown kilns are located along the shore of the river to the east of the pottery

kiln (Fig. 21). The easternmost kiln consisted of parallel brick walls placed in a brick pit. Four iron hoops embedded in the walls covered the firing chamber which extended the length of the kiln. The floor and back of the kiln consisted of fireburned clay, and inside the chamber lay a mass of loam, brick dust, burned oyster shells, lime, charcoal, and fragments of coal (Bailey 1938:9).

The second kiln was also brick-lined but exhibited an oval firing area. Above the chamber the burned clay walls of this simple kiln tapered outward to the surface. Bailey (1938:7) states that this type of kiln was essentially an open pit with the fire being contained under a temporary arch of large stones. The kiln would have been fired continuously until the lime in it had been reduced. Associated artifacts date both kilns in the late seventeenth century, and they are similar to types used in England at this time (Bailey 1938:11).

The third kiln is located just south of the Jaquelin-Ambler house and west of the fragmentary brick kiln (Fig. 21). The kiln was bulbous in shape with the wide end terminating in a brick wall and the narrow end in a brick-lined opening. Like the other kilns, it was set in a pit. Its contents included not only the expected lime, but also tile fragments, the surfaces of which were covered with lead

glaze and sherds of locally-made pottery, indicating that at one time this lime kiln served another purpose. Associated artifacts date the kiln prior to 1640, much earlier than the other two (Cotter 1958:90-91).

A fourth industrial activity present in seventeenth century Virginia was glassmaking. The first and most extensive site of this activity is Glasshouse Point, located on the mainland at the terminus connecting it with Jamestown Island (Fig. 30). The glasshouse complex consisted of three structures: a working furnace where the glass was melted in clay pots, a pot kiln for firing new pots, a joined annealing furnace for the finished glass and a fritting furnace for the preliminary fusion of the ingredients. All of these were set within a larger area, the size of which was indicated by a packed dirt floor (Fig. 23).

The main working furnace was roughly circular in shape with an extended opening at one end. It was constructed of rounded river boulders embedded in clay with an interior paving of the same material. The crucibles were placed on stone "sieges" which lifted them above the level of the furnace floor. Materials found within the furnace were slag, ashes, broken crucibles, stone spalls, and glass drippings (Harrington 1972:17). The pot kiln was

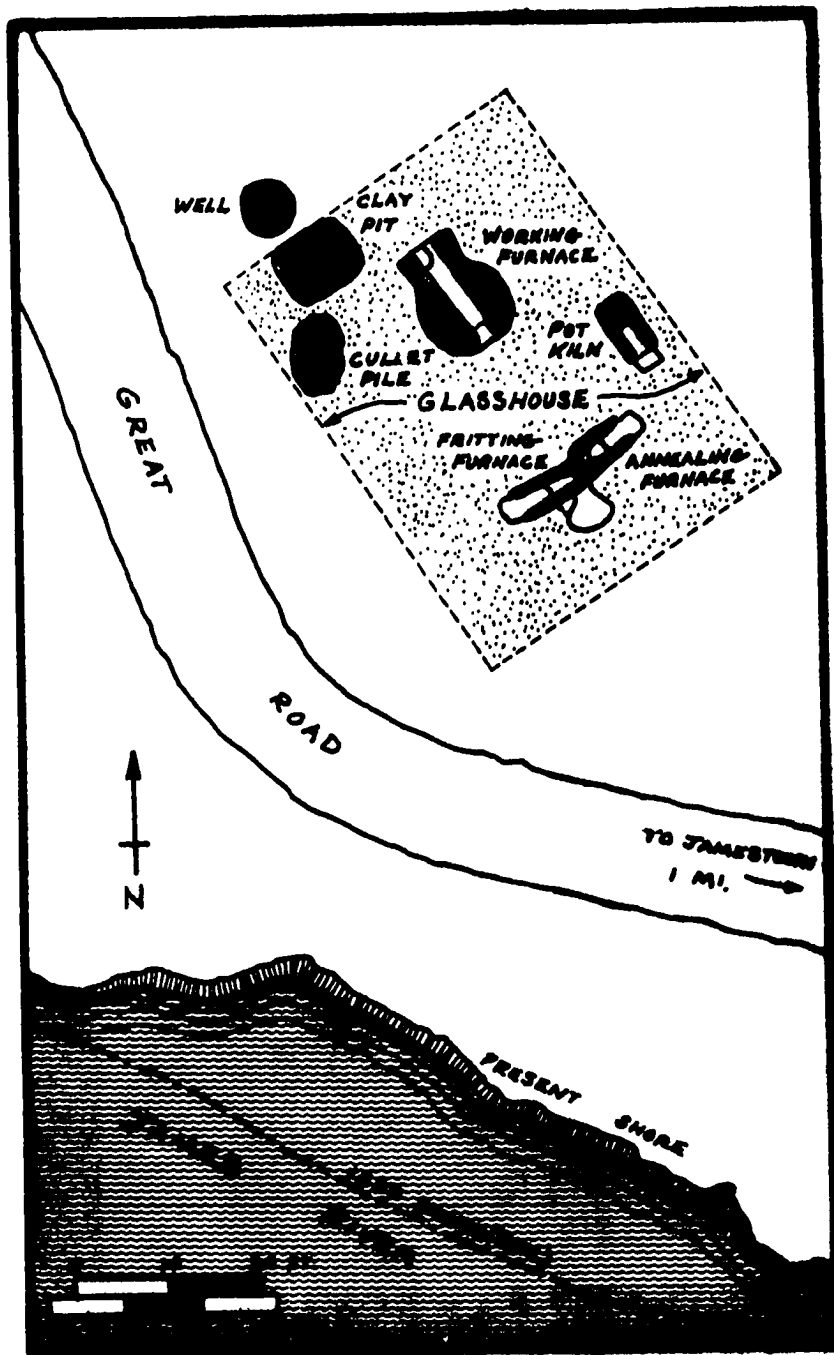


Fig. 23. -- Plan of the glasshouse complex.

rectangular with a narrow firing chamber and a raised firing platform. It was also constructed of boulders set in clay. The contiguous fritting and annealing furnaces were elongated structures placed back to back. They differed chiefly in that the former had a stone-paved fire chamber while that of the latter was paved with brick. The design and construct of the furnaces and their overall layout at the glasshouse site is comparable to that of sixteenth and seventeenth century English glasshouses (see Crossley 1968:53 and Crossley and Aberg 1972:119).

A pit to the west of the furnaces yielded a great deal of furnace debris, apparently filled in after the workmen had excavated a pit for clay from which to make the ceramic crucibles. A well consisted of a four foot circular hole dug about two feet below the normal ground water level with the remains of a barrel at its base (Harrington 1972:20-21). No artifacts were associated with the well and no glassmakers' tools or other diagnostic or datable items were found anywhere at the site, suggesting a short duration for the operation (Harrington 1957:5). Among the glass objects manufactured here were window panes, small bottles, and simple drinking vessels (Cotter 1958:102).

The second glassmaking attempt in the James River area was made in the vicinity of the Green Spring

plantation site. The evidence for this endeavor is much scantier than that for the Jamestown glasshouse and consists only of a brick trough lined with once-molten glass. The bricks bear the incised date of 1666, well within the period of the plantation's seventeenth century occupation. Unfortunately, the precise location where the trough was found is unrecorded, although it is believed to have come from the area to the west of Green Spring, and no evidence of the actual furnace itself has yet come to light (Noël Hume 1963:204-205).

The working of iron and the manufacture of metal artifacts is attested to by the presence of a forge at Jamestown (Fig. 21). Uncovered at the western edge of the site within the area of the 1861 Confederate earthworks was a large forge pit (Cotter 1958:11). Much of the original structure of the forge had been destroyed during the construction of the fort, but the large quantity of charcoal, cinders, and slag, together with many pieces of bar iron, brass and lead runlets, complete and partially complete iron objects, blacksmith's tools, and a small anvil, clearly identify the activities carried out here. There is evidence that an armorer also worked at the forge, for weapons parts, including those of matchlock, snaphaunce, and wheel lock firearms, basket hilts for broadswords, and a rapier guard

as well as waste lead from the casting of bullets, were recovered at this site. Artifacts date the forge within a 1610-1625 time span (Hudson 1956:8).

A sixth technological activity is indicated by a specialized structure located in the northern part of the town (Fig. 21). It is roughly a square brick structure with a red ceramic tile floor. A wide fireplace in the southwest corner projects outward from the wall and contains a cylindrical firebox on the floor of the hearth. A second cylindrical firebox is located on the west wall and a trapezoidal firebox lies against the east wall. The fireboxes were apparently added after the original construction of the building and suggest an industrial function. No particularly diagnostic artifacts were associated with the structure. A chemical analysis was conducted on earth samples taken from each of the fireboxes in an attempt to determine information concerning their use. The results indicate that the temperatures at which the fireboxes were operated preclude their use in metallurgical smelting and suggest low temperature industries such as brewing and baking. Artifacts associated with this structure indicate a mid-seventeenth century date, making it contemporaneous with the nearby kilns and refuse pit (Cotter 1958:106-108).

Other technological activities are indicated by the presence of specialized tools alone. These include boat-building, distilling, timbering, coopering, furniture-making, winemaking, and metalworking (Cotter 1958). Metalworkers' tools indicate that these artisans were not solely confined to Jamestown, for a dated pewter spoon bears the mark of a pewterer who was producing items at Chuckatuck, a dispersed settlement on the south side of the James River, as early as 1675 (Hudson 1957:52).

A second test implication for the operation of a diversity of industrial activities is the presence of the products of those activities within the area of colonization. Because a later hypothesis will attempt to more precisely define the distribution of items of known origin, it will be necessary here only to establish the presence of the products of the industries previously described.

The locally-made ceramics found in Virginia are two varieties of soft-paste earthenware, glazed and unglazed (Jelks 1958:206). Both were manufactured of local red clay (Bailey 1937:103) which produced a paste ranging from light yellow when underfired to a deep brick red when overfired. Lead glazes vary from light green to deep burnished brown in color and were usually applied only to the inside of the vessels (Caywood 1955:20). Specimens of locally-made wares appear in Jamestown structures occupied as early as the

1620's (Cotter 1958), and by mid-century the work of a number of different potters may be distinguished in the area of colonization (Noël Hume 1963:213).

Whether or not one accepts the brown clay pipe fragments as products of the excavated kilns at Jamestown, the presence at this site and other seventeenth century sites along the James River of what are obviously European pipes made of native clay indicates the production of these items in the colony (Harrington 1951).

Evidence of the products of Jamestown's brick kilns is perhaps the most obvious to the observer of the colonial structural remains. Nearly all of the foundations exposed at Jamestown, as well as the church tower, were constructed of what appear to be locally-made bricks. Most closely approximate the statutory sizes of contemporary English bricks, but they seem to become slightly shorter and thinner through time (Harrington 1950:35). Bricks found with both brick kilns encompass the entire range of bricks used in the structures at Jamestown (Cotter 1958:193). Archaeological evidence also indicates that locally-made roofing tile was used to cover the roofs of most of the structures erected after 1650 (Harrington 1950:19). Closely tied to the use of brick and tile was the employment of locally-manufactured lime in the mortar which held the brick walls

together (Bailey 1938:2). Undoubtedly, lime burned in Jamestown kilns was used in the continual rebuilding of the town during the seventeenth century.

The presence, within the area of colonization, of artifacts manufactured at the Jamestown glasshouse is impossible to demonstrate in that the green glass produced there does not seem to have differed perceptibly or chemically from that made in Europe. No unique glass forms were recovered from Virginia, and it is generally assumed that most of the glass items found there are of European origin (Harrington 1972:39). This contention is supported by the apparent short duration of the glasshouse operation itself, which does not appear to have been sufficiently lengthy to have produced glass in quantities suitable for extensive distribution.

Iron objects are especially difficult to assign to the forge at Jamestown, for its products do not visibly differ from those made in Europe during the same period (Hudson 1956:8). The wide range of items recovered from the forge site suggests that many of the artifacts found elsewhere at Jamestown may have originated there. Much of the work accomplished at the forge appears to have been associated with the repair rather than the manufacture of metal objects. This implies a focus for the treatment of

items for local use rather than one for their creation for local or regional use. The relatively long duration of the use of the Jamestown forge, perhaps as long as two decades, and the large number and variety of artifacts found in association with it, however, are sufficient evidence to indicate that items produced there were utilized within the area of colonization.

In summary at least six specialized technological activities have been defined archaeologically within the area of colonization on the Virginia peninsula. These were concentrated primarily in two areas, Jamestown and the vicinity of Green Spring. The diversity of these industries is unique when compared to English settlements of this period. During the sixteenth and seventeenth centuries these activities were usually separated spatially and would seldom be found in the same community or often in the same region (Flinn 1965:85). The factors favoring this dispersal were not only the distribution of raw materials but also the complex network of communications existing in England at this time which made regional specialization an efficient adaptation. Although Jamestown and early Virginia participated in this national communication system in a peripheral manner, their comparative isolation from the metropolitan area and proximity to the expanding frontier

seem to have necessitated the replication of a wide range of industrial activities.

The small size of many of these undertakings implies that the emphasis of colonial technology was on self-sufficiency for the colony rather than the production of goods for a wider market. They manufactured goods either to supplement shipments from the Old World or to provide products which could not be imported. The apparent brief length of the glasshouse operation shows that at least some of these industries flourished only for short periods of time, perhaps because the importation of items made their existence unnecessary.

Hypothesis 9. As the colony's main exports to the metropolitan area must have been products readily available, the commodities involved consist, for the most, of produce or raw or semi-finished materials used in more complex manufacturing processes. As early as the mid-sixteenth century England was importing large quantities of such items as wax, tallow, flax, hemp, and naval stores from Russia and Baltic Sea countries (Flinn 1965:63), and the desirability of obtaining such products was emphasized in the granting of natural resource and mineral rights to the Virginia Company in its first charter (Bemiss 1957:6). Since the extraction of most of these products, with the

exception of mining ores, would be expected to have left few traces in the archaeological record, the search for evidence representing the production of raw or semi-finished commodities must center upon their modification rather than their extraction. These treatments should follow methods used in England at this time and should duplicate the early stages of industrial processes there. As previously mentioned, the "horizontal" arrangement of seventeenth century industry entailing a geographical separation of its parts would lend itself easily to the preliminary preparation of raw materials in a relatively isolated colony.

An examination of the data yields several instances of the preparation of raw products at Jamestown. The first of these is a smelting pit located in the part of the town directly beneath the southernmost of the three pottery kilns described earlier (Fig. 21). The pit was approximately ten feet in diameter with an entrance-like projection at one side. Stratified deposits in the deepest portion of this pit indicate a layer of charcoal overlain by a layer of trash which contained large amounts of iron ore, lime, slag, and charcoal in addition to other debris. The iron was bog ore which was easily obtainable from deposits in nearby swamps and shallow ponds (Cotter 1958:110). Dome-shaped earth ovens were used to smelt iron in England during the

first half of the seventeenth century. These ovens employed a pit in which a wood or charcoal fire was built to smelt the ore with a foot bellows being used to increase the heat (Hudson 1956:5). Although only the bottom portion of this structure is present, its design and associated artifacts indicate that it was an early oven smelter dating from the second quarter of the seventeenth century (Cotter 1958:112).

The second of the preparatory industries is represented by a rectangular pit containing a series of circular deposits of pitch or tar about twenty inches in diameter (Harrington 1942:11). It is located in the western part of Jamestown to the south of the large brick kiln (Fig. 21). This pit seems to be associated with the manufacture of pitch and tar, two substances used by shipbuilders to caulk the seams of wooden vessels. These products are obtained by the destructive distillation of pine wood, a resource plentiful along the James River (Hudson 1957:14). Unfortunately this feature was not fully explored archaeologically, and the extent of the activity it represents is unknown.

Another incompletely investigated feature is situated to the south of the pitch and tar pit (Fig. 21). It is an area ten feet wide by 100 feet in length which shows evidence of the continuous burning of wood (Harrington

1942:11). Probably this area was used for the systematic burning of wood for charcoal and potash. The latter was an important industrial import in seventeenth century England, and the former was significant as a fuel there (Flinn 1965:80) and presumably in Virginia as well.

Although somewhat less abundant than the small-scale finished industries in the area of colonization, the production of raw or semi-finished commodities is evident at Jamestown and apparently absent elsewhere in the colony. It is impossible to determine, on the basis of archaeological evidence, if the iron, pitch, tar, and possible charcoal or potashes were produced for export. The early time bracket into which the iron smelter is placed indicates that this industry was not operating throughout the duration of the occupation of Jamestown and may, like the glasshouse, represent a short-term activity. It is more probable, however, that as these industries were not permanently located and were frequently moved, even in the Old World, the sites uncovered at Jamestown represent only their location during a particular time. The significance of the movement of these sites will be discussed later.

Hypothesis 10. Due to the central location of the frontier town in a frontier system which was chiefly oriented toward subsistence, the settlement which occupied this

position would have assumed the role of providing technological services for the other settlements within the area of colonization. For this reason it is postulated that most, if not all, industrial activities within this area would have been located in or near the frontier town.

Following the analysis in Hypothesis 4, the forty-seven Jamestown structures utilized between 1650 and 1690 include fifteen which cannot be considered household subsistence units. Of these ten have been identified as industrial structures of some sort. These consist of two brick kilns, three lime kilns, four pottery kilns, and one probable brewery. In addition a smelting pot lies beneath one of the kilns, and areas assumed to have been used for the production of pitch, tar, charcoal, and potash were investigated briefly. Within the area of the nucleated settlement of Jamestown, there were thirteen industrial activity areas representing seven separate industries that were in operation sometime during the third quarter of the seventeenth century.

A survey of other sites shows such activities appearing in only two, Green Spring and the Challis site, both of which are but a few miles to the west of Jamestown. These sites contain two pottery kilns and a probable glass furnace.

Two conclusions may immediately be drawn from the preceding evidence. First, there is a marked contrast between the presence of a variety of industrial activities at Jamestown and their nearly complete absence elsewhere in the area of colonization. Second, the proximity of the isolated industries to Jamestown Island (approximately two-and-one-half miles) suggests that they may represent an expansion of industrial activities within a limited area. This assumption seems to be strengthened by the slight chronological discrepancy in the periods of use of the pottery kilns inside and outside of Jamestown. Although all were operating during the second half of the seventeenth century, the kilns at Jamestown had ceased production by the 1660's. On the other hand the Green Spring kiln was not constructed until at least 1665 (Caywood 1955:13), and the Challis site kiln was not in operation before the 1680's (Noël Hume 1963:213). The relationship between these two kilns and Jamestown is made even more clear by the presence of broken vessels from the Challis kiln in late seventeenth century trash deposits at Jamestown (Noël Hume 1963:213). It would seem that this kiln, although outside of the immediate boundaries of the frontier town, fulfilled much the same function in supplementing supplies of imported ceramics as did the earlier kilns within the town itself. The role of

the Green Spring glass furnace is unclear, because the dates and extent of its operation, like those of the Jamestown glasshouse, are unknown.

Cotter (1958:165) has suggested that seventeenth century industries at Jamestown were clustered into two foci, one at the north edge of town near the Pitch and Tar Swamp and the other along the shore of the James River (Fig. 21). If the temporal relationships of these technological activities are examined, several patterns emerge. First, the earliest industries dating prior to 1630 appear near the river yet on opposite sides of the town areas as well as in the vicinity of the Jaquelin-Ambler house. These activity areas were removed from the existing houses occupied at this time. The northern "industrial focus" appears to have been used from the 1630's through the middle of the century, although the iron smelter may be older. These industries were abandoned in the 1660's with the spread of dense settlement into this area. Industrial activities do not appear again in Jamestown until late in the seventeenth century when the two lime kilns along the present shoreline were set up. Their operation extended past the time of the town's decline and into the early part of the eighteenth century. Thus, the spatial arrangement of industries in Jamestown seems to represent a pattern of relatively dispersed activities gradually being encroached upon by

settlement. Briefly, industries were centered around the northern edge of town but were subsequently removed to more distant locations such as that represented by the Challis site.

While it is obvious that Jamestown represented the center of industrial activity in the area of colonization throughout most of the seventeenth century, and the activities concentrated there were more diverse than those normally found in most English towns of the period, the tendency of industries to remain dispersed in the manner of their Old World counterparts is also noticeable here. This dispersal was in part necessitated by the need to provide access to raw materials, including the forest for fuel (Flinn 1965:83). In the case of an expanding settlement, this requirement would also entail frequent removal. Technological activities appear to have remained at the edge of the expanding periphery of the frontier town throughout the period of its occupation, never being consolidated as an industrial section yet never extending more than a few miles from the center of Jamestown. As the size of the town began to shrink with the rapid loss of population at the end of the century, industries again appeared briefly within the limits of the old town. With the final abandonment of the frontier town, these too disappeared.

Hypothesis 11. Because a colony expands through time, and new frontier towns replace their older counterparts, it is assumed that the focus of technological activity will shift from the older to the newer settlement. As this occurs, industries will decrease markedly or cease to operate entirely in the old frontier town as the latter is severely depopulated. Hypothesis 6 has demonstrated that as the Virginia frontier expanded inland along the peninsula from the James and York Rivers, one settlement, Williamsburg, assumed Jamestown's role as frontier town in terms of those activities associated with the subsistence subsystem. It is the purpose of this hypothesis to show that changes in the technological activities within this settlement and the older frontier town reflect the movement of the focus of the economic subsystem to a new center more strategically situated in relation to the expanded area of colonization.

The first test implication of this hypothesis is that the concentration of industrial activities will at some time cease to exist in Jamestown, marking its decline as the economic center of the area of colonization. To some extent, this implication has been dealt with in the previous discussion. It has been demonstrated that after initial expansion outside the immediate area of the town, the various manufacturing activities carried out there

tended to disappear completely after 1700. When Jamestown's size shrank drastically, two lime kilns were actually built within the former area of dense occupation, but these too were abandoned with the townsite in the first few decades of the eighteenth century. The Challis site was also abandoned by 1730 (Noël Hume 1963:216). No archaeological evidence of subsequent industrial activity associated with the immediate vicinity of Jamestown has come to light, and it may be assumed that Jamestown ceased to function as a center of industrial activity in the early eighteenth century.

The second test implication states that, as Jamestown and its associated industries declined, a concomitant upsurge of such activities would occur, centering about the new frontier town of Williamsburg and settlements tied directly to it, such as its port, but not at any other location within the area of colonization.

From the third decade of the eighteenth century, locally-made pottery, which did not originate in the Jamestown area, began to appear in English settlement sites along the Virginia peninsula. Although no actual kilns have been located, high concentrations of wasters suggest kiln locations at Williamsburg or Yorktown. Of particular significance are the "rolled rim" potter whose characteristic wares are widespread after 1725 (Noël Hume 1963:221)

and a Yorktown potter who produced both lead-glazed wares and stonewares after 1730 (Watkins and Noël Hume 1967:110). Excavations conducted in 1970 uncovered the stoneware kiln in Yorktown. Its size and form are comparable to European kilns of the eighteenth century, and associated artifacts date the period of the kiln's use as 1720-1745 (Barka 1973:313).

Apart from ceramic manufacturing, a number of other technological activities have been identified through archaeological investigations at Williamsburg. Evidence of gold and silversmithing, furniture-making, and printing are among these (Noël Hume 1963). The bulk of industries associated with this settlement seem to have been situated in two areas to the east and west of the town; although, most of the sites have not been thoroughly investigated. The river traffic both from the York and James Rivers would presumably have come up the two tributaries of these rivers which flow near the town. Most of these sites would date from the second quarter of the eighteenth century.

After treating at length the manufacturing activities at Williamsburg, it is obvious that, with the passing of Jamestown, this inland settlement seems to have attracted the concentration of the specialized industrial activities, formerly concentrated in Jamestown, which served as both port and frontier town.

In summary five hypotheses have been examined which deal with the characteristics of the economic subsystem in the area of colonization on the Virginia peninsula. It has been shown that contact with indigenous peoples resulted in little borrowing by the English, apart from subsistence products, due to the flexibility of the European technology. The aborigines, on the other hand, extensively borrowed and duplicated English technology. A multiplicity of small-scale and often quite specialized manufacturing activities arose at Jamestown, representing a greater diversity of industries than would normally be expected in contemporary English settlements. Several of these activities indicate the initial stages in the manufacture of commodities which seem to have been further modified outside of the area of colonization, presumably in the metropolitan area. In contrast to the regionally scattered pattern of seventeenth century industry in England, those of the James River area were clustered around the frontier town of Jamestown. They appear to have been set up on the edge of settlement and to have moved from time to time in response to expansion of settlement and diminishing raw products. Finally, a marked shift in the concentration of the industrial activities occurred at the close of the seventeenth century. These activities disappeared from

Jamestown only to reappear subsequently at the new frontier town of Williamsburg. The archaeological data from the Virginia peninsula indicate the changes in the economic subsystem proposed in the frontier model.

The Social Subsystem

Hypothesis 12. It is assumed that the conditions of the frontier in Virginia would have resulted in marked simplification of the stratified social system found in sixteenth and seventeenth century England. This phenomenon should be manifest in a reduction in the number of hierarchically-arranged status positions, particularly in those at both ends of the spectrum, resulting in a "leveling" of society in the area of colonization. The process should be evidenced primarily by the loss of many of the multitude of specialized control statuses coupled with the appearance of several generalized high status positions. The number of statuses within the colony should not represent as great a range of variation as is found in the metropolitan area.

Because the nature of this hypothesis is comparative, its test implications must be constructed in terms of expected contrasts to conditions in England. It will be recalled that in seventeenth century England the older hierarchical organization based upon the medieval feudal estates and the church structure was being replaced by a

more centralized organization more adaptive to the changing economic situation in Europe. This readaptation resulted in a great number of political, social, and religious statuses, the functions of which frequently overlapped. On the frontier one might expect to observe not only the elimination of those whose existence was no longer adaptive but also the combination of others in order to facilitate the efficient administration of the relatively small, scattered frontier population.

As previous examination has shown, the settlement pattern of coastal Virginia was not comparable to that found anywhere in England. For this reason it cannot be equated initially with any particular type of English social or political unit in terms of what statuses are likely to be found there. A colony is, in a sense, an attempt to replicate the state which founds it, and one may expect the entire social subsystem to be represented here albeit in an attenuated form. Therefore, the area of colonization here should be characterized by a series of statuses representing the functions of those in England but combined into a fewer number of positions. This should be discernible archaeologically through the examination of the following test implications.

The first of these deals with the civil-religious division of authority which still persisted into the seventeenth century. It may be assumed that a colony established under the auspices of the English government would also have an established state church but one subservient to the crown. It is likely that the political and social duties of the latter would be subsumed by the civil organization of the colony. This is not to say that the governor of the colony would be a priest but rather that, while he would presumably serve as the king's representative, there would not be a comparable surrogate for the highest English ecclesiastical status, the Archbishop of Canterbury.

The presence of a dual hierarchy in the homeland in which state and church occupied roughly equal positions might necessitate the occurrence of nearly equal symbols of civil and religious rank in the area of colonization. These would most likely be represented by specialized structures symbolic of prestige within the community. Such a pattern is evident in some larger Spanish settlements in North America in which the structures of religious orders, especially the church, certainly rivaled the prominence of the governor's residence and buildings of the civil government (Reps 1969:51), but such settlements do not form the centers of settlement frontiers. An examination of the data from Jamestown reveals no such duality in structures

here. Although several large residential and civil structures are present in the Jamestown area and are associated with high status artifacts (See Caywood 1955, Cotter 1958, and Noël Hume 1965), none may be characterized as being religious in nature. The only religious structure in Jamestown is the brick church (Fig. 24). Although a substantial structure, it is not particularly outstanding in size and, in fact, is identical to at least one other mid-seventeenth century church in Virginia, St. Luke's in Isle of Wight County south of the James River (Yonge 1904:54).

Another clue as to the role of the church may be gained from the distribution of burials. In England all burials were traditionally confined to the parish churchyard with high status individuals often being interred in prominent tombs or within the actual walls of the churches themselves. Nonconformity to this pattern in the area of colonization would suggest a loss of influence by the church in civil affairs. Burials at Jamestown fall into two different patterns. The first is represented by the interment of individuals in the vicinity of the church structure, presumably in the churchyard (Cotter 1958:22). This area surrounded the church and extended at least 200 feet to the west in front of it (Yonge 1904:52). In contrast to the churchyard interments, burials were also uncovered in the excavation of the Ludwell-Statehouse

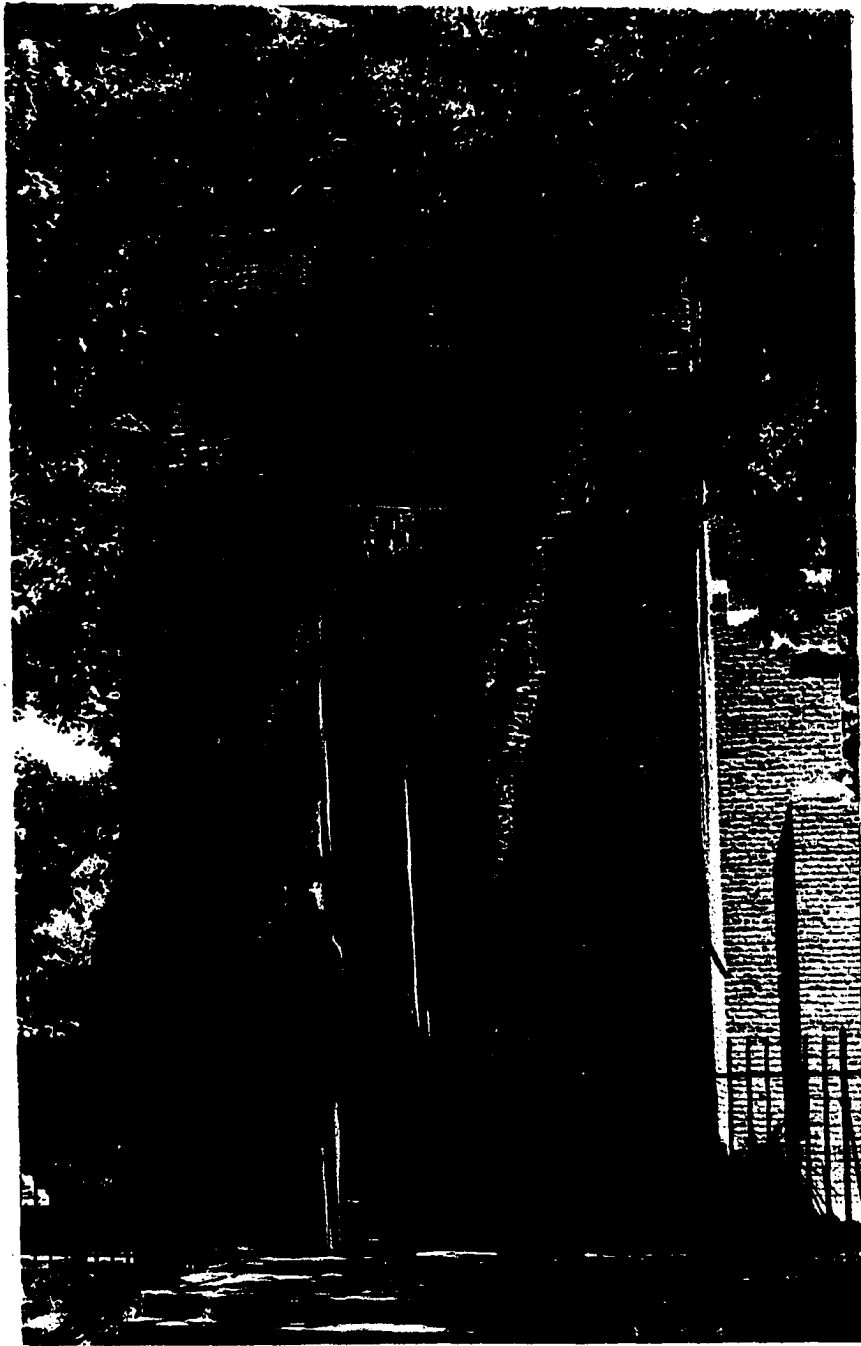


Fig. 24. -- The church tower at Jamestown, with a portion of the reconstructed church in the background.

structure situated on a low ridge at least 700 feet west of the church. In the limited testing conducted at this structure, seventy-two graves were located, and it is estimated that the remaining area of the structure may contain as many as 280 more (Shiner 1957:82). In addition cemeteries are common in many of the isolated settlements throughout the area of colonization (Jester 1957:82, see Fig. 25). Although most of these burials examined did not yield evidence indicating high status persons, several such interments are also present. They occur both in the churchyard at Jamestown (Tyler 1906:129-134) and in isolated cemeteries and are characterized chiefly by large and often elaborate tombstones, most of which are assumed to have been imported from England (Jester 1957:80). Within the interior of Jamestown church, two interments beneath flat tombstones denote the burials of both civil and religious persons of high status. One tomb is inscribed with the name of the local minister, while the other is that of an unknown person who possessed noble or knightly status as indicated by recesses designed to hold inlaid brasses representing a draped figure, an inscription, and a shield (Forman 1938:160). Apart from the churchyard cemetery at Jamestown and those of other churches throughout the area of colonization, no other religious high status burials are found. The remaining cemeteries were

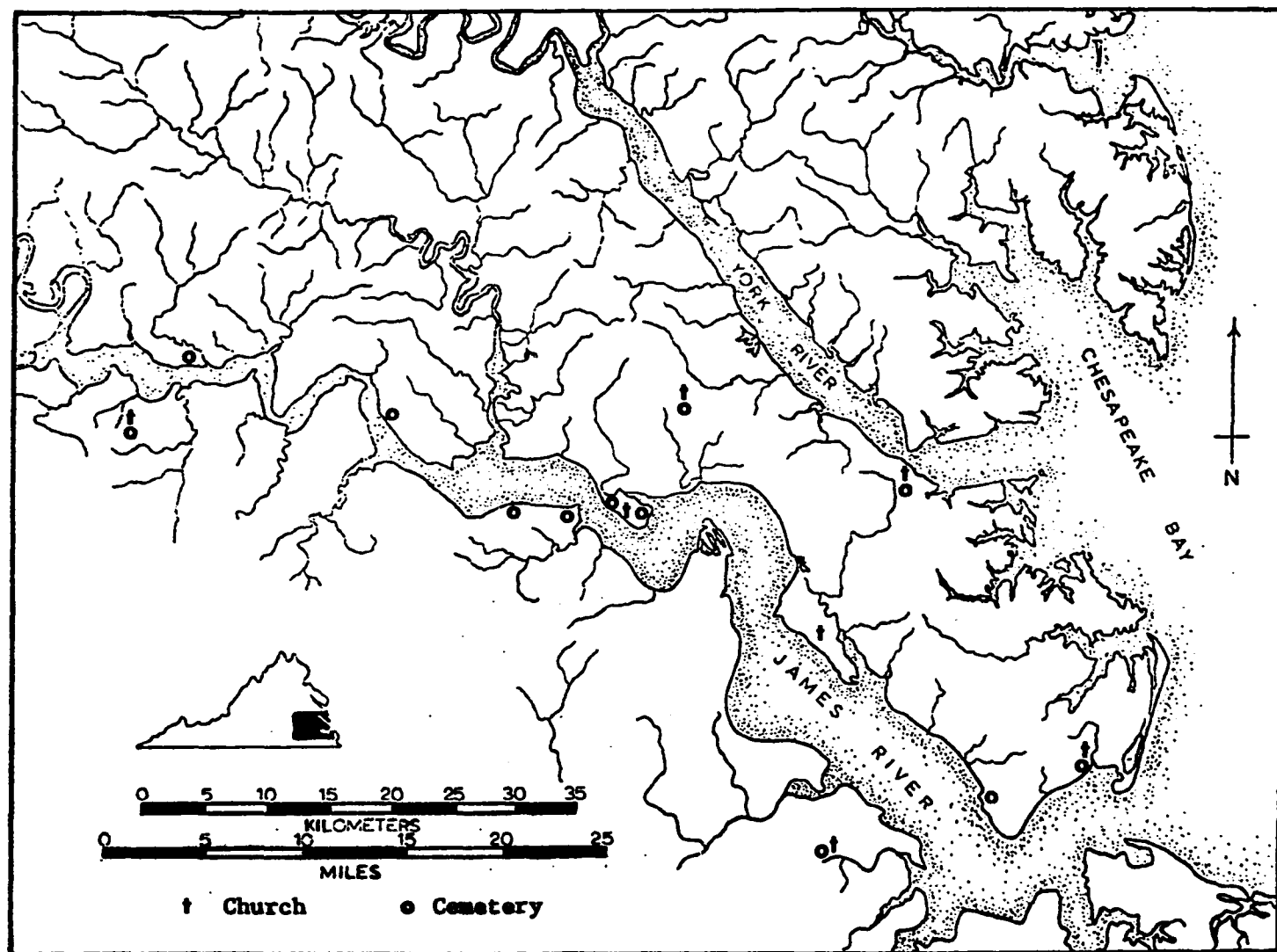


Fig. 25. -- Locations of churches and cemeteries in coastal Virginia.

associated with the scattered homesteads throughout this area (Jester 1957:78).

The second test implication is that the almost universal class of English landholders possessing nearly all of the land and having large number of tenants will not be present. This is not to say that great land holdings may not have developed but rather that the position the landholders occupied in the social, political, and economic structure of England would be altered by the dispersal of settlement on the frontier. With the loss of power to a centralized authority in the colony, they would tend to be supplanted by a class of moderate sized owners employing agricultural laborers. This would be expressed archaeologically by the isolated nature of the individual settlements as previously noted (see Figs. 14 and 17) as well as by the general absence of structures on the order of the large English manor houses of the period.

Of the twenty sites outside of Jamestown which may be identified as habitations occupied prior to 1690 (Fig. 14), only Bacon's Castle, Denbigh plantation, the Thomas Pettus plantation, and Green Spring plantation appear to be substantial homes of prosperous farmers, but none rivaled the size and elegance of the last (Caywood 1955: 8-11), the only one comparable to a manor house in Virginia. As all of these structures date from the 1640's or later,

it may be assumed that they represent second homes of early settlers or first homes of more recent colonists with the resources at hand to establish large landholdings. Both Thompson (1970:97-98) and Stewart (1967:142) have noted the difference in status based upon landholding and consequent wealth in present-day South American colonies. Certainly, such status or even class difference occurred in colonial Virginia but do not seem to have been as clear-cut as in England.

Closely related to this is the third test implication that the lowest levels of seventeenth century English society, principally the urban poor and rural peasants, will be absent on the frontier. In regard to the latter, the obligatory economic relationships between peasant and landlord became unnecessary, and the closed agricultural resources characteristic of the peasant community are non-existent due to the very nature of frontier expansion (Redfield 1956:31-32). Likewise, the complex urban situation did not occur in the area of colonization, for the frontier inherently provides an escape valve for landless people. Archaeologically these characteristics are reflected by the scatter settlement pattern with an allotment of large segments of land to each household. Houses throughout the colony were substantial, though often modest, (See Forman 1938:83) and represented physical standards

above those of the lowest rural inhabitants of England. They did not vary greatly in size and seem to represent a comparable social level for the occupants. Although the earliest structures appear to have been wood-framed buildings with board or wattle and daub covered walls, by the 1640's they were being replaced, at least at Jamestown, by brick structures (Cotter 1958:164).

An analysis of the artifacts recovered from these structures also indicates a moderate economic level. Ceramic wares include delft, sgraffito, and stonewares in addition to the more common lead-glazed earthenwares, some of which were made in Virginia. Oriental porcelain was also common in small quantities. This is significant in that it was only in the seventeenth century that the Dutch East India Company began to import porcelain into Europe in quantity (Savage 1960:6), and at the time of the Jamestown occupation, it was expensive in relation to other types of ceramics. Other equally valuable items such as precious metals, glassware, and products of artisans also occur in settlements throughout the area of colonization.

The number of specialized statuses on the James River frontier is accompanied by an attenuation of the high status positions and what appears to be a leveling of lower statuses at a level above that of the peasantry of England.

Hypothesis 13. Because the frontier represents an adaptation to land uses dramatically different from those in the metropolitan area, the settlements in Virginia would not be expected to have conformed to any of the settlement types found in England during this period.

The first test implication is simply that the overall settlement pattern of the James River frontier differs from the pattern found in various parts of England. As discussed in Chapter IV, the settlement pattern found in seventeenth century England was primarily the result of the adaptation of extensive plow agriculture to the limited resources of two basic environments. Only in the highland regions where fertile soil was scarce and often scattered was a dispersed pattern of settlement common, accompanied by a dual adaptation of agriculture and herding.

The environment and resources of the Virginia coastal plain resembles closely that of Midland England, but it has been demonstrated that the settlement pattern in the former is markedly different (see Hypothesis 3). The nucleated villages are replaced by scattered farms which spread outward from a single small clustered settlement on the James River. Large rural towns and country centers are absent as are urban areas. The development of unique subsistence patterns on the Virginia frontier, then, seems to have

resulted in the abandonment of the overall settlement pattern characteristic of lowland England.

A different level of analysis is involved in the second test implication of this hypothesis. This states that not only will the overall pattern of settlement be different but that the composition of the clustered settlements found in both cases will also be unlike one another.

Three types of nucleated villages are found in Medieval England (Roberts 1973:47): those built along a single or two streets at right angles (see Fig. 3), those grouped around a central square or green, and those arranged in an apparent haphazard fashion with no obvious nucleus or order. Each of these may be seen as an adaptation to different conditions. The village grouped around a central green was designed for defense and was usually situated in areas likely to come under attack such as the Scottish border. Street villages were built along existing thoroughfares and comprised by far the most common type of settlement. Finally, the haphazard villages arose as the result of squatter settlements on common pasture or waste or as encroachments into forest clearings during Anglo-Saxon times. Unlike the first two settlement types, they do not seem to have been planned as permanent, organized communities but rather were the result of the aggregation of

loosely-knit groups (Banks 1963:31). Two structures commonly associated with most villages were the manor house and parish church, symbols of secular and ecclesiastic authority.

Trading was conducted in market towns where manufactured goods were produced for local distribution at markets. The transportation of the period allowed each market to serve a range of about ten kilometers. Markets were not places of permanent trading but rather were open areas used during designated days only. Their periodic nature allowed many to have overlapping ranges without creating competitive spheres of influence (Fox 1973:75-76).

A comparison of the settlement pattern in Jamestown with these settlement types indicates several significant similarities and differences. First, the pattern of Jamestown is indicated by the placement of structures (Fig. 26) which does not conform to the linear village or those grouped around a central square. The roads have been reconstructed utilizing archaeological evidence consisting of both the actual cross-sections of seventeenth century roads (Hatch 1949) and the remains of early property ditches. Unlike the haphazard arrangement of the third type of village, Jamestown seems to have taken the form of an elongated, expanding gridiron extending eastward behind the brick church. The gridiron pattern is significant in that

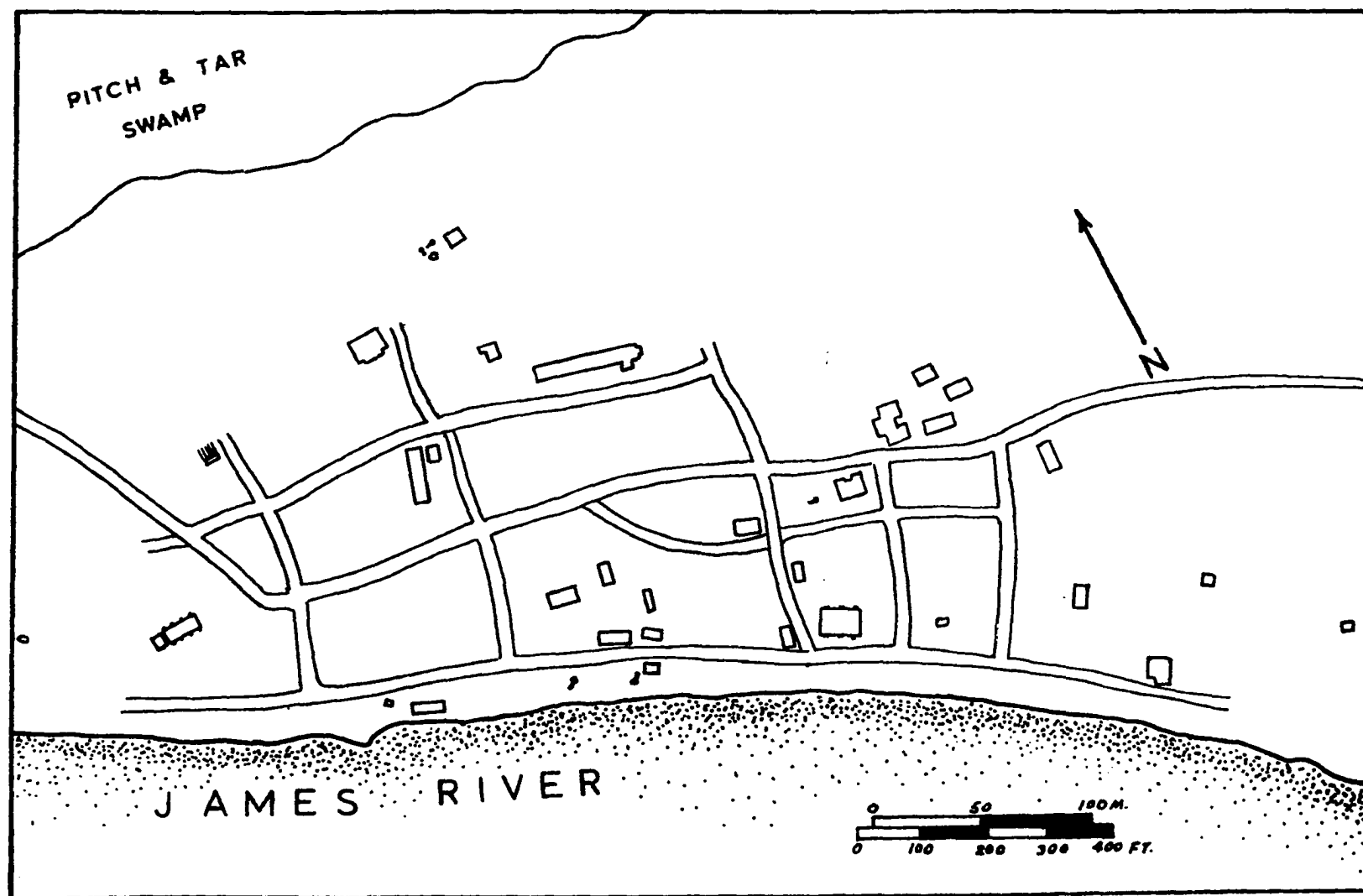


Fig. 26. -- Conjectural reconstruction of Jamestown, 1650 - 1690.

it marks a departure from the settlement pattern types associated with English villages, suggesting instead a town and presumably the site of a market. It is a pattern characteristic of planned English settlements erected in the province of Ulster in northern Ireland during the early seventeenth century (Reps 1969:20). The Irish colonies were attempts to establish towns in a potentially hostile country, and their planning represented an orderly organization to facilitate transportation and defense (Reps 1972:6). It is logical to presume that a concept of town planning which had achieved success in the Old World would have been copied in the New World as well.

The church at Jamestown faces away from the town and toward the disturbed ground occupied by the 1861 fort and the eroded shoreline. Normally this structure would be situated in the center of a settlement or at one end facing inward (Hoskins 1957:81). Its position and the presence of a seventeenth century zone of occupation discovered below the bulk of the fort (Cotter 1958:15) indicate that the gridiron probably extended to the west of the church and either now lies beneath it or has disappeared into the river. Tests conducted in the James River just offshore indicate a seventeenth century occupation existed on at least a portion of the eroded land (Cotter 1958:17).

The pattern of settlement along the James River was unlike that found in areas of England possessing similar resources. Although only partially preserved, Jamestown itself more closely resembles a town rather than a village, and in particular it exhibits many features in common with the planned towns erected by the English as fortified settlements in northern Ireland.

Hypothesis 14. It is postulated here that Jamestown represented the focus of sociopolitical activity within the area of colonization on the Virginia peninsula. The following test implications have been generated to test this hypothesis.

The first states that Jamestown should exhibit evidence of the presence of all the highest status positions in the area of colonization or at least a concentration of statuses as high as those found elsewhere in the colony. As previously mentioned, the size and nature of individual residence structures was perhaps the most obvious symbol of wealth and its accompanying high status in seventeenth century England. A number of such structures have been investigated archaeologically or still stand in coastal Virginia. Four of these (Bacon's Castle, Denbigh plantation, the Thomas Pettus plantation, and Green Spring) lie outside the nucleated settlement on Jamestown Island (Fig. 14), while at least two residential structures within

the town itself (Structures 38 and 112) and possibly three others (Structures 6, 115, and 125) represent dwellings of high status individuals (Fig. 27). Tutter's Neck, just east of Jamestown, appears to be a high status residence dating from about 1700, the end of the period considered (Noël Hume 1966b:56).

An examination of the artifacts associated with those structures excavated denotes a presence of items of high value during the seventeenth century. These include decorated or elaborate building hardware, glass stemware, porcelain, brass, latten, silver utensils, brass-bound books, silver buttons, brass pins, and other items coated or inlaid with precious metals or other substances such as mother-of-pearl (See Cotter 1958, Noël Hume 1965 and 1966b, and Caywood 1955).

The house at Green Spring appears to overshadow all others in size and in composition. To quote archaeologist Caywood (1955:25), its owner must have "brought with him the idea of the type of manor house of the times -- replete with medieval towers." Its rebuilding as an even larger structure in the late seventeenth century makes its prominence even more marked on the Virginia frontier. Green Spring then is a likely candidate for the location of the highest status in the area of colonization during the last half of the seventeenth century. Its location, less than three

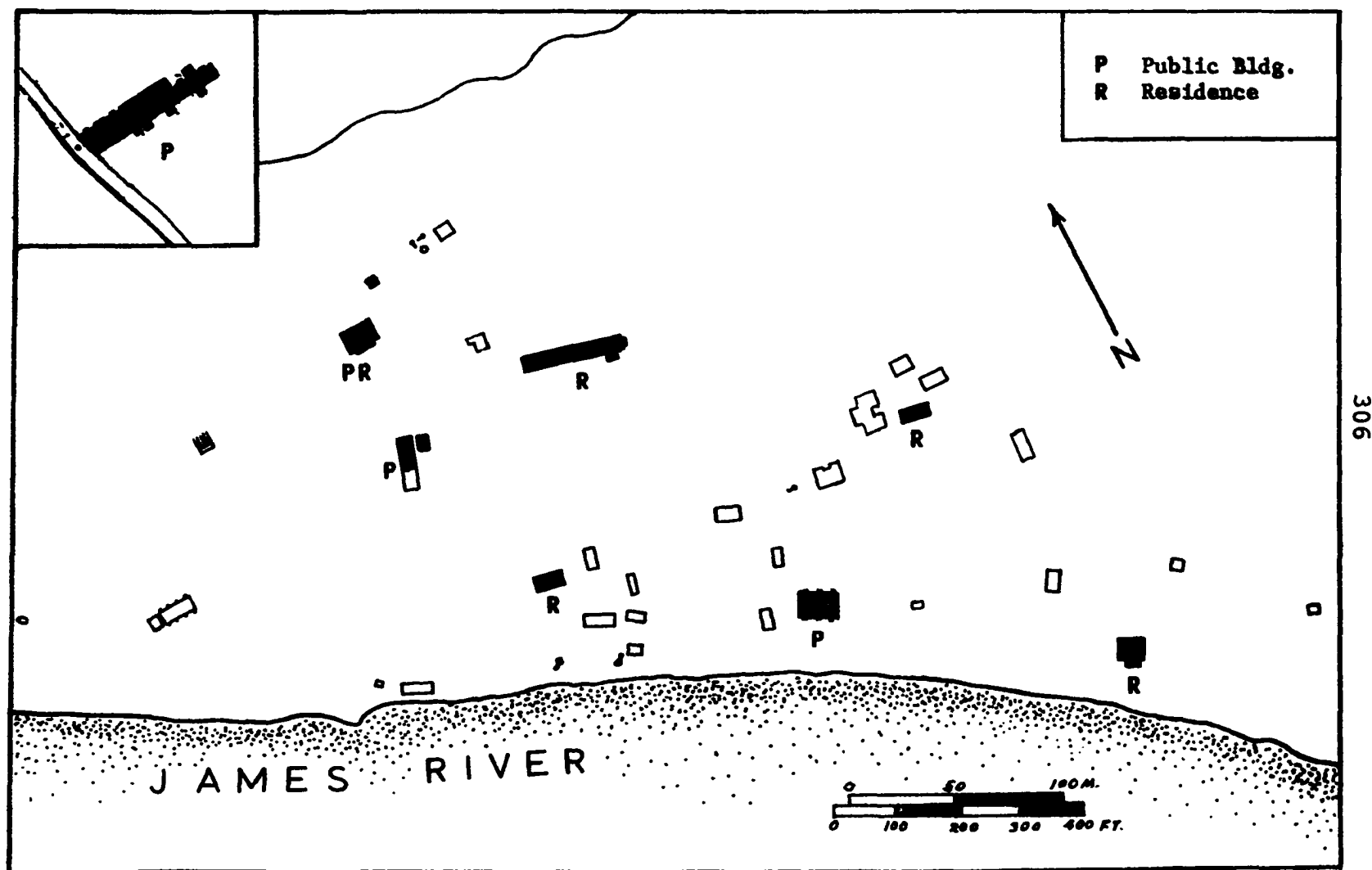


Fig. 27. -- Location of high status residences and public buildings at Jamestown, 1620 - 1690.

miles from Jamestown, together with the presence of a number of other high status dwellings there or close by, strongly implies a concentration of socially and politically prominent persons in this vicinity.

The second implication is that a religious center should be located in the frontier town, but as there was apparently no ecclesiastical hierarchy in the colony (see Hypothesis 12), it should share only an equal importance with other religious centers in the area of colonization. In Jamestown one religious structure is present, a brick church located near the western end of the existing town. The foundations and tower of this church are constructed of bricks dating from the second quarter of the seventeenth century. They are noticeably smaller than those used in other buildings at Jamestown (Cotter 1958:21). Inside the brick walls lie the cobblestone and brick foundations of an even earlier church which presumably had a timber superstructure (Yonge 1904:47). Clearly marked sacred vessels constituting part of a 1661 communion service from the James City (Jamestown) parish church which are preserved at the more recent church in Williamsburg (Tyler 1906:126) further indicate the presence of the church at Jamestown in the latter part of the seventeenth century.

Other seventeenth century churches have been identified in the James River area (Fig. 25), testifying to a

religious continuity throughout the area of colonization. Two are substantial brick structures comparable to the Jamestown church. Saint Luke's church is remarkably similar to the foundations of the latest Jamestown church and was used as a model for the reconstructed building in 1907 (Forman 1938:159). The scattered locations of the churches suggest that though Jamestown was a focus of religious activity, it was only one of several in Virginia and seems to have served its immediate area rather than the entire area of colonization.

Third, and perhaps of greatest importance, is the requirement that centers of governmental and/or bureaucratic activity be situated in Jamestown. Unlike the religious system, the sociopolitical organization should have had its center at Jamestown. Archaeologically, this phenomena should be evident in the presence of public buildings (those not associated strictly with subsistence, domestic, or industrial activities) at Jamestown and their absence elsewhere in the colony. It is unlikely that any particular assemblage of artifacts would be associated with such structures but rather that those associated with other types would be absent. Also the size of the structures is significant here, for presumably the meeting place and offices of the colonial officials would require a building larger than most of those in the colony. This

factor could become especially important if the assemblies common on the national and local level in England since the thirteenth century (Bagley and Rowley 1966:166) were perpetuated in Virginia. One of the primary functions of these assemblies or parliaments was to maintain local solidarity, the lack of which is a persistent problem in most frontier situations (Thompson 1973:17).

An examination of the archaeological data shows no structures outside Jamestown that did not have a distinct domestic or technological function. Within the town itself, one structure, apart from the church, especially lends itself to interpretation as a public building. It is the Ludwell-Statehouse structure located northwest of the present town (Fig. 13). Unfortunately, few of the associated artifacts were recorded, making interpretation difficult, but none indicates the building's use as a house or shop (Yonge 1904:68). One architectural feature suggesting its use as a public building, however, is the absence of fireplaces (Yonge 1904:67), a fire safety feature built into late eighteenth century public buildings (Cotter 1958:25).

Other public buildings amenable to governmental meetings were inns or taverns which were often associated with such a role in England (Holmes 1969:78). If we may include such structures at Jamestown, three other buildings may be added to the list of likely sites of governmental

activity (Fig. 27). Structures 17, the rowhouse near the river, and 19, at the west end of town, were both domestic structures large enough to have been used as inns or taverns (Cotter 1958:46, 58 and Forman 1935a). Both contain substantial deposits of wine and liquor bottles and white clay pipe fragments, usually characteristic of such buildings. The latter even contained a vaulted brick wine cellar (Cotter 1958:55). Structure 112, at the north end of Jamestown, is also large enough to have served such a purpose, especially if it was associated with the nearby brewery, but there is no other evidence to support such a contention (Cotter 1958:117).

Throughout the area of colonization on the Virginia peninsula, only Jamestown possesses evidence of the centralization of governmental activity. The greatest concentration of high status positions was here, and the palatial residence of Green Spring was less than three miles distant. Jamestown also possessed the only recognizable public buildings which might serve as administrative centers for the colony. The role of Jamestown as a focus of secular activity contrasts with its apparent role as one of several equal religious centers in the colony.

Hypothesis 15. Although the focus of sociocultural activity is located in the frontier town, the unity of all the components of the frontier network must also be visible

in each one. The cultural similarity of the settlements has been touched upon previously, and this section will deal specifically with this phenomenon. Due to the dominant position of the metropolitan area in colonial affairs, it is first necessary to demonstrate the Virginia colony's common unity with England. The sociopolitical unity of the colony as a distinct unit, however, is much more difficult to establish because of its dependent relationships to the mother country. The internal unit of the colony is also closely associated with trade and communications, as these links are paramount to the colony's survival. Hypothesis 18 deals directly with this relationship and seems to encompass many of the arguments that it would be appropriate to advance here in terms of the archaeological record. In order to avoid duplication only, a statement on the general unity of the Virginia settlements will be attempted here. The unity of the settlements as a colonial entity will be examined in the discussion of the trade and communications subsystem in Hypothesis 18.

The first test implication is that the adaptation to Virginia environment was shared by all settlements throughout the area of colonization. This entails primarily the utilization of a common subsistence pattern by all settlements. It has been shown that in all the settlements examined, agriculture, with a strong emphasis on the hoe

as the principal implement (implying the cultivation of maize, tobacco, and other New World crops), was the basic subsistence activity accompanied by the utilization of various wild and domestic animal resources and possible wild plant foods as well. All components of the frontier depended heavily upon Europe for manufactured items, with only a few basic commodities (such as brick, tile lime, and some ceramics and glass) actually being manufactured in Virginia. Throughout the area of colonization, most colonists appear to have adapted similarly to the environment of the Coastal Plain.

Inherent in the cultural similarity of peoples is the common patterning manifest in the attributes of their material objects. The second test implication states that significant patterns will be discernible in the artifacts employed in all components of the frontier system. This patterning should be reflected in a preponderance of English traits as opposed to those associated with other European nations. In this study a number of traits associated with the material culture of the settlements on the Virginia frontier will be examined. For reasons of brevity, those traits which may not be classified according to nationality will not be treated extensively here. The traits examined are most likely to be diagnostic of their place of origin in that they involve artifacts exhibiting

a wide range of variation, which does not necessarily alter their function. Most of these traits are widespread in sites throughout the area of colonization.

The first is ceramics, items of widespread use and fragile enough to have had a short life span and thus found in nearly every site excavated. During the second half of the seventeenth century, a variety of stonewares and porcelains were utilized by Europeans and carried to their colonies in the New World. Deetz (1973:26-27) has recently shown that at about this time a marked change occurred in the function of ceramics in England. During the early part of the seventeenth century, ceramics played a relatively small role in general food consumption and were primarily associated with dairying which still constituted an important part of the yeoman's diet. After 1660, however, new ceramic components were added to that of dairying and brought into use a wide variety of forms and types of vessels, including many imported from other parts of Europe. This change is mirrored in the English colony at Plymouth, Massachusetts, and presumably took place in Virginia as well. The rapid dispersal of ceramics and other utilitarian items in American colonial sites has been noted (Noël Hume 1970:26), and the presence of an extremely short spatial time-lag between the appearance of particular types of these artifacts in the metropolitan area and in

the colony seems to be characteristic of intrusive colonization situations in general (Allen 1973:56). For the most part ceramics may be clearly distinguished from one another and their origins can be identified. At Jamestown and other James River area sites, one would, of course, expect a preponderance of English ceramics, especially utility wares; however, due to the export of ceramic wares by most European nations (Mankowitz and Haggard 1957:138), products of other nations should also be expected in this English colony. The Dutch dominated world trade in the seventeenth century (Masselman 1963:454), and it is likely their delftware, German stonewares, and Oriental porcelain would turn up in the American colonies of most other nations.

This assumption is confirmed by an examination of the archaeological data. The utility wares are, for the most part, of English origin, consisting mostly of lead-glazed earthenwares and lesser quantities of slip-decorated earthenwares, coarse-tempered Devon earthenwares, and sgraffito wares, in which the slip is incised in designs to expose the contrasting color of the underlying body. German salt-glazed stoneware and a large amount of Dutch delft are as widespread in Virginia sites as they were in England at this time. These ceramics are similar to those in the assemblage recovered from post-1660 sites at Plymouth,

Massachusetts (Deetz 1973:27). Spanish majolica and Italian sgraffito were also present but in smaller numbers (Bailey 1937:102). The locally-manufactured Virginia earthenware discussed earlier appears in great quantities at most sites, but Colono-Indian ware occurs only sporadically and in later sites. The occurrence of various ceramic types at the sites investigated and their frequencies at Jamestown are shown in Tables 2 and 3. The relatively high percentages of English and local ceramics and their regular appearance at sites throughout the area of colonization reveal a uniformity in use patterns reflecting the cultural unity of this area.

An examination of brick structural remains at Jamestown reveals that, of twenty structures reported, all but one exhibited English bonding (Cotter 1958). No matter what the style or size of the building, a common feature in its construction is the technique used in bonding the walls. The style of bonding may vary considerably, but throughout most of the seventeenth century, English bond, consisting of alternate courses of headers (exposing the end of the brick) and stretchers (exposing the side), was most commonly used in English sites; although, haphazard bonds occasionally occurred also (Noël Hume 1969c:122-123). The use of English bonding to the exclusion of other styles within the area of colonization would be expected to

indicate a common ethnic affiliation for the builders on the frontier. The church and the Ludwell-Statehouse structure were also bonded in this style (Yonge 1904:68). Figure 24 clearly illustrates the English bonding in the surviving church tower at Jamestown. The employment of English bonding in seventeenth century structures elsewhere on the James River is also extensive, occurring in all but one of the brick buildings on which such information is available, the 1635 Thoroughgood house in Princess Anne County (Farrar 1957:189 and Painter 1965:130). All of those brick structures in the immediate vicinity of Jamestown, including Green Spring (Caywood 1955), Clay Bank (Noël Hume 1966a:8), Tutter's Neck (Noël Hume 1966b:45), and Denbigh (Noël Hume 1965), exhibit English bonding.

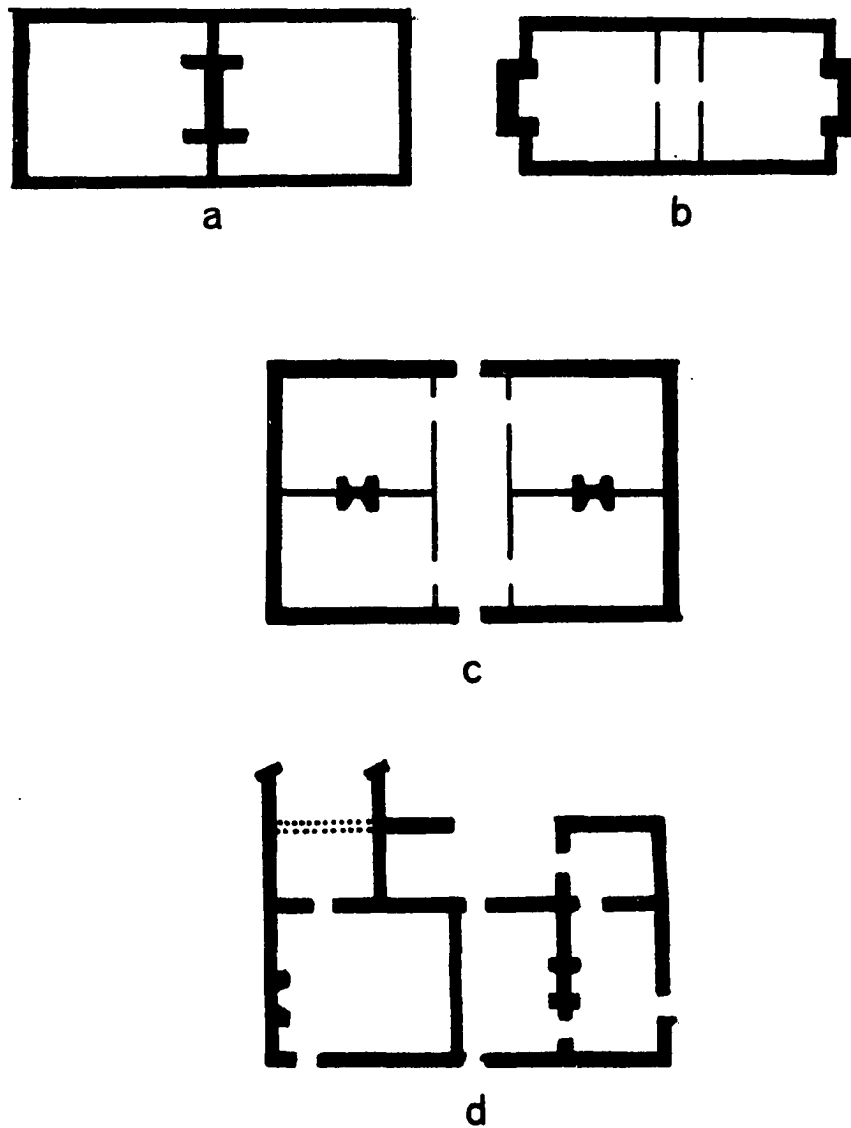
This nearly exclusive use of English bonding is unique in a sense, for during the seventeenth century, another style, Flemish bonding, was introduced in England and achieved rapid popularity there (Forman 1938:86). Apparently, this did not happen in Virginia. Flemish bond is present only in the Thoroughgood house and a late structure at Jamestown. Its alternating pattern of headers and stretchers came into almost universal usage in the eighteenth century and occurs in most of the brick structures in Williamsburg (Whiffen 1958). Figure 12 illustrates

the use of Flemish bonding in the Jaquelin-Ambler house constructed on the site of Jamestown after its abandonment.

A third example of artifact patterning within the area of colonization is a general likeness noted between house plans in all of the settlements and their counterparts in England. An examination of the Jamestown houses indicates the presence of three basic house plans, all common to seventeenth century English structures (Noël Hume 1969c:128-129). These are illustrated in Figure 28. All are variations of the "post-medieval" house which was essentially a two-part building with a central chimney or, less frequently, a two-bay house with a chimney at one or both ends (Hewett 1973:60). Similar house plans are found in seventeenth century structures in New England where many of the intact structures are directly traceable to prototypes in East Anglia (Hewett 1970:121). The two row houses at Jamestown consist of almost identical rectangular apartments joined along the short walls in one example and along the long walls in the other (Cotter 1958:127). Forman (1938:107) has noted the striking resemblance between the plan of one of the rowhouses and that of a seventeenth century London city house illustrated in Moxon's Mechanic Exercises, a contemporary architectural guidebook.

No structures in the Jamestown area may be identified as examples of the colonial architecture of other European states. Albert Manucy's (1962a) extensive study of Spanish architecture at St. Augustine, Florida, indicates, for example, that in contrast to the English plans, Spanish houses were characterized by the presence of a loggia (an open-sided room) or in some cases a sheltered porch, both of which opened into several rooms (Fig. 28). Cooking facilities were often in detached structures (Manucy 1962a: 122). Although the design of houses in Spanish St. Augustine may be seen as an adaptation to a somewhat warmer climate, it is significant to note that houses constructed there during the British occupation of the city followed English rather than Spanish building precedent (Manucy 1962a: 60). The exclusive use of a limited number of English structural plans in the James River area and the absence of those typical of other non-English colonies further attest to the cultural continuity within the area of colonization.

The apparent conservatism in building styles illustrates an interesting point with regard to frontier adaptation. Although a culture may be seen as the result of the adaptation of a population to its total environment, it also represents the previous adaptation of that population in its former situation. For this reason a certain degree



Not to Scale

Fig. 28. -- Comparison of seventeenth century colonial house plans in North America: a. - c. English, d. Spanish.

of cultural conservatism will always be present and will vary with those aspects of the culture in which the greatest specialization occurs (Herskovits 1947:488). The more complex and specialized the sociocultural system as the whole, the more it will be resistant to change. This is witnessed here by the prevalence of the same English house forms in New England, Virginia, and Florida.

A number of other items from Virginia may be identified as English traits and may be assigned to an English occupation. Readily identifiable non-English counterparts are known, the presence of which would indicate a non-English settlement. None, however, occur in coastal Virginia. They include marked specimens of hardware and a gravel-tempered ceramic oven of a type produced in southwestern England (Bailey 1937). In addition the prominence of metal domestic artifacts, especially cooking containers, is characteristic of English culture as opposed to the ceramic tradition which continued to fill the same role in southern European countries (Smith 1956:105). Other metal items found here reflect designs used in England during the seventeenth century, namely agricultural implements, equestrian items, firearms and edged weapons, armor, and building and domestic hardware, but these artifacts are indistinguishable from those also made and used in other European countries during this period.

The only non-English items other than ceramics are Spanish coins and Spanish or Italian beads which occurred in small quantities at several sites in the area of colonization. Unlike most of the diagnostic English items which represent a wide range of activities, these two types of artifacts are both usually associated with trade or exchange. The beads were almost certainly trade items, as this type of artifact was manufactured in the glasshouses of southern Europe and distributed throughout the continent. For this reason their presence does not necessarily indicate a non-English occupation (Smith 1956:110). Likewise, Spanish coins were struck in large numbers from the sixteenth century onward as a result of the enormous influx of precious metals from Mexico and Peru and achieved wide circulation throughout Europe and other parts of the world as a medium of exchange (Masselman 1963:72). The association of these identifiable non-English traits with exchange activities not particularly tied to settlement aspects of colonization and the absence of such foreign traits in other activities on the Virginia frontier implies only a peripheral association of the colony with non-English peoples.

In summary the seventeenth century settlements of this area show not only a common adaptation to the Virginia environment but also a cultural continuity reflected in the patterning of various artifact forms. In both cases a

strong affinity is shown to cultural patterns in England, indicating not only the origin of the colony but also the European state to which it retained its closest ties during its early history.

Hypothesis 16. Finally, as the earliest frontier town is replaced by another more strategically placed in relation to the moving frontier, the center of socio-political activity should have shifted from the former to the latter.

The first test implication for this hypothesis is the disappearance of the characteristics outlined in Hypothesis 14 from Jamestown at the end of the seventeenth century or slightly thereafter. This date has been established as the approximate time of the abandonment of Jamestown as a compact settlement and the rise of Williamsburg, a settlement close to the edge of the expanding frontier, in its place.

A comparison of the distribution of high status residences and public buildings at Jamestown with the post-1700 settlement of the site (Figs. 20 and 27) indicates that, of the eight occupied during the last half of the seventeenth century, only one remained in use after 1700. There is clear evidence that many of these, including the large Ludwell-Statehouse building, one of the row houses,

and the large structure in the northwest part of the town, were destroyed by fire (Cotter 1958). Yonge (1904:68) has noted the presence of an exploded shell in one of the basements of the Ludwell-Statehouse structure, suggesting its destruction was associated with military activity, possibly war or rebellion. Certainly, a public building affiliated with the social and political administration of the colony would have been a focal point of factionalism within or invasion from outside the area of colonization. In contrast the religious center at Jamestown remained well into the eighteenth century. Another piece of communion service from this church dates from 1733, and a list of tombstones in the Jamestown churchyard, compiled in 1857 when many now destroyed were still intact, indicates that burials took place there regularly until the time of the American Revolution (Tyler 1906:129-134).

By the first quarter of the eighteenth century, archaeological evidence indicates that a center of socio-political activity no longer was located at Jamestown. As noted previously, the chief activity in this area seems to have been subsistence farming with the exception of the local church. By mid-century the cluster of structures surrounding the Jaquelin-Ambler house were all that remained, attesting to the utilization of the site solely as part of a larger river plantation.

As a second test implication for this hypothesis, it is predicted that the characteristics which disappeared from Jamestown at the end of the seventeenth century will appear in the new frontier town of Williamsburg. A cursory study of the archaeological evidence from Williamsburg shows a pattern similar to that at Jamestown. Numerous high status residences are apparent, perhaps the most outstanding example of which is the "Governor's Palace" building (Wertenbaker 1954:450). The excavated foundations of this structure indicate a large domestic building measuring nearly 100 by 200 feet with eight ground floor rooms and five fireplaces. Evidence of marble mantle pieces and floor tiles, walnut paneling, and stone-paved cellars attest to the material wealth invested in this structure (Noël Hume 1963:110). Whiffen (1958:61) compares it to the "double pile" class of house which appeared in England in the late seventeenth century, replacing the older Elizabethan-Jacobean architectural style represented in Virginia by the Green Spring house.

Archaeological investigations have also uncovered a number of other types of public buildings including the "Capitol," an "H"-shaped structure containing two large halls as well as smaller offices; a prison; a magazine for storing munitions; early structures associated with the

College of William and Mary (Whiffen 1958); and the "Public Hospital" (Noël Hume 1973:91).

Evidence of two churches occurs at Williamsburg. The earlier of these is similar in size and architecture to that at Jamestown and to St. Luke's but lacks the distinctive tower (Noël Hume 1963:194). It was demolished prior to the erection of a later church nearby. The larger size and cruciform plan of the eighteenth century church represents a development in British architecture which took place subsequent to the Jacobean style exhibited by the other Virginia churches (Whiffen 1958:83).

The replacement of Jamestown by Williamsburg as the focal point of the sociopolitical subsystem seems to reflect the temporal change in the colonization gradient as do previously discussed variations in the subsistence and economic subsystems. Unlike Jamestown, however, Williamsburg seems to have been a somewhat more elaborate example of English colonial town construction. Although rising from a small dispersed settlement (Reps 1972:143), it was laid out on a precise grid plan much more regular than that of its predecessor (Fig. 29). The larger, more embellished style and careful placement of its public buildings further suggests a more deliberate planning of the settlement as well as concentration of much of the colony's wealth at this site.

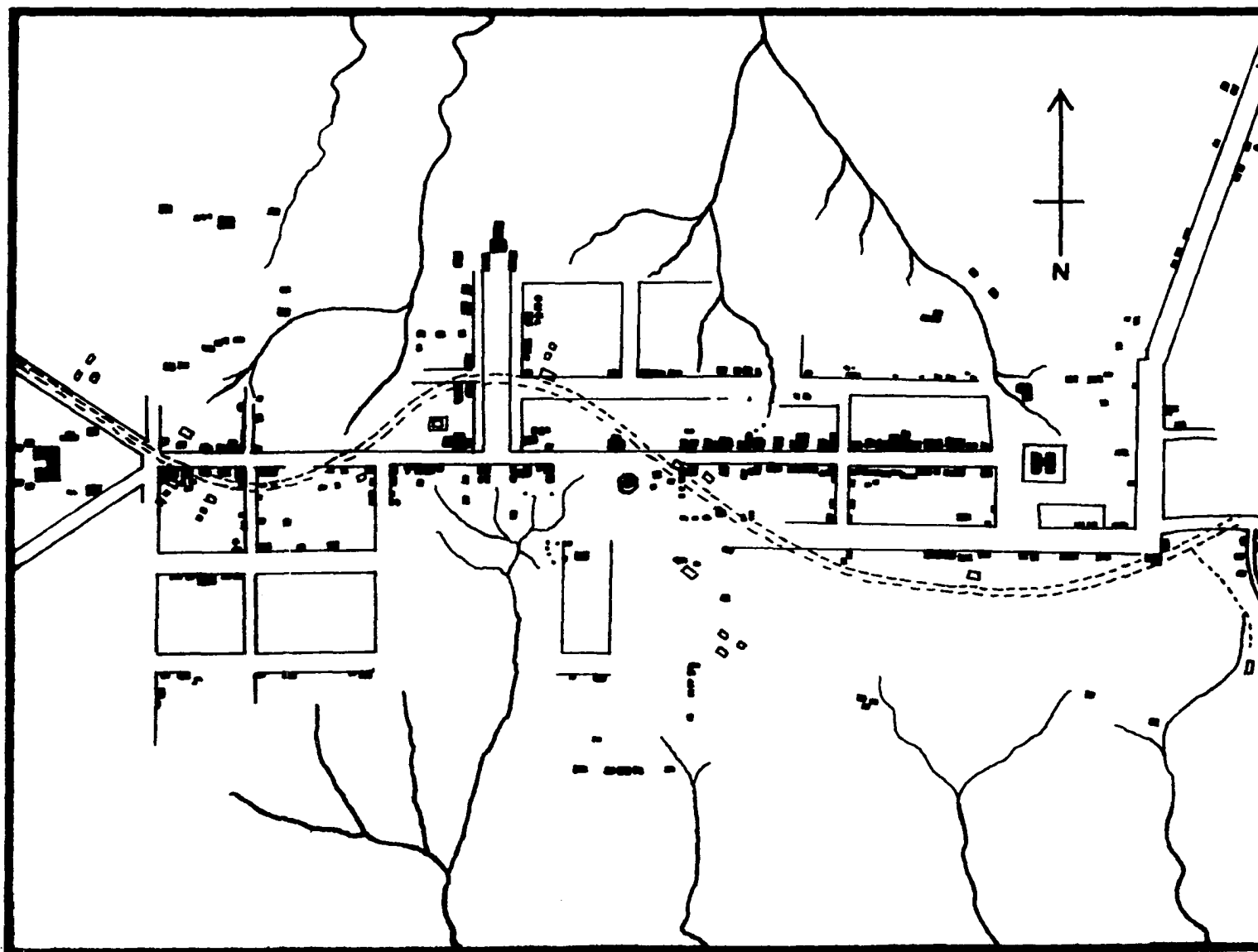


Fig. 29. -- Comparison of settlement patterns at Williamsburg, 1690 - 1750. Outline structures are associated with Middle Plantation while solid structures are post- 1700 Williamsburg buildings.

The Trade and Communications Subsystem

Hypothesis 17. The first hypothesis deals with the nature of the exchange between the intrusive and indigenous cultures within the area of colonization. Because the domination of the former is critical to the success of the colonization attempt, the exchange of finished goods should have been one-sided in favor of the English. Trade will probably have been minimal within the area of colonization, as the presence of the intrusive culture, if prolonged, would result in the occupation of the ecological niche possessed by the native horticulturalists. As a result, the latter would have had to abandon the area, rebel and be exterminated or driven out, or adapt their culture to accommodate the Europeans. Such an adaptation would likely have resulted in drastic acculturation to the point of becoming ethnically unrecognizable. In any case, the presence of aboriginal sites within the area of colonization is not very likely after the period of initial contact. The bulk of trade would probably be associated with a trading frontier, a phenomenon quite different from and peripheral to the settlement frontier under consideration here.

Archaeologically, this would be first reflected in the virtual absence of aboriginal items in colonial sites as is the case at Jamestown and most other sites

investigated. Second, such specialized trade items that existed would form a very small proportion of the archaeological material on English sites and would probably be associated with the early part of their occupations. Finally, the European materials occurring on Indian sites would be found in greatest quantities on those sites outside the initial area of colonization.

In Hypothesis 7 the extent of the archaeological evidence concerning the Indian trade was briefly examined. It indicates the presence of European artifacts of seventeenth century vintage, mostly cooking utensils, tools, and clothing items, on Indian sites situated along tributaries of the major coastal rivers both above and below the Fall Line. European material is common in early contact period Indian burials throughout the Tidewater area of Virginia (Schmitt 1952:68). The sites are particularly common in territory occupied by the Pamunkey Indians on the river by the same name (Speck 1928:402) and along the Meherrin and Nottoway Rivers in southeastern Virginia (Binford 1964:340). It is interesting to note that sites in both these areas exhibit specimens of Colono-Indian ceramics similar to those recovered from English colonial sites (Noël Hume 1962a:4).

No protohistoric sites have been reported in the immediate area of Jamestown. Late prehistoric sites are

present, including at least one on Jamestown Island itself, but none show evidence of European contact (Cotter 1958:14). Because this area was presumably occupied at the time of the initial European contact, the absence of trade indicates that the Indians did not remain in the area subsequent to the English intrusion. Certainly there was no influx of European goods comparable to that into more distant sites.

Items similar to those of European origin found on aboriginal sites appear in small numbers at Jamestown (Hudson 1957:28), suggesting that at least some trade may have passed through this settlement; however, the large quantities generally characteristic of colonial trading posts are noticeably absent here. Since it is likely that much of the trade was conducted to obtain perishable native products such as furs or hides (see Phillips 1961/I:14), it is not surprising that little evidence of trade is present in the archaeological record.

In summary the absence of evidence for trade with the aboriginal inhabitants on any more than a minor scale within the area of colonization indicates that exchange with the Indians did not play a significant role in the trading subsystem of the Jamestown colony. Instead, it must be assumed that the trade which took place involved distant tribes and was probably conducted by traders operating only peripherally to the area of colonization and

within the context of a separate, and presumably much more extensive, trading frontier.

Hypothesis 18. The role of the frontier town in the trade and communications subsystem of the colony should be that of a distribution center for imported goods entering the area of colonization as well as those manufactured within it and a collection point for those exported out of it. As the sociopolitical unit of a colony is based largely upon the maintenance of these commercial linkages, this unity should be reflected in the redistribution of commodities within its limits. The frontier town should serve as the primary link between the colony and the metropolitan area. It is important to note, however, that it may not necessarily constitute the sole focus of trade and redistribution within the colony nor the only connecting link with the homeland.

The first test implication deals with the physiographic prerequisites of Jamestown as the center of a trade and the communications network in coastal Virginia. Two characteristics necessary to such a center are that it should possess natural port facilities capable of handling ocean-going vessels from England and that an unobstructed path should lie between it and the remainder of the area of colonization. It will be recalled that in the discussion of the physiographic setting one of the most prominent

features of the Coastal Plain in Virginia is the presence of deep, tidal rivers with numerous tributaries dissecting the flat terrain. This feature is clearly illustrated in Figure 7. Jamestown was situated on the bank of one of the major rivers in a location where the current prevented the formation of off-shore bars (Fig. 8).

From Jamestown access to land could be accomplished without much difficulty via the isthmus at the west end of the peninsula. Evidence of a seventeenth century road extending from Jamestown to the mainland appears in several locations (Hatch 1949:18). Exploratory excavations were carried out by Harrington in 1941 in order to obtain cross-sections of the road at three points (Fig. 30). Surface depressions south of the Glasshouse site (Fig. 23) strongly suggested a road curving eastward in the direction of what was then Jamestown Island. Archaeological excavations here revealed a four-layer profile (Fig. 30), consisting of undisturbed clay subsoil directly overlain by a densely-compacted layer of dark brownish-grey topsoil with evidence of deep wheel ruts. The ruts had been filled in with layers of greyish sand from the adjacent beach in an attempt to resurface the old road. The entire surface was covered by a deposit of recent humus. Remains of ditches were found alongside of the road, but they are believed to date from a later period of use. The only artifact recovered was an

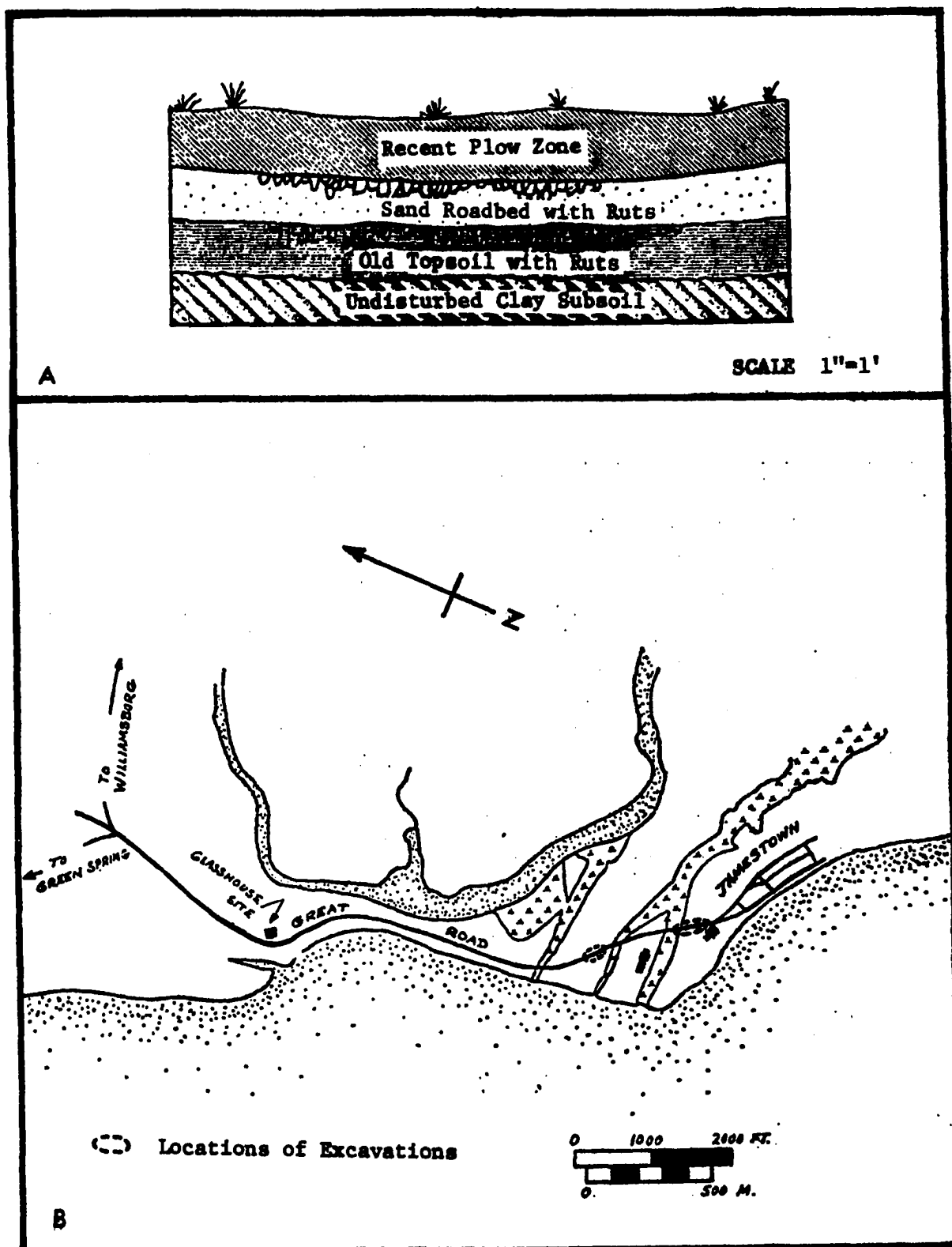


Fig. 30.-- Archaeological investigations along the Great Road. A. Profile through roadbed showing construction layers. B. Map of road with locations of excavations indicated.

iron horseshoe of a type used in the seventeenth century. The significance of the roadbed at the Glasshouse site lies not only in that it substantiated the presence of the colonial highway but also in that it made possible an accurate determination of the location of the eroded isthmus between Jamestown Island and the mainland (Harrington 1948:7).

Evidence of the highway occurred in two places on Jamestown Island (Fig. 30). In both the cross-sections indicated a wearing down of the old topsoil and a refilling with sand in the manner of the road at the Glasshouse site. Instead of beach sand, however, sand from one of the low island ridges was utilized for fill (Harrington 1941:26). In some places the road broadened to a width of thirty-five feet as impassible sections were bypassed. The road was not entirely unimproved, for in many places its level had been cut down over three feet in an attempt to level the crests of ridges and raised nearly two feet in marshy areas to bring the road surface above water (Harrington 1942:8).

Another possible link to the mainland was via a brick rubble bridge which crossed the Pitch and Tar Swamp north of the town (Fig. 13). The dates of use for this bridge are unknown (Cotter 1958:150).

The only other evidence of colonial highways in the James River area consists of traces of the Green Spring road which apparently passed from this site to Jamestown. During a survey of the land in preparation of a base map, Harrington (1940) noted several traces of a road approximately one-half mile west of the Glasshouse site.

No other evidence of colonial highways exists, but the road to Green Spring presumably led to other settlements along the river, and another branch of the road led northward from the Glasshouse site and may have led to Middle Plantation and other points (Hatch 1949:21).

Perhaps more significant to movement within the area of colonization than roads were the rivers and tributary streams which allowed access to much of the hinterland. The apparent dependence earlier in this chapter (Fig. 16). Stewart (1967:95) has noted that in modern colonies the settlement pattern is largely shaped by the placement of the principal routes of communication within the colony. Although archaeological evidence for water transportation in Virginia is lacking, the location of settlements here would seem to argue for its prominence in the colony.

The second test implication is that the frontier town should exhibit evidence of exchange with other settlements within the area of colonization. Many examples of intra-colony exchange have been mentioned earlier. These

involved primarily the transfer of manufactured goods throughout the colony from a known point of origin. Perhaps the most obvious case is that of the locally-made pottery. Three sites of seventeenth century pottery making are known, Jamestown, Challis, and Green Spring. Specimens from these kilns have been identified at Clay Bank, the Helmet and Lightfoot sites, Tutter's Neck, Kecoughton (Brittingham and Brittingham 1947:7), the Drummond, Petitt, and Marrable sites, and an unnamed domestic site northwest of Jamestown (Virginia Historic Landmarks Commission 1971) in addition to the three kiln sites. Further indicators of exchange with other settlements include the dated pewter spoon from Chuckatuck found at Jamestown (Cotter 1958:189) and the bricks very likely made at the Jamestown kilns which have been found in many structures on the Virginia peninsula, including St. Luke's church, the Rolf house (Harrington 1950:35), Clay Bank (Noël Hume 1966a:8), Tutter's Neck (Noël Hume 1966b:44), and several sites northwest of Jamestown Island (Virginia Historic Landmarks Commission 1971).

Necessary to the frontier town's role as a center of collection and redistribution is the presence of storage facilities and paraphernalia associated with the shipment of goods. The third test implication calls for the identification of such items. Only one structure at Jamestown

has been identified as a warehouse (Forman 1935b:4). Its foundations lie on the present river bank just to the east of the pottery kiln (Fig. 21), and it was apparently constructed on the scarp of an erosional depression leading to the seventeenth century shoreline (Cotter 1958:63). It was a rectangular brick structure with a lower section of cobblestone which had been destroyed by erosion prior to 1935 (Forman 1938:144). Its function as a storehouse is indicated by the fact that it contained no fireplaces or internal partitions, and window glass, usually plentiful in other structures, was absent here. Its location on a slope not far from the river bank would also be desirable for a warehouse in which to store goods carried by ship (Cotter 1958:65). Its dimensions (fifty-two by sixteen feet) are close to those of storehouses erected at Frederica, Georgia, (Manucy 1962b:55), and its long, narrow shape is reminiscent of English storehouses of the period (See Cunliffe 1972:190). The presence of the Warehouse at Jamestown indicates that the site was a center for storage and presumably for redistribution or export of the commodities collected there. Although only one such structure is apparent, it contrasts markedly with the absence of such facilities elsewhere in the area of colonization during the period when Jamestown was occupied.

In summary the settlement of Jamestown was strategically situated in terms of communication with other settlements in the colony either by boat, via the many navigable rivers and streams of the Coastal Plain, or overland by highway. Deep water port facilities existed there, and at least one warehouse was constructed on the seventeenth century waterfront. The distribution throughout the colony of locally-made products as well as those manufactured in Europe is indicative of both the frontier town's central position in much of the exchange within the colony as well as the interrelationship of all of its component settlements and their participation in a single trade and communications network.

Hypothesis 19. With the expansion of the frontier through time, the communications role of the frontier town should pass to settlements more strategically located in relation to the enlarged exchange network. Just as the new frontier town assumes the economic and social functions of its older counterpart, it should also take over its function in relation to the trade and communication subsystem.

The first test implication states that at some particular time the characteristics of an exchange center will cease to be found within the old frontier town. That is to say, its exchange with other components of the colony

will be sharply reduced or terminated, and it will no longer function as a major focus of exchange with the metropolitan area in England.

Near the end of the seventeenth century Jamestown was virtually abandoned. Very few of the excavated structures there contain evidence of an occupation beyond the first quarter of the eighteenth century. Ceramics produced here and at the nearby kilns at Green Spring and Challis as well as other commodities made in or distributed from Jamestown do not occur on sites dating after this period. Instead, products originating at Williamsburg (Noël Hume 1963: 225) or Yorktown (Watkins and Noël Hume 1967) began to take their places. It is also estimated that the highway linking the Jamestown peninsula with the mainland was eroded away by this time (Hatch 1949:17), seriously impeding communication with other land settlements.

The decline of Jamestown's role as a port of trade with the metropolitan area is witness by the absence of imported eighteenth century artifacts in the townsite. Such items appear in other sites on the Virginia peninsula. Also, the single structure identified as a warehouse was used no later than 1700 (Cotter 1958:66).

A particular type of datable artifact associated directly with trade to English ports is present at Jamestown in small quantities. It is the bale seal, a lead

device composed of two disks attached by a narrow strip. The seals were affixed to bales of woolen cloth exported from England and bear numbers indicating the quality and length of the cloth being shipped as well as the cipher of the reigning monarch. Such seals also served as excise stamps after 1634 (Kelso 1966:107). Those seals recovered from Jamestown all bear ciphers of seventeenth century monarchs (Cotter 1958:191) as do two other seals recovered from the Helmet and Lightfoot sites (Painter 1956 and Kelso 1966:106), which have respective terminous ante quem dates of 1625 and 1688.

The second test implication states that, simultaneously with the decline of Jamestown as a center of trade and redistribution, another settlement in the area of colonization will assume the characteristics of such a focus of exchange activities. The movement of this focus inland, however, creates a problem not encountered in the establishment of a frontier town along the coast with direct access to the metropolitan area by sea; that is, the movement of goods and the linking of communications between the coast and the inland center. Perhaps the simplest solution to this problem is the establishment of a port facility or several with direct ties to the new frontier town. The port of the older frontier town may be utilized for this purpose.

On the Virginia peninsula the obvious location of the new center of trade and communications center is Middle Plantation or Williamsburg, the only inland settlement to possess the sociopolitical and economic characteristics of a frontier town. Williamsburg is situated almost in the center of the lower portion of the Virginia peninsula and would have had easy access to both the York and James Rivers via two tributaries navigable by small craft. There is, however, no evidence of the port facilities at the mouths of either which would have been necessary to transfer cargoes from oceangoing ships to smaller craft, such as the shallop, which were capable of hauling goods on the creeks as well as the large rivers (Evans 1957:21). The decline and abandonment of Jamestown at this time would seem to eliminate its use as an ocean port for the transfer to smaller vessels destined for Williamsburg. Such a port would have to have been located elsewhere on the peninsula. Since there were no large port settlements other than Jamestown prior to the end of the seventeenth century, this port or ports would very likely consist of newly-established settlements situated downriver from the mouths of the two creeks leading to Williamsburg. Two such sites have been explored archaeologically. The first is Yorktown on the York River, located about ten miles from Williamsburg

(Reps 1972:81), and the second is Burwell's Landing east of Jamestown Island on the James River (Virginia Historic Landmarks Commission 1974:14).

Williamsburg and Yorktown appear to have arisen simultaneously at the beginning of the eighteenth century, and it seems likely that the latter would have served as the deep water port from which goods were transferred to the former by boat or over land. Although archaeological investigations have not been extensive at Yorktown, much of the eighteenth century settlement has survived, including an early customs house (Trudell 1971:77) indicative of the town's role as a port. The use of ballast stones in building foundations is also suggestive of trade, for these stones would normally be dumped by ships in the New World prior to their taking on new cargoes. Remains of barrels and other storage containers have been recovered from the area below the bluffs where commodities awaiting shipment would presumably have been stored (Noël Hume 1963:154).

Burwell's Landing consists of a cluster of building remains, including those of an eighteenth century warehouse and tavern. Their location south of Williamsburg at a potential anchorage for ocean-going vessels strongly suggests that it represented another smaller port through which supplies may have flowed inland to the new frontier town.

Both Yorktown and Williamsburg show evidence of exchange with England at the same level as Jamestown, but they differ in that the imported items are more recent. This difference is best illustrated by ceramics, the manufacture of which underwent a great deal of change during the eighteenth century (Noël Hume 1970). By the middle of the century, white and scratch-blue salt-glazed wares and hard paste earthenwares developed by Josiah Wedgwood, Thomas Whieldon, and others began to appear (Mankowitz and Haggard 1957:233). At the same time certain other wares, notably delft, sgraffito, and many of the older earthenwares were losing popularity and consequently occur less frequently in English sites (Noël Hume 1963:234).

The position of Williamsburg and Yorktown in the production of local commodities has already been mentioned. As might be expected, their products occur in sites throughout the area of colonization which were occupied after the decline of Jamestown and its adjacent industrial sites. Ceramics identified as having been manufactured at Yorktown have been found in large quantities at their source but also at Williamsburg, Rosewell, an eighteenth century plantation on the York River (Noël Hume 1962b:212), the later occupation at Tutter's Neck (Noël Hume 1966b:68), and even the topsoil covering the abandoned Challis site (Noël Hume 1963:221).

TABLE 2

OCCURRENCE OF CERAMICS IN COASTAL VIRGINIA BY TYPE AND SITE

	Jamestown 1607-1690	Kecoughton 1610-1760	Clay Bank 1680-1710	Challis 1680-1730	Green Spring 1650-1710	Helmet 1620-1640	Lightfoot 1680-1700	Tutter's Neck 1690-1710	Denbigh 1640-1680	Thoroughgood 1635-	Drummond 1670-1700	Pettitt 1650-1700	Marrable 1670-1730
Earthenwares - English													
Slip decorated	x				x		x		x	x			x
Sgraffito	x				x								
Lead glazed- plain	x		x		x	x	x	x	x	x		x	x
Coarse-tempered Devon	x	x			x			x				x	
Earthenwares - Local													
Unglazed	x	x		x	x	x	x	x			x	x	x
Lead glazed	x	x	x	x	x	x	x	x		x	x	x	x
Earthenware - Iberian													
Majolica (Spanish)	x		x		x				x			x	
Sgraffito (Italian)	x					x							
Delft - English/Dutch	x		x		x	x	x	x	x	x	x		x
Stoneware - English	x		x		x	x		x			x	x	
Stoneware - German	x	x			x	x	x	x		x	x	x	
Porcelain - Oriental	x				x	x		x	x		x		x
Colonio-Indian	x		x		x		x	x					

TABLE 3

FREQUENCIES OF CERAMICS AT JAMESTOWN

FREQUENCIES BY TYPE

	N	%
Earthenwares - English		
Slip decorated	59	1
Sgraffito	75	1
Lead glazed - plain	3370	33
Coarse-tempered Devon	268	3
Earthenwares - Local		
Unglazed	94	1
Lead glazed	3456	34
Earthenware - Iberian		
Majolica (Spanish)	57	1
Sgraffito (Italian)	18	<1
Delft - English/Dutch	1876	19
Stoneware - English	83	1
Stoneware - German	635	6
Porcelain - Oriental	43	<1
Colonio-Indian	10	<1

FREQUENCIES BY NATIONALITY OF ORIGIN

	N	%
English	5731	57
American	3550	35
Spanish	82	1
Italian	18	<1
German	635	6
Oriental	43	1
Colonio-Indian	10	<1
Total	10069	100%

Without examining this later frontier town in great detail, it is obvious that, with the abandonment of Jamestown as a trading center at the close of the seventeenth century, its position was assumed by Williamsburg and the ports of Yorktown and Burwell's Landing. It is important to remember, however, that the role of each frontier town was possibly somewhat more attenuated in Coastal Virginia than elsewhere because of the riverine nature of the terrain. The settlement pattern of dispersed sites clearly shows that most sites were situated along watercourses, and many of these could conceivably have been served directly by ocean-going vessels or those engaged in coastal trading. The role of the deep water port would still be significant in such a riverine frontier, and it is for this reason that Yorktown seems to have shared many of the exchange functions with the inland settlement of Williamsburg in contrast to Jamestown which served as both port and frontier town.

Summary

In this chapter archaeological evidence from Jamestown and other sites in coastal Virginia is examined in order to demonstrate the utility of archaeological methodology to confirm the occurrence of the process of past culture change described in the frontier model. Nineteen hypotheses were constructed to explore adaptations in four

subsystems of English culture as it existed at the time of the colonization of Virginia. These hypotheses deal with changes of two kinds. First, those resulting from the transformation of Old World patterns in the colonial environment and, second, those which took place in the colony through time as the frontier expanded.

The magnitude of the first type of change is the most far-reaching of the two in that it entails rapid and thorough readjustment in all four subsystems discussed here. The extreme and persistent pressures placed upon the English sociocultural system by the necessity of adjusting, in relative isolation, to a new environment appears to have involved the overall structural alternation characteristic of systematic change. The abrupt disorganization of the system followed by its immediate reorganization without any visible transitional state, as witnessed here, is typical of such change.

Obviously, the development of colonial Virginia did not cease with the movement of its center of activity inland from Jamestown to Williamsburg. Nor, by this time, was the Virginia peninsula the only area of colonization in the Chesapeake Bay region. The temporal and spatial limits drawn in this study are admittedly arbitrary yet are broad enough to encompass those changes described in the frontier

model. The necessity of examining these changes archaeologically also demands that these limits be imposed, for the data required to conduct an analysis beyond them are not available.

The remarkable coincidence between the phenomena predicted in the hypotheses based upon the frontier model and the conclusions arrived at through an analysis of the archaeological data testifies to the utility of archaeological methodology in providing a means by which to detect and study past sociocultural change. In order to substantiate the occurrence of the precise changes described in this chapter, a historical discussion will follow in which documentary material is presented in the same order as the archaeological hypotheses. Chapter VII will serve as a check on the conclusions derived using archaeological methodology and should serve to further demonstrate its utility in the study of past societies.

CHAPTER VII

THE DOCUMENTARY SITUATION AT JAMESTOWN: THE CONFIRMATION OF THE ARCHAEOLOGICAL CONCLUSIONS

Historical Summary of Early Settlement in Virginia

In April, 1607, one hundred and five English settlers landed on Jamestown Island to establish a permanent colony in Virginia. The colony was the organized effort of the Virginia Company of London which had received a charter from the crown the previous year. It is important to note that this company's base in London afforded it certain advantages not available to other English colonial ventures based elsewhere. London had the necessary capital and credit to sustain a long-term colonial effort and possessed experience in the management of overseas trading ventures to Muscovy, the Levant, and more recently, to the East Indies. London's proximity to the seat of government at nearby Westminster was also advantageous. In short the Virginia Company seems to have offered the greatest hope for maintaining an English colony in America. Other earlier colonial

schemes such as the Roanoke Island ventures of the 1580's failed chiefly because the southwestern English port towns in which they were organized invariably did not have resources sufficient to support a colony (Craven 1957:2).

The purpose of the Virginia Company was the establishment of a base for commercial activity in North America. The charter of 1606 directed the colonists to seek navigable rivers which might facilitate inland trade and to look for minerals and other valuable resources (Bemiss 1957). The colony was sent out in the hope of returning long-term profits for the adventurers at home who risked their financial resources and the colonists or planters who risked their persons. Not only did the company seek gold, silver, and trade with the Orient, but moreover, it sought to produce raw material necessities unavailable in the British Isles. At a time when the expansion of naval power and commercial shipping was crucial to the prosperity and even the survival of Great Britain as a state, the supply of naval stores was of critical importance (Morton 1960:7). The company not only placed a heavy emphasis on agricultural development but also encouraged a variety of horticultural experiments to produce exotic commodities such as sugar, ginger, wine, vegetable dyes, oils, and mulberry trees for the manufacture of silk (Craven 1957:11). In addition it was felt that the

establishment of an English outpost north of the Spanish colonies in Florida and Central America "would deterr, or at least retard ye Spaniard from suddayne attempting [to attack] us" (Kingsbury 1933/III:1).

During the first four years of the colony's existence, little attempt was made to make it self-sufficient. The settlers' primary concerns were the establishment of the fort and the production of export commodities, principally clapboards, soap ashes, and later glass, tar, and pitch. Consequently, Jamestown was dependent chiefly upon England for subsistence. Much of the necessary food was obtained through exchange with the sub-chiefs of the Powhatan or even with the paramount chief himself (Smith 1907a:37). The presence of the Englishmen seems to have been a source of constant tension, especially to those Indian groups in closest proximity to the colony, and open hostility often flared. In addition to the intermittent warfare, the summer heat and disease, particularly oppressive in the swampy environment of Jamestown Island, took a heavy toll of the colonists. In January, 1608, only thirty-five of the original colonists remained alive (Morton 1960:13). Only the periodic influx of new settlers sustained the colony during these early years. Among the newcomers in the fall of 1608 were the first female colonists and families. To add

to the problems of disease and Indian warfare, factionalism among the leaders of the colony was rife, and effective direction was attained only periodically under such charismatic personalities as John Smith who served as governor from 1608 to 1609 (Bruce 1924:71).

Despite the issuance of a new charter in 1609, providing a strong government capable of more effective control, and the arrival of 500 new colonists that year, many of them families, conditions continued to worsen after Smith's departure. The winter of 1609-1610, called the "Starving Time," was marked by near famine at Jamestown. The colonists were forced to slaughter all their livestock and forage for wild foods. Many actually starved during this winter, and cases of cannibalism were reported (Smith 1907c: 295). Of the 490 settlers in Jamestown in the fall of 1609, only sixty remained alive the following June when the colony was temporarily abandoned. The arrival of a relief fleet under the command of Lord Delaware, however, allowed the site to be resettled and provisioned until a program of self-sufficiency could be implemented (Morton 1960:27).

Sir Thomas Dale arrived at Jamestown in the spring of 1611 and immediately initiated several steps to ensure the permanency of the colony. To make the colony

self-sufficient, he increased communal farming activities and expanded the base of the colony. Maize was planted on "old fields," or cleared Indian lands, located further down the peninsula at Kecoughton and across the Chesapeake Bay on the Virginia cape. Forts were erected to secure these areas. Dale sent Sir Thomas Gates up the James in the fall of 1611 to establish a fortified settlement at Henrico more than thirty miles from Jamestown (Carrier 1957:14). This military settlement was erected on a neck of land which was palisaded across the land side. In the winter of the same year, Gates crossed the James from Henrico and seized Indian fields lying between the James and Appomattox Rivers (Bruce 1924:99). These he divided into communal farm lands known as "hundreds."

Hundreds was a feudal term used to denote an English political unit smaller than a county. Essentially, it represented a unit ten times as large as a tithing, which consisted of ten families within a town (Bruce 1910/II: 287). In Virginia a hundreds was an estate granted by the company to a private owner to be operated as a corporate farm. The owner retained his demesne, or plantation, while distributing the remaining land to individuals who were responsible for clearing the land and occupying it. The occupants remained tied to the owner not as feudal tenants

but rather in terms of the advantages he provided by supplying the goods and services necessary to the operation of the individual farms, including shipping facilities for the disposal of surplus produce in return for imported products (Talpalar 1960:20). Dale had originally intended the hundreds to consist of land worked by farmers who lived in a village, but with the allotment of large tracts of land under the provisions of the Instructions of 1618, settlement became dispersed with the colonists living on the land they cultivated (Carrier 1957:15). By 1622 more than eighty farms were scattered along the James. Only at Jamestown and Henrico did compact settlements exist (Trewartha 1946:587).

The third charter of 1612 made the Virginia Company a fully joint stock undertaking, allowing stockholders to claim dividends in terms of land at the end of a specified period. In 1617 the company attempted to attract new immigrants by offering land directly to private associations of colonists to settle within the lands granted to the company. Each of these settlements was to be located at least five miles from any of the existing settlements and was authorized to operate under its own government as long as its rulings did not conflict with those of the Virginia Company. This provision was designed to provide for the

colony's expansion by increasing its size as well as physically scattering its population (Robinson 1957:17). No towns were erected on any of the hundreds; however, and with the abandonment of Henrico, Jamestown became the only nucleated settlement in the colony.

Important in the rapid growth of Virginia during the second decade of the seventeenth century was the development of tobacco as a cash crop. Tobacco had been introduced into Europe by the Spanish during the sixteenth century, but its widespread use in England did not occur until after 1586 when Sir Francis Drake introduced tobacco leaf and seed from the West Indies. The habit of smoking had been adopted from the aborigines by many of the English visitors to the New World including the first Roanoke colonists (Morton 1960:39). Although native Virginia tobacco, Nicotiana rustica, produced an inferior leaf, the introduction of and experimentation with West Indian and South American varieties of Nicotiana tobacum resulted in a marketable commodity. Under the program to expand the cultivation of subsistence crops imposed by Governor Dale, little tobacco was grown, but upon his departure, all restraints on its cultivation were removed. By 1617 the raising of tobacco was widespread in Virginia, and it was even utilized as the standard medium of exchange there (Carrier 1957:20).

The growth of the colony through increased immigration and agricultural expansion did not occur without seriously affecting the aboriginal inhabitants of the area. The tobacco boom caused a rapid growth in the amount of land under cultivation. In 1617 grants of 80,000 acres were made at Martin's Hundred and Smith's Hundred, and between 1616 and 1623 more than forty-four separate grants of land were made in Virginia (Robinson 1957:20). Hostilities between the English colonists and the Indians had temporarily ceased after the destruction of a large village and nearby Indian fields in 1610 (Percy 1922:272), but the further expansion of English settlement caused new tensions. Sporadic outbreaks occurred as early as 1618 (Bruce 1924:107). In March, 1622, a coordinated attack on settlements all along the James by the Powhatan resulted in the deaths of at least 350 settlers and caused the abandonment of most of the outlying settled areas up-river from Jamestown (Kingsbury 1935/IV:531). The response to this attack came in the form of a new resolve by the Europeans to rid the area of the Indians. A statement written by a colonist in 1622 seems to summarize the rationale developed to govern relations with the Powhatan and other aboriginal groups.

. . . we, who hitherto have had possession of no more ground then their waste, and our purchase at a valuable consideration to their owne contentment, gained; may now by right of Warre, and law of Nations, invade the country, and destroy them who sought to destroy us: whereby wee shall enioy their cultivated places, . . . Now their cleared grounds in all their villages (which are situate in the fruitfulllest places of the land) shall be inhabited by us, whereas heretofore the grubbing of woods was the greatest labour (Kingsbury 1933/III:556-557).

Planned attacks continued to be directed on the Powhatan groups for the next ten years and the greater part of the peninsula between the York and James Rivers was taken by conquest. In 1644 the Powhatan made a last effort to stem the tide of colonial expansion by again attacking numerous settlements and killing between 300 and 500 English colonists. Retribution was again swift and severe and during the next year and a half, Indian villages and fields were systematically destroyed and their inhabitants dispersed. The paramount chief was captured and killed (McCary 1957:80). Two years later a treaty made with his successor brought a temporary end to the conflict by setting aside areas for Indian groups and establishing a boundary line between them and the lands of the colony (Robinson 1957:5). In order to secure the boundary line, forts were established at strategic locations. These forts, located far beyond the limits of the agricultural settlements, effectively ended the

threat of Indian attacks on the Virginia frontier and made possible the future expansion of the area of colonization.

During the second decade of its existence, the Virginia colony underwent a number of significant internal changes. The comparative prosperity brought by tobacco prompted its leaders to plan a reorganization of the company. By doing so, they hoped to correct past policy and management errors which they felt had restricted not only the number of colonists but also their chances for success after their arrival. These reforms were embodied in the Instructions of 1618 (Craven 1964:46). The document replaced the autocratic government outlined in the Lawes, Divine, Morall and Martiall of 1612 with a more liberal representative government in which the various settlements were organized into governmental units. The policy of granting land to those settlers who came to the colony at their own expense and those who brought in other colonists was extended and was expanded to allow the establishment of subsidiary colonies (Morton 1960:54). This program was remarkably successful as witnessed by the 3,000 people who migrated to Virginia between 1619 and 1622 (Craven 1957: 40).

The rapid increase in the colony's population also led to unforeseen problems. Crowded conditions and disease combined with deficiencies in provisions continued to take a terrible toll of the incoming colonists. When added to the losses suffered in the 1622 Indian war, the mortality rate often rose as high as seventy-five percent (Morton 1960:88). A 1622 list of colonists indicates that only 1,700 Englishmen were alive in Virginia by the end of that year (Kingsbury 1933/III:537). These events, combined with the failure of company industries, prevented the financial success of the Virginia Company, and in the fall of 1623, it was invited to surrender its charter. The refusal of the company's representatives to do so led to the recall of all charters and the dissolution of the company (Craven 1957:57). Virginia came under the direct control of the crown as a royal colony in 1624.

During the following decade, English settlement rapidly increased along the Coastal Plain (Fig. 32). Further to the north Lord Baltimore meanwhile secured his grant for Maryland and sent over 200 colonists to the St. Marys River. At this time the population of both colonies was about 4,900 persons (Sutherland 1966:182).

The representative government begun under the Virginia Company was retained on an unofficial basis until 1639 when it was given official sanction by the crown. Although Charles I was attempting to rule England without a parliament, he seemed to have no objection to a representative assembly in one of his North American colonies (Morton 1960:112). The Civil War in England and the subsequent Puritan Protectorate under Cromwell from 1652 to 1660 seemed to have had a minimal effect upon the colony. Its peripheral position in relation to the home country allowed it not only to operate essentially free of Parliamentary control but also to enjoy an unfettered right to free trade (Bruce 1924:171). The governmental structure of the colony remained intact throughout this period, and with the restoration of Charles II in 1660, Virginia returned to the status of a royal colony (Morton 1960:187).

The high financial return of tobacco as opposed to other commodities seems to have permanently influenced the settlement pattern of the colony as it expanded beyond the immediate area of Jamestown. Tobacco actually seems to have encouraged dispersal because of its capacity to rapidly impoverish the soil in which it is grown and necessitate the continual planting of fresh land. The preference of the tobacco growers for bottomland soils further extended the

size of the areas brought under cultivation. The outright granting of land to private persons by the crown allowed the accumulation of large plantations as well as smaller farms (Trewartha 1946:588). By the end of the seventeenth century the size of the average land holding in Virginia was 498 acres (Sutherland 1966:187).

With the rapid expansion of the colony inland across the Coastal Plain, new centers arose to replace older ones. Jamestown remained the capital and seat of government in Virginia throughout the seventeenth century, although it was nearly destroyed in 1676 during Bacon's Rebellion, an abortive insurrection by settlers dissatisfied with the effects of economic regulation following the Restoration and the Indian policies of the royal governor (Morton 1960: 281). In 1699 the capital was removed inland to the small settlement of Middle Plantation, leaving the site of Jamestown virtually abandoned. Middle Plantation, renamed Williamsburg, grew rapidly in the early eighteenth century and continued as the major focus of English sociocultural activity until the expansion of settlement above the Fall Line favored the establishment of new centers closer to the edge of the frontier.

In summary the English colony in Virginia was initially established as a commercial venture at Jamestown in

1607. For the next decade it struggled to achieve an agricultural subsistence base. During this time, other settlements were planted along the James River in an attempt to enlarge the colony. Most of these were unsuccessful until the export of tobacco was permitted in 1618. Its cultivation in Virginia as a cash crop was due chiefly to the artificial English market created for the product. By restricting home planting and discouraging the importation of Spanish tobacco with high tariffs, the government permitted Virginia a virtual monopoly of the English tobacco market. This policy was retained after the Crown assumed control of the colony in 1624. Although the monopoly initially insured an increase in production, a rapidly fluctuating and often glutted market soon necessitated the regulation of colonial tobacco growing (Edwards 1940:184). Still, the quantity of the crop required for export was great enough to encourage an expansion of land under cultivation, because potentially arable land seemed unlimited, and in the absence of traditional fertilizers, it was generally the practice to abandon old fields after continuous cropping had exhausted them and to clear new land (Bennett 1939:874). The extensive cultivation necessitated by this crop rapidly increased the amount of land inhabited. The growing size of the colony soon led to encroachment upon

the territory of the Powhatan chiefdom, resulting in several large-scale uprisings which were subsequently put down with much bloodshed and destruction. By the close of the seventeenth century settlement had greatly expanded along the Virginia Coastal Plain. On the James River frontier this movement was witnessed chiefly by the expansion of settlement up the peninsula and the removal of the river port of Jamestown to the more centrally-located inland site of Williamsburg.

Documentary Analysis of the Frontier Model

The historical development of English settlement on the Virginia peninsula provides many obvious parallels to the process of sociocultural change discussed in Chapter II of this study. In order, however, to confirm the conclusions drawn from the archaeological analysis, it is necessary to document certain changes in each of the four subsystems. This section will examine each of the nineteen hypotheses tested archaeologically in terms of the historical record in order to demonstrate the occurrence of these changes. The documentary data will provide a detailed account of the process of frontier change in seventeenth century Virginia and confirm the methodology utilized to recognize the presence of the characteristics of the model in the archaeological record.

The Subsistence Subsystem

Hypothesis 1. The adoption of native subsistence items and techniques occurred quite early on the Jamestown frontier. By 1607 European colonists were already familiar with many of the flora and fauna of the New World, and early accounts of the Jamestown colony (see Chapter IV) discuss in great detail those exploited by the native inhabitants of the region. Shortages in foodstuffs occurred in the early years of the colony, forcing the colonists to barter finished goods for food (Sainsbury 1860:66). In March, 1608, a colonist wrote:

Thanks to God we are at peace with the inhabitants of the surrounding country, trading for corn and supplies . . . Their great Emperor . . . has sent some of his people to show us how to plant the native wheat [maize], and to make some gear such as they use to go fishing (Barbour 1969/I:160).

In the spring of 1609 John Smith initiated the first planting of maize by the colonists (Bruce 1895/I:199), and soon other native cultigens were adopted including pumpkins, muskmelons, watermelons, and several varieties of squashes, beans, and gourds (Beverley 1947:141).

Not only did the native crops possess the advantage of being locally available, but they were also well adapted to the brown loam and sandy loam soils of the Coastal Plain. Without the extensive use of fertilizers, maize yields more

than twice as much per acre as wheat or other European grains (Bennett 1921:87). An unknown author writing in 1649 remarked of maize, ". . . it yields them [the colonists] five hundred for one, increase, . . . makes good Bread . . . will keep seven years, and maults well for Beere . . ." (Force 1847/IV/1:4).

Another advantage of maize and other New World cultigens was that their planting did not necessitate techniques of land clearing as extensive as those needed to sow European grains. Maize, beans, and squash could be planted together in hills in newly cleared forest lands without the removal of the stumps (Beverley 1947:145). Such conditions made the use of European plows impractical, favoring instead hand tools such as the hoe (Bruce 1895/I:338). Hoes and spades were used occasionally even in the planting of wheat in small areas (Jones 1956:136). Plows were never common in seventeenth century Virginia, especially in newly-settled areas.

Shortages of food and even famine were common in the early years of the colony and prompted the Virginia Company and later the crown to establish granaries for the storage of maize and to compel its cultivation by each family (Bruce 1895/I:275). The importance of maize is reflected in a 1623 letter in which a colonist wrote that

Virginia's subsistence was almost solely dependent upon it (Kingsbury 1935/IV:239). As a result of directives enacted periodically throughout the seventeenth century, maize production rose dramatically. By the 1630's Virginia began to export maize as a cash crop to other English colonies in North America and the West Indies. Contemporary low prices for wheat, barley, and other European grains further discouraged their cultivation in Virginia (Bruce 1895/I:382).

It is clear that upon their landing in the New World the English colonists were obliged by necessity to drastically readapt their subsistence techniques to the conditions present there. The advantages of native domesticants, especially maize, in the frontier environment discouraged the planting of European grains and resulted in a subsistence base heavily dependent upon aboriginal products.

Hypothesis 2. The same adverse conditions that favored the adoption of native domesticated products in Virginia were also in part responsible for a general broadening of the subsistence base of the English settlers. In the early years of the colony's existence, hunting, gathering, and fishing often played a large role in this subsystem. In 1608 John Smith wrote that ". . . we lived three months of such naturall fruits as the countrie afforded" (Smith

1969:445). Again, during another lean year in 1623, a colonist wrote: "The most evident hope from altogether starving is Oysters . . ." (Kingsbury 1935/IV:230).

Even in times of relative plenty, wild foods continued to comprise a sizable proportion of the colonists' diet. A 1649 description of Virginia states,

. . . they have thirty several sorts of Fish, River and Sea, . . . plentiful and large . . . they have five and twenty sundry sorts of Birds and Fowles, Land and Water [in] abundance, and food not amisse . . . they have twenty kinde of Beasts, whereof Deere [are in greatest] abundance, most sorts to be eaten . . . (Force 1847/II/8:4).

Throughout the seventeenth century hunting and fishing equipment continued to be a regular commodity shipped to Virginia (Kingsbury 1935/IV:281).

Although wild animals and plants remained an important source of food in Virginia long after the first precarious years of the colony's existence, many of these resources diminished as colonization intensified. By the end of the century the relative abundance of large game in more densely settled areas had markedly decreased. In 1705 Robert Beverley reported,

. . . the Inner Lands . . . have the advantage of Wild Turkeys, of incredible Bigness, Pheasants, Partridges, Pigeons, and an Infinity of small Birds, as well as Deer, Hairs, Foxes, Raccoons, Squirrels, Possums. And upon the

Frontier Plantations, they meet with Bears, Panthers, Wild-Cats, Elks, Buffaloes, and Wild Hogs, which yield Pleasure as well as Profit to the Sports-man (Beverley 1947:153).

A half century later Hugh Jones (1956:79) noted that even venison "was not so plentiful as it has been, . . . but in the frontier counties the deer abound."

On the Virginia frontier of the seventeenth century it would appear that an adaptive response was made early to the use of a wide variety of wild plant and especially animal foods. The abundance of these resources allowed them to continue to be utilized even after a subsistence base of domesticated crops had been established. It should be noted that those settlements on the edge of the frontier always tended to exploit these resources to a greater degree than the more densely populated areas to the east.

Hypothesis 3. Readjustment of the English colonists to the Virginia environment seems to have entailed the breakdown of the specialized farming systems characteristic of the Old World. As in all frontier areas, coastal Virginia offered the European settler unlimited resources of land, where John Rolfe (1951:11) wrote in 1616, farmers "maie have ground for nothing more than they can manure: reape more fruites and profittes with half the labor." Although originally intended as a communal venture under

the auspices of the Virginia Company (Bemiss 1957:4), it soon became clear to the company's leaders that, if an adequate subsistence base was to be developed, it would be necessary to distribute land holdings to individual settlers. In 1614 Sir Thomas Dale initiated a modified form of private landownership by assigning colonists plots under lease under the condition that they plant maize. Two years later Governor Yeardley shortened the obligations of company laborers and allowed them to take up land as tenants (Bruce 1895/I:221). In 1618 the Virginia Company instructed Yeardley to make land grants in fee simple (a freehold to be occupied indefinitely and which is inheritable by descendents and collateral relatives to those "ancient planters" who had immigrated prior to 1616 (Bemiss 1957:98).

The land policies of the Virginia Company, however, were not the sole factor encouraging the rapid dispersal of settlement. Ecological conditions tied to the cultivation of maize and tobacco were significant. Although both crops were readily adaptable to cultivation in newly-cleared land without the use of fertilizer, they rapidly exhausted the soil and necessitated continuous land clearing. This resulted in the practice of acquiring large tracts of land

and farming only a portion of them at once while allowing the exhausted soil to return to forest (Hartwell, Blair, and Chilton 1940:8-9).

The topography of the Coastal Plain with its numerous rivers and navigable streams offered convenient water highways for the transportation of tobacco and other goods. Throughout the seventeenth century, the majority of patents for land in Virginia were concentrated on those areas immediately adjacent to these watercourses (Bruce 1895/II:524).

Domestic animals, which played such a large role in European farming systems, were brought to Virginia early. Rolf (1951:3) reported horses, pigs, goats, and poultry in Jamestown in 1616. Draft animals, however, did not play as large a role in Virginia, and Lord Delaware found that, upon his arrival in Virginia in 1611, these animals were generally allowed to run loose and forage in the mild climate (Hakluytus Postumus 1906/XIX:88). Large herds of wild pigs were common on the Virginia peninsula as late as the 1630's (Bruce 1895/II:296).

In contrast to the cooperative nature of English open-field farming, cultivation in Virginia was managed on an individual basis. In 1623 colonist George Sandys wrote ". . . the English throughout this wild Countrie,

planted dispersed lie in small families, far from Neighbours, . . . live like Libertines out of the eyes of the Magistrate, not able to secure themselves nor to be relieved by others" (Kingsbury 1935/IV:70).

In summary the ecological conditions resulting from the natural environment, the needs brought about by subsistence practices, and the demands of commercial production favored rapid expansion into new lands and a dispersed settlement pattern. With seemingly unlimited resources of arable land available, the factors which favored the open-field and infield-outfield adaptations of Europe were diminished to the point that they were nonexistent. The greater efficiency of expansive farming in the rich Coastal Plain soils effectively eliminated the need for utilizing the farming systems developed to deal with vastly different conditions in the Old World.

Hypothesis 4. Within the area of colonization, the concentration of subsistence activities was, of necessity, situated outside of the frontier town. This condition seems to have been due to the fact that the function of the town as an administrative and commercial center would eliminate many of its inhabitants from engaging in subsistence activities. The expansive nature of cultivation and the depletion of soil soon left those lands closest

to the frontier town exhausted. George Percy (1967:22) stated that the earliest planting was done on Jamestown Island in 1607 but soon spread to the mainland. By the 1630's all of the forest had been cleared in the vicinity of the island , but that closest to the town was then used for pasture and gardens (Bruce 1895/I:313). A half century later the island had returned to a more natural state with the high ground containing a heavy growth of trees and the low ground consisting of mixed forest and marsh (Hartwell et al. 1940:8).

The bulk of new settlers arriving from England quickly found their way to the edge of the frontier due to the lenient policy of granting land in forested areas which required little more than occupation of the tract and the paying of a nominal quit rent (Hartwell, et al. 1940:19). By 1635 only about twenty percent of the British population in Virginia lived in the immediate vicinity of Jamestown (Bruce 1895/I:319), and the population of the town was only about 200 persons. As will be discussed in greater detail below, Jamestown served chiefly as a nucleus for non-subsistence activities. The governor lived there, and courts and assemblies were held there. Early industries were centered at Jamestown, and it served as the location of public storehouses and the fort. Though

never attaining prominence as a port due to the easy access to much of the interior afforded by the network of inland waterways, it did serve as a terminus for inbound settlers and the seat of most commercial authority.

Throughout its 100 years of existence, Jamestown remained the only settlement in Virginia to have achieved substantial size (Bruce 1895/II:525). As the center of sociocultural activity within the area of colonization, its role stood in marked contrast to that of the farms and plantations of the interior.

Hypothesis 5. With the expansion of the area of colonization and the creation of new frontier towns closer to the edge of the frontier or more centrally located within the newly-settled areas, the role played by subsistence activities within the affected communities was subject to marked change. This is clearly visible in the case of Jamestown which was replaced by Middle Plantation as the frontier town of the colony at the end of the seventeenth century.

The geographical advantage of Middle Plantation may be seen by examining briefly the spread of the settlement associated with the expansion of the area of colonization during this century. By the 1620's the frontier had spread along both banks of the James River to a point just

above its confluence with the Appomattox (Fig. 31). By the 1640's it had spread northward to the York River and to the peninsula of the Eastern Shore (Fig. 32). At the close of the century, settlement had expanded along most of the major rivers of the Coastal Plain (Fig. 33). Although forts were established as far inland as the Fall Line and expeditions had reached the Allegheny Mountains (Morton 1960:240), the bulk of the English population still remained concentrated on the peninsula formed by the York and James Rivers.

This shift placed Jamestown on the margin of settlement, and it began to decline as a socioeconomic center in the late 1600's (Bruce 1895/II:562). Bacon's Rebellion in 1676 destroyed the town, and it never recovered. By the end of the century, it was virtually abandoned (Beverley 1947:86). With the movement of the political and economic machinery to Middle Plantation, Jamestown reverted to farms, and by the mid-eighteenth century it had become part of an extensive river plantation (Tyler 1906:83).

The decline in the prominence of subsistence activities at Middle Plantation is just as obvious. Prior to 1690 it was a small, dispersed farming settlement. Concerning its rural nature, Robert Beverley (1947:105)

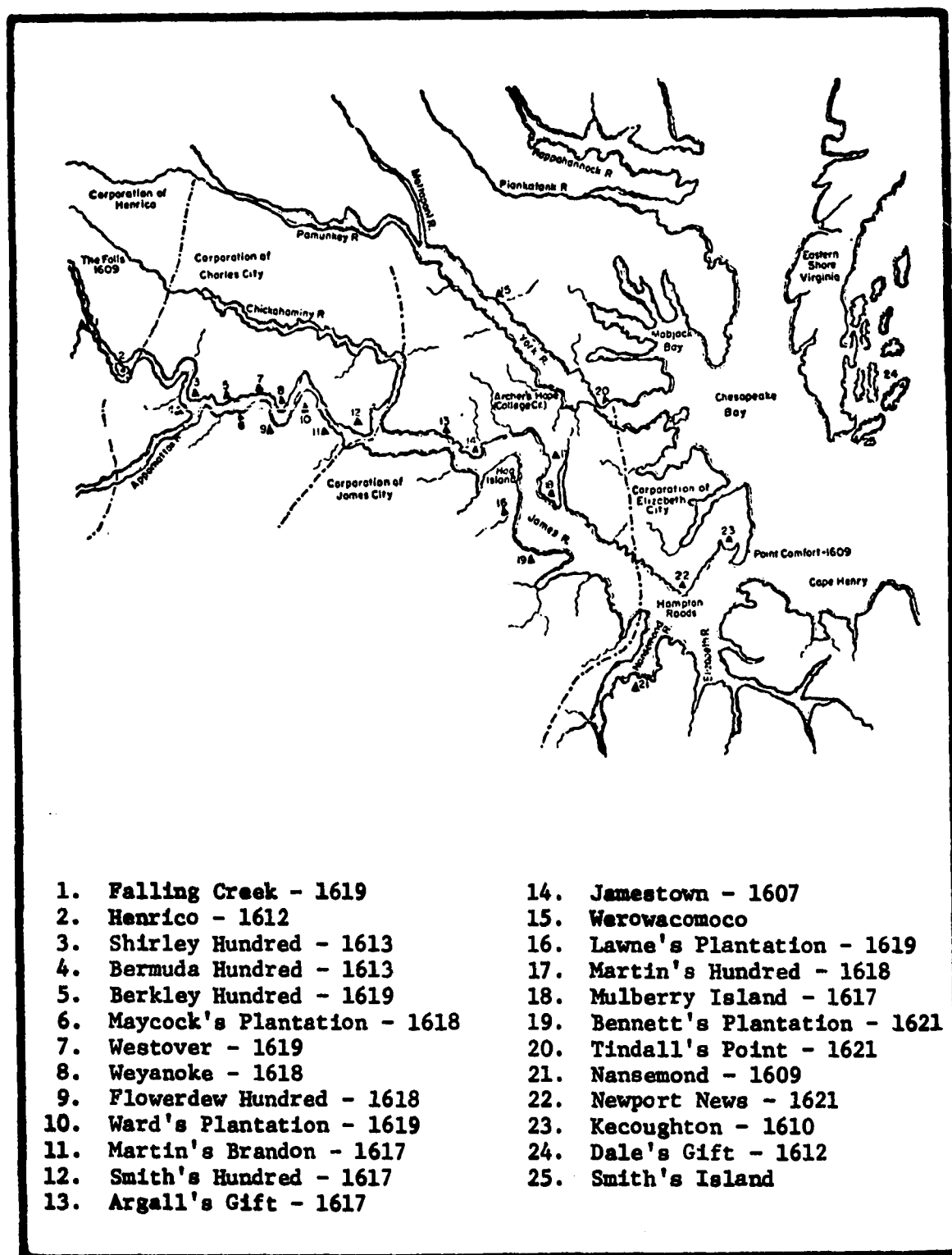


Fig. 31. -- English settlements in coastal Virginia in 1622.

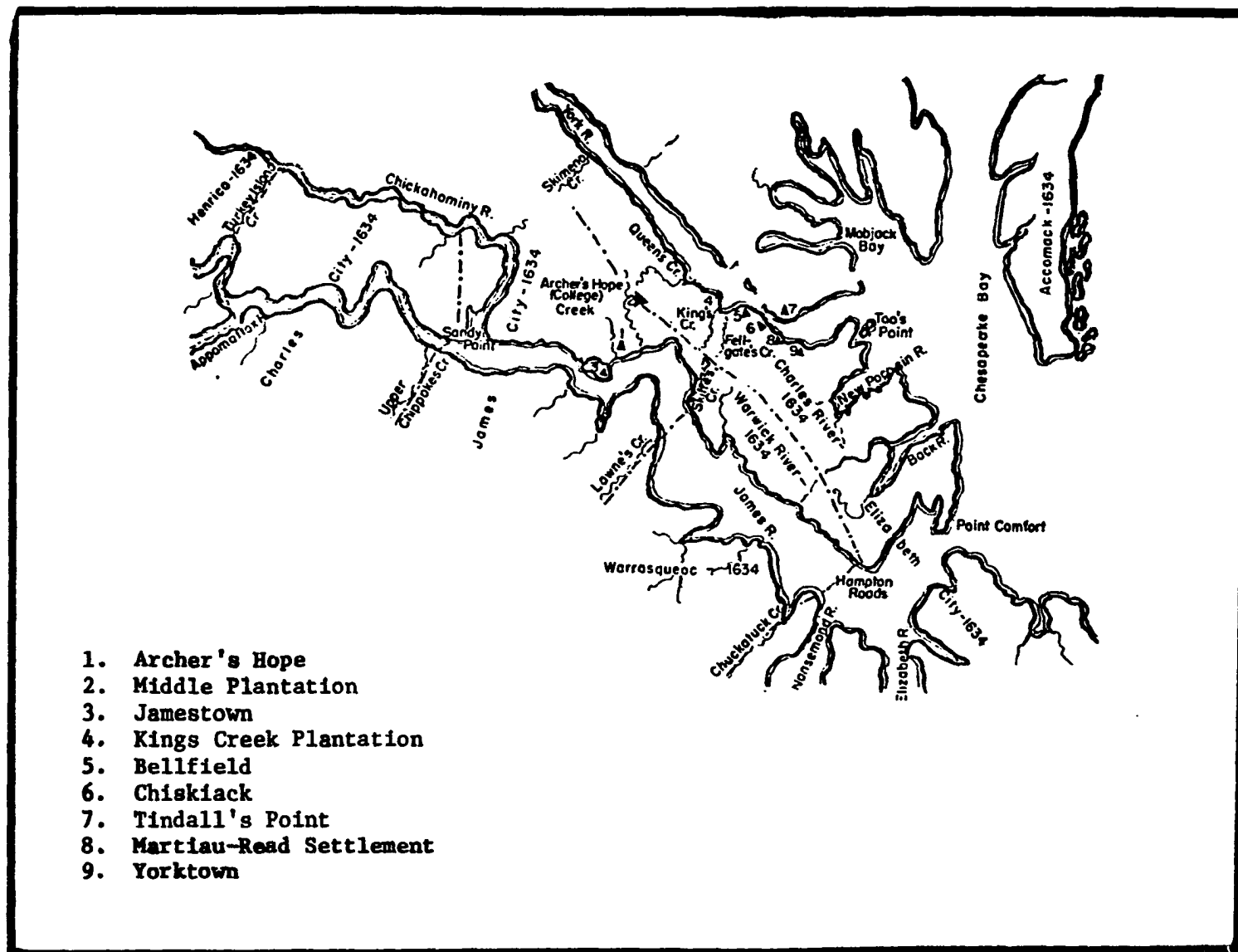


Fig. 32. -- Expansion of English settlement to the York River after 1630.

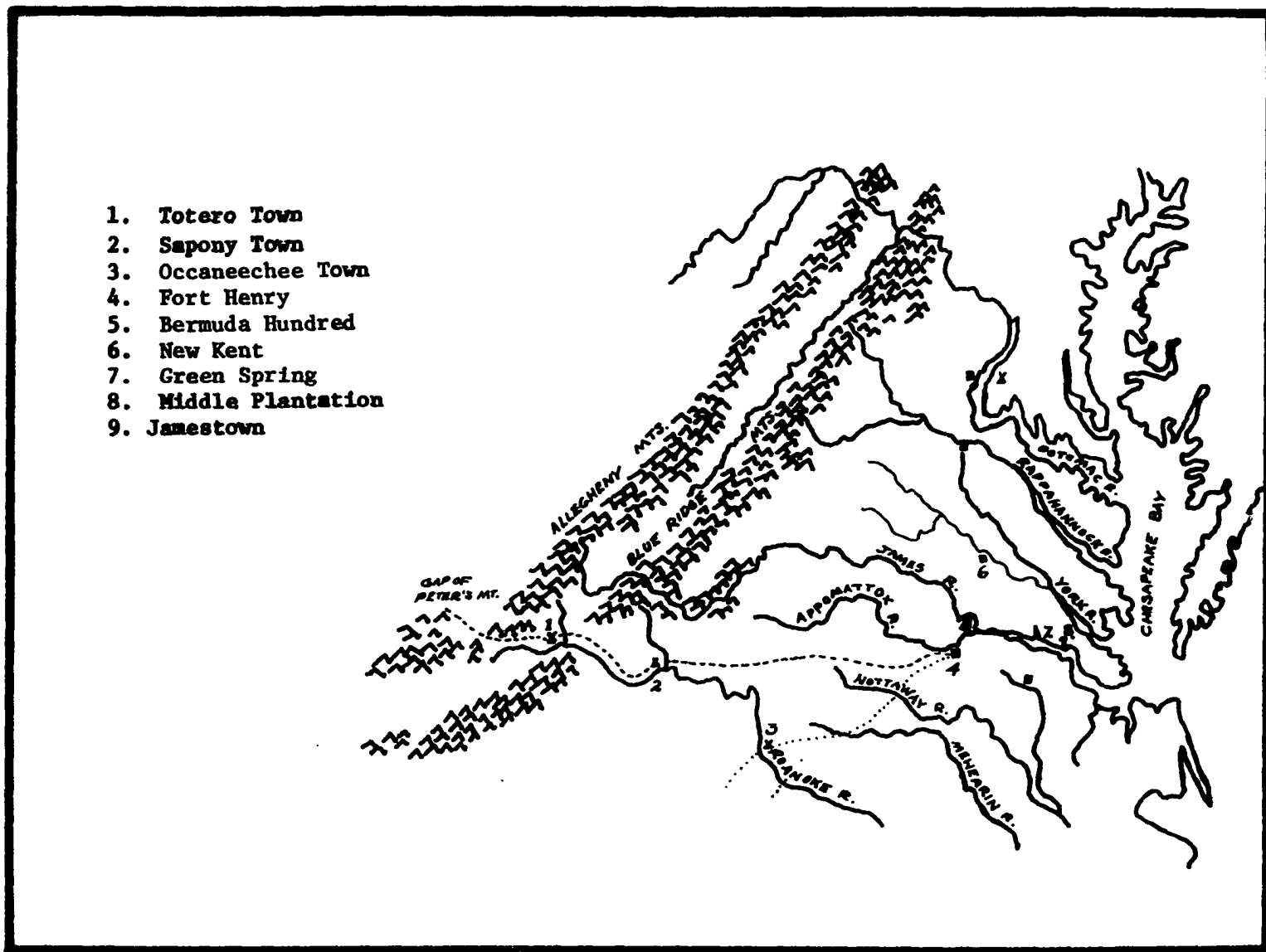


Fig. 33. -- Virginia in 1676: English forts, Indian towns, and exploration routes into the interior.

remarked in 1705 that the removal of the government there had resulted in its placement at a location where there were no accommodations for people as there were at Jamestown.

Williamsburg was laid out as a planned community and almost at once assumed the role of social, political, and economic center of the Virginia colony. Public buildings, small industries, storehouses, and a comparatively dense population characterized the settlement by 1702 (Carson 1965:2). So complete was the transformation of both settlements that it prompted Hugh Jones (1956:71) to observe that, while Williamsburg had become a "delightful, healthful, and thriving city," Jamestown had reverted to little more than "an abundance of brick rubbish."

Hypothesis 6. Finally, the number of subsistence products upon which the colony eventually became dependent were much fewer than those in use in the metropolitan area. Native domesticants were among those adopted because they are often better suited for cultivation than the European crops. The impact of native cultigens in the early development of Virginia has already been touched upon in Hypothesis 1. In the first several decades of the colony's existence, a great deal of experimentation took place in an attempt to obtain useful commodities for the

profit of the Virginia Company. Among these were a diversity of plants introduced from Europe and other parts of the New World. These included mulberry trees (as food for silk worms), hemp, flax, and vines (Tyler 1907:265). In 1616 Rolf (1951:5) reported that a number of commodities were being planted in Virginia, including maize, beans, peas, wheat, barley, turnips, cabbages, pumpkins, carrots, parsnips, and various herbs. As late as 1643, nearly twenty years after the dissolution of the Virginia Company, the government continued to promote a diversified subsistence base by encouraging experimentation with such items as silk, lemons, oranges, pomegranates, rice, and figs, none of which were successful (Bruce 1895/I:328). Governor Berkeley planted orchards of apple, peach, apricot, quince, and other fruit trees at his estate at Green Spring, but his example was not widely followed.

European grains such as wheat, oats, and barley achieved little success despite attempts by several governors to initiate their cultivation in the early years of the colony's history. The greatest problem involved in growing wheat was the condition of the newly-cleared ground. Wheat was difficult to sow amid stumps left after the initial clearing of trees had taken place, and the fertility of the forest soils was so great that it tended

to stunt the growth of grains by causing enormous stalk growth (Bruce 1895/I:238). In order to prepare the soil for European grains, several crops of maize or tobacco had to be grown first to reduce its fertility (Jones 1956: 77). By mid-century, however, enough land had been suitably prepared to allow the growing of grain, especially wheat, on a fairly large scale. Along with maize, which had been exported as a cash crop to New England and the West Indies for at least a decade (Sainsbury 1860:184), wheat was, for a short period, also shipped in small quantities to European and American markets (Bruce 1895/I:329).

In addition to maize the other dominant cultigen in seventeenth century Virginia was another New World crop, tobacco. It achieved popularity very early because of its ability to grow in newly-cleared ground which could be prepared by available hand tools, its high yield per acre, its light weight and consequent low shipping cost, its resistance to spoiling when cured, and the market for this product in Europe at a regularly high price (Bruce 1895/I: 260). The widespread raising of tobacco as a cash crop not only doomed most of the attempts to develop the production of other commodities but also interfered with the subsistence of the colony. The extent of this situation is reflected in a 1627 letter from Charles I to the Governor

and Council of Virginia which stated that: "His Majesty is troubled how little account can be given of any substantial commodity from the colony, and how truly it may be said that this plantation is wholly built upon smoke, tobacco being the only means it hath produced" (Sainsbury 1860:86).

Regulations limiting the planting of tobacco and encouraging the raising of food crops had to be maintained throughout the seventeenth century. In 1708 Oldmixon (1741:453) was still able to remark that in the colony: "Their almost sole Business is planting and improving Tobacco, even to that Degree, that most of them scarce allow themselves time to produce their necessary Provisions." In the second quarter of the century tobacco growing still dominated the local economy to such an extent that Hartwell, et al. (1940:7) commented ". . . so it is at present that Tobacco swallows up all other things every thing else is neglected."

Despite the unlimited potential of the Virginia environment for the production of a large number of diverse New and Old World products, the adaptive response made in the colony involved the production of only a few major commodities. Maize dominated the food crops, while the cultivation of tobacco as a cash crop overshadowed all other agricultural activities.

The Economic Subsystem

Hypothesis 7. Contact between the English colonists and the aboriginal inhabitants of Virginia was neither constant nor prolonged except during the first few years. Although the number of Indian items adopted by European settlers has often been stressed (see Hallowell 1957), it would seem that the greater complexity of the Old World technology would have inhibited the borrowing of a great deal of the aboriginal technology. Diffusion, it would seem, is much more likely to have flowed in the opposite direction.

In seventeenth century Virginia much of the technological information which was learned from the aborigines was concerned with subsistence. Along with the adoption of native cultigens, the English learned swidden techniques for the preparation of fields (Jones 1956:165) and the proper methods of planting, harvesting, and preparing the crops (Bruce 1895/I:199). Yet even in these tasks European metal tools proved superior to their native counterparts and were sought after by the aborigines to replace their own tools. The English settlers found this situation to their immediate advantage in obtaining food and raw products from the Indians as related by Strachery (1953:115) in 1612.

They are much disirous of our Commodityes, and therefore when any of our Boates arrive before their Townes, they will . . . demaund after Copper, white beades, howes, to pare their Corne fields and hatchetts for which they will give such things as they have in exchange, as deare skyns, Furrs, . . . Fowle, Fish, deare, or Beares Flesh, tryed deares suyt made up handsomely in Cakes, their Country-Corne Pease Beanes and such like, and to saye truth, their victuall is their chief riches.

The potential adaptiveness of English technology allowed it to generally prevail on the frontier. This is not to say that they represent actual adaptive responses to the frontier but rather that they were not maladaptive to the extent they would seriously threaten the existence or growth of the colony. For example, houses and other buildings followed English forms and techniques of construction (Forman 1938), town planning paralleled European models (Reps 1972), and extractive and finishing industries involved in obtaining raw materials were similar to those used in the Old World (Jones 1956:81). Innovations in technology did take place, however, resulting in the development of such items as the heavier axe and the "Virginia hoe" (Bruce 1895/I:463), but on the whole technology remained little changed from its counterpart in Europe.

Hypothesis 8. Because the necessity of adapting to a completely new environment far from the metropolitan area removed the Jamestown colony from normal networks of exchange

and redistribution, it was necessary that many products usually obtained through such channels be manufactured entirely or in part within the area of colonization. In addition the Virginia Company saw local production of New World commodities as a means of earning profits to repay its stockholders.

Despite the stifling effect of large-scale tobacco raising on other activities, many small-scale industries were implemented during the early history of the colony. Brickmaking was begun in Virginia in 1607, and kilns were erected not long after at Jamestown and at the ill-fated settlement at Henrico. In the 1620's brick was beginning to be used as an integral part of structures at Jamestown and other adjacent areas. Virginia bricks were occasionally even exported as far as the Bermudas (Bruce 1895/II:137). A contemporary colonist wrote: "There is a good store of earth fitt to make brick almost in every place; And heretofore much Brick hath been made in the Contrie" (Kingsbury 1935/IV:260). Closely tied to the manufacture of brick is pottery making. Beverley (1947:125) found the clays well-suited for making both earthenware and white clay pipes. By mid-century both pottery and brickmaking were listed as profitable trades in the colony (Force 1847/II/8:7).

Other small industries present in the colony involved blacksmiths who repaired tools and weapons and manufactured unavailable metal items; coopers who produced hogsheads for shipping tobacco as well as barrels for other loose commodities; carpenters who also served as turners and joiners; and shipbuilders whose craft had obvious utility in this riverine area (Bruce 1895/II;430-435).

Further industries which produced commodities primarily for local use included grinding mills. In 1649 there were five water mills and four wind mills in addition to numerous horse and hand mills in the colony (Force 1847/II/8:5). Millstones were imported from England as early as 1623 (Kingsbury 1935/IV:93). Sawmills were first erected in the 1620's (Kingsbury 1933/III:144) but were not common until mid-century (Bruce 1895/II:492). Lime burning for mortar is reported as early as 1623 (Kingsbury 1935/IV:260) utilizing shell from the Chesapeake Bay area. Tailors, hatters, shoemakers, tanners, and hosiers also produced goods in the colony, but their production was legally restricted by a government in England ever jealous of protecting home industries (Bruce 1895/I:48).

For the most part the industries encouraged by the Virginia Company which had been designed to replace imports from other foreign sources failed (Kingsbury 1933/III:

596). Most of these products were not usable locally and were much more difficult to produce with the limited labor supply than was tobacco. Despite continued exhortations by the company (Bemiss 1957:116) and numerous attempts during the early years of the colony to produce such commodities as pitch, tar, soap ashes, flax, cotton, wine, salt, iron, hemp, silk, and others, the successful production of these items never came to pass (Beverley 1947:295).

As the seventeenth century progressed, English economic policy began to crystallize in an effort to regulate production throughout its empire for the benefit of home industry. This trend seems especially noticeable following the Restoration of Charles II in 1660 with the passage of stricter navigation acts regulating the foreign trade of the American colonies. Charles' instructions to the Council of Trade in 1668 clearly stated his intent to determine ". . . how the said [American] plantations may be further promoted and how the commodities of them may be best improved and regulated and advanced so as that this kingdom may from the said plantation alone, . . . be supplied" (Thirsk and Cooper 1972:526). This policy effectively prevented the development of competitive industries in the colonies and insured the dependence of the latter on England. The uniqueness of tobacco growing in Virginia and

the fact that this industry was not subject to protective legislation further encouraged its growth to the detriment of other industries (Bruce 1895/II:395). Although small-scale industries remained to serve local needs within the area of colonization (Bridenbaugh 1950:21), the combined effect of trade legislation and a tobacco economy prevented the proliferation of industrial activities that occurred in other American colonies.

Viewing this phenomenon in a more general sense, Baldwin (1956:166) notes that in most settlement plantation frontier regions, the efficient utilization of labor intensive production tends to hinder the development of domestic large-scale industry and prevent the concentration of settlement around centers of non-agricultural production. This trend is clearly discernible in Virginia. Although a wide range of small-scale industries could be found in its dispersed settlements throughout the seventeenth century, almost all of the efforts to produce major industrial export commodities ended in failure. This is chiefly because the dependence of a settlement plantation frontier upon an export market serves to funnel profits into the further expansion of the plantation agricultural system or back to the metropolitan area as interest or dividends for investors rather than into the development of local industries. Economic

ties structured in this manner also tend to encourage a dependence of the colonists upon imported manufactured goods which are exchanged for the agricultural export commodity. The situation as it existed in Virginia contrasted markedly to that in the English colonies of New England which were unable to produce such a commodity and consequently did not remain an economic enclave in the manner of their southern neighbor. It was their retention of an economic diversity that allowed the subsequent development of large-scale industrial and commercial activities in this area (Robott 1948:22).

Hypothesis 9. Closely tied to the production of commodities for export to the manufacturing centers in England was the presence of certain types of part industries representing early phases of complex manufacturing processes. Semi-finished commodities might be produced in the New World to be shipped exclusively to finishing industries in England. As England was beginning to exhaust many of her natural resources at this time (principally timber necessary in industry prior to the use of coal), the seemingly endless supply of these products in Virginia would naturally have been looked upon as a replacement for them.

On the whole the industries encouraged by the Virginia Company were of this type. For example, in 1608 and again

in 1621 attempts were made to set up a glasshouse for the manufacture of raw glass for the English market as well as for producing beads for the Indian trade. Both failed without producing significant results (Kingsbury 1935/IV: 24). Similarly, works to produce bar iron for export were constructed upriver at the site of ore deposits following the pattern of dispersed industries close to raw materials common in the seventeenth century (Bruce 1895/II:444). Its isolated location made it vulnerable to attack, and it was destroyed by the Indians in the 1622 massacre (Kingsbury 1935/IV:14). Ironworks also required sizable investment in capital and labor, including at least two square miles of woodland to supply charcoal for the furnace (Bridenbaugh 1950:17). In the seventeenth century the assembly of such resources was beyond the capacity of the Virginia Company (Kingsbury 1935/IV:640).

Other extractive industries designed to produce raw or semi-finished commodities for the English market were attempted. Many, such as silk (Bemiss 1957:115), flax, pitch, tar and other naval stores, and charcoal (Bruce 1895/II:458) were well within the capability of the colony (Force 1847/II/8:5-8), but the ecological advantages of tobacco growing offered a much more efficient means of obtaining a marketable product. As early as 1623 the company realized

the futility of such diversification and abandoned the development of these industries (Kingsbury 1906/II:396). With the further expansion of the frontier in the latter part of the eighteenth century, many of these industries were reintroduced, especially in areas not suitable for tobacco. Many commodities such as bar iron even became minor staples in the export trade for short periods (Bridenbaugh 1950:16).

Hypothesis 10. The industrial activities which were successful within the area of colonization should be associated with its most densely-settled area, the frontier town. Although at first attempts were made to disperse industries in Virginia, as in the case of the ironworks, logistical problems and the dangers of attack forced the abandonment of such sites in favor of those closer to Jamestown (Beverley 1947:126). Prior to 1638 the colonial assembly had encouraged this clustering by passing acts to lay out ground for "handicraftsmen and tradesmen" at Jamestown Island (Sainsbury 1860:269). Throughout the seventeenth century, laws were enacted to draw technical specialists into towns, both to provide them access to a central location and the communication linkages of a larger settlement as well as to remove them from the temptation to leave their trades in favor of tobacco farming (Bruce 1895/II:411). Although attempts to encourage the growth of towns throughout

the Virginia frontier were, for the most part, unsuccessful, the single town which did exist managed to attract most of the significant industrial activity in the colony.

During this time, a number of industries were established at Jamestown. Among them were sawmills, grain mills, brick, lime and pottery kilns, a salt-making facility, and the ill-fated glasshouse, as well as numerous small trades practiced by such craftsmen as carpenters, blacksmiths, bricklayers, masons, tanners, shoemakers, weavers, coopers, and tailors (Bridenbaugh 1950:14-15). It is important to remember, however, that during the seventeenth century the majority of finished goods used in Virginia were imported from England.

Hypothesis 11. With the replacement of Jamestown by Williamsburg as the frontier town of the Virginia peninsula, the focus of industrial activity shifted from the former to the latter and, to a lesser extent, to its principal port of Yorktown on the York River. Jamestown had never fully recovered from its destruction in 1676, and it appears that many of the industrial activities associated with it either ceased to function or temporarily dispersed into the surrounding countryside, which was now safe from Indian attack. The eighteenth century practice of concentrating manufacturing

activities on individual large plantations had not yet become common in Virginia, for the seventeenth century plantation was greatly limited in size due to the inadequacy of the labor supply and its transient nature (Wertenbaker 1922:45). Unlike a later period the majority of the laborers were indentured servants, not slaves, and would themselves become freeholders at the expiration of their indenture (Craven 1971:8-9).

Many of the colonial craftsmen from Jamestown quickly transferred their residence to Williamsburg. An anonymous writer reported in 1699 that the town already had two mills and a smith's shop (Carson 1965:1). References to the extent of colonial industries are rare because the official mercantilist position of the English government was one of discouraging them in favor of agricultural products (Bruce 1895/II:566). Other documentary sources are vague on this topic. An example of deliberate deception with regard to local industry is the statement in an early eighteenth century official report that there were no ceramic industries in Yorktown with the exception of a single "poor potter." Further research has shown that his work was comparable to that of English potters and that he oversaw an extensive operation in the colony (Barka 1973: 314). It is probable that many other commodities used

within the area of colonization were also manufactured nearby as indicated by Jones' (1956:71) 1753 statement that "The number of artificers here in Williamsburg is daily increasing." The movement of these activities from Jamestown inland to the new frontier town of Williamsburg clearly illustrates a trend in the pattern of industrial development on the frontier.

The Social Subsystem

Hypothesis 12. When compared with the social structure of sixteenth and seventeenth century England, that of colonial Virginia immediately appears to have been abbreviated. It was recognized in the first charter that the precarious nature of a distant colony demanded a centralization of power to eliminate the causes of factionalism that had destroyed earlier attempts to colonize the New World. By placing all governing power within a council appointed by the Virginia Company (Bemiss 1957:19), they hoped to avoid the problems which had arisen in the Roanoke colony, which was essentially an attempt to create a miniature feudal state in North America (see Quinn 1955:508). In this case the rule of a hereditary nobility proved unwieldy, and the colony was unable to sustain itself. In the Virginia colony both religious and secular power were given to the council.

Despite the careful planning of the company, the council still proved incapable of coping with the hardships of the initial period of adjustment. Of the situation John Rolf (1951:4) wrote: "This government lasted above two years; in which tyme such envie, and dissentions were sown amongst them, that they choaked ye seedes and blasted the fruits of all mens labors." Only during the brief period of Smith's presidency of the council was the colony able to firmly establish itself (Smith 1907b:151).

The charter of 1609 attempted to codify the powers that Smith had initiated. It placed all authority in the hands of a governor appointed by the company. He had the power to appoint all secular offices, ensure adherence of all colonists to the Church of England, settle all cases of criminal and civil law, command all military forces, control the manufacture of all goods and the exchange of goods with the Indians, manage the work of the colonists, and censor communications with the metropolitan area (Bemiss 1957:57-66). Under this charter the colony was able to survive the initial period of adjustment. The subordination of ecclesiastical authority to civil authority first established here was maintained throughout the period of English rule (Oldmixon 1741:435).

The authority of the governor continued to be substantial throughout the seventeenth century, and his sole responsibility remained to the company and later the crown (Bruce 1895/II:329). However, his supremacy was moderated by the creation of the General Assembly by order of the king in 1621 (Bemiss 1957:128). The assembly consisted of representatives from each of the administrative divisions of the colony (House of Burgesses) together with the governor and his appointed council. Their power to enact laws for the colony subject to the governor's veto was significant not only in that it created a second level of political statuses not directly subject to the governor's power, but also because it allowed the assembly to assume the roles of a variety of hierarchical status positions in England. These included manorial, town, parish, royal, and parliamentary statuses (Oldmixon 1741:454). The power of the House of Burgesses grew during the period of the Protectorate of Cromwell following the English Civil War, and prior to the Restoration in 1660, it actually controlled the administration of public affairs and elected the governors. The Restoration, however, brought an end to legislative control and ushered in a period of reactionary gubernatorial rule (Bruce 1895/II:263).

Several other official statuses illustrate the concentration of roles within the area of colonization. The Secretary of State was originally appointed to transcribe official correspondence of the governor and council, but by the 1660's his duties had expanded to include drawing up all commissions, passports, discharges for ships, and other public documents. He was also charged with carrying out the duties of legal clerk and secretary of the General Assembly and was the administrator of Indian affairs in the colony. In England this variety of powers would have been spread among a number of offices (Bruce 1910/II: 397-399).

Another office which was greatly expanded in Virginia was that of sheriff. While the English sheriff was primarily a royal official with a minor judicial role at the county level, his colonial counterpart was a powerful county court official. His court served as a focal point of county government and had the power to hear criminal cases as well as civil suits. Its power included maritime and ecclesiastical law as well as common law and combined the duties of the English courts of Chancery, King's Bench, Common Pleas, Exchequer, Admiralty, and ecclesiastical courts (Karraker 1930:107). His duties also included empanelling juries, apprehending felons, arranging for punishments to be carried out, and collecting all taxes and revenues (Karraker 1930:156).

The adaptive efficiency of the reduction of statuses on the frontier is obvious in view of the small size and dispersed nature of the population. Russel-Wood (1974:223) has noted a similar expansion of the jurisdiction embodied in individual governmental statuses in Spanish and Portuguese colonies in the New World. In both cases the phenomenon is associated with a general trend which serves to check the divergence inherent in the administration of an expanding frontier. The direct control of colonial affairs by a single governmental structure with very little overlap between its components allowed the central government to maintain its authority while at the same time provided an organization for the dispersed settlements of the interior. So significant was this arrangement that an attempt following the Restoration to usurp the power of the counties led to a strained relationship within the General Assembly and promoted the factionalism that eventually led to the rebellion of 1676 (Bailyn 1969:74). The basic form of socio-political organization developed in the seventeenth century formed the model for the colony as its frontier expanded in the following century.

Hypothesis 13. The settlement types characteristic of seventeenth century England were not replicated in the Virginia colony. This is reflected best in the settlement

pattern previously discussed. The dispersed settlement which so impressed early observers was still evident in 1708 when Oldmixon (1741:453) wrote: "The people are very numerous, [but] dispersed through the whole Province." Despite contemporary laments that the seating of colonists was "without any Rule or Order" (Hartwell, et al. 1940:11), the majority of seventeenth century land patents were concentrated on lands adjacent to navigable streams which afforded communication with other settlements (Bruce 1895/II:524).

To cope with the dispersed population, territorial divisions were based upon the hundred which took on a strictly spatial meaning in Virginia. It became a unit to which judicial, military, and political functions were attached (Bruce 1910/II:288). Rolf (1951:7) mentioned only two such units in 1616, but six years later their number had grown to six. Superimposed upon these in 1618 was a division of the colony into four corporations or boroughs (Fig. 31): James City, Elizabeth City or Kecoughton, Charles City, and Henrico (Kingsbury 1933/III:100).

In 1634 an attempt was made to replicate the socio-political divisions of England by laying out the colony into eight shires or counties (Fig. 32). Each of these was further divided into parishes. This system became

the territorial basis of the House of Burgesses (Bruce 1910/II:427). Although such units might appear to ignore the settlement pattern, they were actually quite flexible. Parish boundaries fluctuated with population changes, and frontier counties were actually created with no defined borders to the west (Bruce 1910/II:296). Throughout the seventeenth century attempts were made to settle colonists in towns (Bemiss 1957:122), but all of these failed because they were maladaptive in light of the extensive type of farming practiced on the frontier. The desire of the colonist to maintain a large number of small ports from which to inexpensively load tobacco and the English government's efforts to discourage the development of competitive, diversified industries in the New World combined to prevent the growth of concentrated settlements in Virginia for trade or manufacturing purposes (Rainbolt 1969: 356).

Hypothesis 14. A crucial part of the central role of the frontier town was its function as the sociopolitical center of the area of colonization. Until the fourth quarter of the seventeenth century, Jamestown served as focal point of such activity for much the entire peninsula area. At the beginning of the period of colonization, Jamestown was established as the chief city in Virginia,

and it was here that the officials of the colony resided. It remained the colony's administrative center during its first great period of expansion prior to 1622, and when the four boroughs were established, it was designated as the capital (Bruce 1910/II:292). Throughout the seventeenth century its position as the dominant community was reflected in its greater representation in the House of Burgesses.

Jamestown was the residence of the highest status position in the colony, the governor. The instructions of 1618 officially required that he live there on company lands set aside for this purpose (Bemiss 1957:96). Despite this statute, some governors, such as William Berkeley who lived at Green Spring, did not reside in the structure built for that purpose, but all of them maintained a house close to the town (Bruce 1910/II:337).

Jamestown was the seat of governmental activity in Virginia. The council met there throughout the seventeenth century, usually at the governor's house but occasionally in other houses designated for this purpose. The House of Burgesses regularly met there also but did not occupy a special state house until 1643. Prior to this time their meetings with the rest of the General Assembly were held in public structures large enough to accommodate them. These included the governor's house, the church, or one

of the local taverns (Bruce 1910/II:450). Four separate state houses were built at Jamestown, all of which were destroyed by fire. The burning of the last of these in 1698 prompted the removal of the government to Middle Plantation the following year (Jones 1956:63).

Jamestown was also the judicial focus of the area of colonization. The General Court, in which the governor and council sat as judge,s tried cases from all parts of the colony at Jamestown twice annually (Hartwell, et al. 1940: 46). Although originally intended to assemble in various parts of the colony, the low population density of most areas made the formation of juries to try criminal cases anywhere else impractical (Karraker 1930:109).

The Church of England in Virginia was under the jurisdiction of the Bishop of London and, therefore, had no established hierarchy in the New World. By the end of the seventeenth century each parish (which also served as an ecclesiastical unit) functioned independently of all others in religious matters. Each possessed its own church which was often a solitary structure situated at a crossroads or other strategic location. One of the most substantial of these was the parish church at Jamestown. The control of church affairs in Virginia, including the induction of ministers, was in the hands of the governor and council

(Hartwell, et al. 1940:67). A commissary, representing the Bishop of London, served as a member of the council as an advisor on religious affairs (Jones 1956:256).

While religious activity within the area of colonization was not solely confined to the frontier town, it was subject to regulation by a secular government there. Together with the marked reduction of status positions in the area of colonization, the concentration of these statuses in one location tended to focus the sociopolitical activity of the colony on the frontier town.

Hypothesis 15. The sociopolitical unity of the area of colonization has been alluded to previously in this chapter, but it is necessary to discuss it in greater detail here. Before the first colonist set foot on Jamestown Island in 1607, the sovereignty of England over this land was clearly expressed in the first charter of the Virginia Company. It stated that ". . . we [the crown] give and graunte . . . all the landes, tenements, and heredaments which shall be within the precincts limitted for that [Virginia] Colonie, . . . to be houlden to us, our heires and successors . . ." (Bemiss 1957:11). The first governor's instructions advised that all inhabitants of the colony maintain their loyalty to the governor and council as representatives of the king (Bemiss 1957:15). Religious

conformity was also expressly demanded of the colonists in the instructions of 1621 (Bemiss 1957:109), and there is evidence to indicate that adherence to the Church of England was enforced throughout the seventeenth century (Beverley 1947:68).

Perhaps the greatest threat to the unity of the frontier settlement in Virginia was the dispersal of the population which resulted in a breakdown of those cooperative patterns associated with village life in England and encouraged a tendency toward local autonomy (Bruce 1895/II: 524). As early as 1618 the governor was ordered to make an attempt to limit this dispersion by directing ". . . that no particular plantation be . . . placed stragglingly in divers places, . . . but shall be united together in one seat and territory . . ." (Bemiss 1957:102). Throughout the century directions from England and ordinances of the General Assembly were aimed at population consolidation and the building of towns, but all failed (Bruce 1895/II:524).

Sociopolitical unity was maintained by means of a flexible form of government through which the entire area of colonization could participate together with representatives of the company and later the crown. This is not to say that the government of Virginia was a purposeful attempt at forming a representative democracy, for the

governor's power remained supreme; but rather that it was a means by which the heterogeneous nature of frontier expansion could be checked. It allowed the colonists a significant role in determining the affairs of the colony, while at the same time it channeled dissent through a single governmental body and maintained sociopolitical unity through interaction.

Hypothesis 16. As the frontier expanded, the sociopolitical center of the Virginia colony shifted inland from the site of Jamestown to a position more ideally situated to the center of the area of colonization. The shift of political power is described by Jones (1956:66) as follows: "When the state house and prison [at Jamestown] were burnt down, Governor Nicholson removed the residence of the governor, with the meeting of General Courts and General Assemblies to Middle Plantation . . ."

The presence of central status positions at the new capital is indicated in the report of a 1701 Swiss observer who noted the presence of the governor's residence and the "houses of gentlemen" (Carson 1965:71). Jones (1956:71) wrote that: "Here dwell several very good families, and more reside here in their own houses at publick times. They live in the same neat manner, dress after the same modes, and behave themselves exactly as the gentry in London."

Williamsburg was also a local religious center on the parish level as was Jamestown. The Bruton Parish church was situated there. The original church was built in the dispersed settlement of Middle Plantation in 1683 but was replaced by a larger edifice in 1711 after the founding of Williamsburg on the same site. Perhaps the largest church in Virginia, it was described by Jones (1956: 70) as ". . . a large, strong piece of brick work in the form of a cross, nicely regular and adorned as the best churches in London." A contemporary account (Carson 1965: 2) stated that Williamsburg was the residence of the bishop, but he apparently mistook this office for that of the commissary who had moved there from Jamestown (Hartwell, et al. 1940:68).

Public buildings at Williamsburg were well-planned. The capitol or statehouse, was built ". . . in the form of an H nearly; the Secretary's Office and the General Court taking up one side below stairs; the middle being a handsome portico leading up to the Clerk of the Assembly's office, and the House of Burgesses on the other side; which last is not unlike the House of Commons (Jones 1956:69). In addition to the capitol other public buildings included a prison and a magazine, a public school, and the College of William and Mary (Carson 1965:1). The college was founded to

provide secular education in mathematics and philosophy as well as seminary training for the clergy (Hartwell, et al. 1940:68-69). Non-government public buildings included a theater (Jones 1956:70) and at least eight inns or taverns (Carson 1965:2).

Williamsburg itself was carefully planned to discourage the haphazard development that had characterized Jamestown (Reps 1972:75). It was laid out on a regular gridiron plan with public buildings strategically placed. Ordinances regulated the size of lots and the construction of private buildings. Although it never attained a size comparable to English cities of the period, it remained the socio-political center of Virginia for nearly eighty years, after which it was replaced by settlements closer to the edge of the moving frontier along the Fall Line (Morton 1960:360).

The Trade and Communications Subsystem

Hypothesis 17. Trade with the Indians in the area of colonization should have constituted only a small part of the colonial economy except perhaps during the period of initial contact. If regular trade existed at all, it would have been with groups with whom the colonists have only indirect contact.

Following the landing at Jamestown Island in 1607, a brief period of semi-friendly relations with the aboriginal inhabitants of the area occurred. John Smith (1907c: 133) wrote ". . . the Salvages, every other day, brought such plentie of bread, fish, turkies, squirrels, deare, and other wild beasts: part they gave as presents from the king [paramount chief]; the rest, hee as their market clarke, set the price how they should sell." The desire for European artifacts, especially those of metal, was great among the Indians, but the uncontrolled exchange of these items, particularly when supply ships landed, quickly deflated their value. When the colonists' crops failed and famine threatened in 1608, the Indians attempted to extort large sums of European merchandise for maize and other crops (Morton 1960:17). During this time, Smith was compelled to forcibly check ". . . the unreasonable desire of those distracted lubbery gluttons [colonists], to sell, not only our kettles, howes, tooles, and Iron, nay swords, pieces [firearms], & the very ordenance, and houses . . . to the Salvages, especially for one basket of corne . . ." (Smith 1969:447).

To prevent uncontrolled trade from continuing, the Virginia Company instructed Sir Thomas Gates in 1609 to be very wary of trading for provisions and ordered him to

regulate all trade in the colony. The instructions specified that, in particular, the trade in all potential weapons and the teaching of European manufacturing techniques were to be prohibited (Bemiss 1957:64). Apparently the early regulation had their desired effect, for in 1616 John Rolf (1951:6) wrote:

And whereas heretofore we were constrayned yerely to seeke after the Indians, and in-treat them to sell us Corn, which made them esteeme very basely of us: now the case is altered, they sue to us, come to our Townes, sell the skins from their shoulders, which are their best garments to buy corne.

Following the massacre of 1622 and subsequent English reprisals, the Indian trade in the immediate vicinity of the colony decreased. Exchange still took place, however, as seventeenth century court records cite cases of persons still occasionally trading for maize and animal skins (McIlwaine 1924). By the 1640's trading had been confined to those individuals granted commissions by the governor (McIlwaine 1924:500), to the dismay of at least one colonist who complained in Parliament that this restriction constituted an "interdiction and interception of the richest and choicest trade with the natives" (Stock 1924:124).

Prior to 1650 the only extensive commercial trading was conducted through the upper Chesapeake Bay region by boats moving up and down the estuaries. After the Indian

war of 1644, forts were established at the heads of the major rivers in the Coastal Plain, and these outposts formed the nucleus of the trade in skins which was to later expand into the overland trade of the eighteenth century (Morrison 1921:228). The erection of the forts not only established a military presence beyond the actual limits of the area of colonization but effectively ended most of the illicit trade with neighboring tribes (Beverley 1947:87). The cultures of the indigenous groups within, or in close proximity to, the area of colonization virtually disintegrated under the strain of European pressure, forcing their remaining members to undergo a massive adjustment to survive as marginal societies in the English colony. In contrast those groups further inland and not in direct contact with the settlement frontier were able to adapt in a much more flexible manner (Lurie 1959:60). Increasingly, English traders conducted their business among these peoples far outside the boundaries of the area of colonization resulting in less rapid and a somewhat more attenuated form of acculturation (Crane 1956:119). Explorations to the south and west of the colony in the late seventeenth century opened up new contacts in this region (Morrison 1921:87), and subsequent trade was increasingly confined to these more distant peoples.

Hypothesis 18. The frontier town plays a unique role in the trade and communication subsystem of the frontier area. First, it may have served as a major link between the area of colonization and the entrepot, which in this case was located in the metropolitan area. In addition it should have been the focus of trade and communications within the colony.

Rather than maintaining contact with a single port in England, Jamestown was linked with a number of such entrepots. Although the principal port from which the majority of people and supplies flowed, especially in the early years, was London, a number of other ports also participated in the trans-Atlantic trade with Virginia. Chief among them were Bristol, Weymouth, Dartmouth, Plymouth, Bideford, Barnstaple, and Southampton (Bruce 1895/I:620). The predominance of outgoing traffic from ports in the southwest of England is indicated by the trans-Atlantic migration of numerous species of insects native to this region to North America (Lindroth 1957:322). The animals were carried along with stone ballast, which was normally dumped in the New World upon taking on cargo.

At the time of the first landing in 1607, Jamestown served as a principal center through which English supplies and new colonists flowed. Its position near the mouth of

the James River allowed the town direct access to the sea, and the deep waters off its shore made it a natural port where oceangoing ships could anchor close to the bank (Argoll 1906:94). Throughout most of the period of the Virginia Company's control (1607-1624), it attempted to maintain monopoly over all external trade. Prior to 1619 no individual was permitted to deal with outside merchants, and all goods were distributed through a common magazine, administered first by the company and later as an association of individuals (Tyler 1907:264). With the revocation of the company charter, restrictions on trade were lifted, and the importation of goods into the growing number of settlements in Virginia increased (Morton 1960:131). Despite official discouragement, Dutch traders assumed an important role in the overseas trade of the colony prior to 1660 (Stock 1924:205). Virginia was also involved in regular trade with the Dutch colony, New Netherland, as well as British settlements in the West Indies, New England, and Maryland (Bruce 1895/II:299).

Although Jamestown served as the main port of entry in Virginia, the accessibility of much of the interior to water transport, often by seagoing vessels, tended to supersede a road system centering on the frontier town. The elaborate and convenient system of tidal rivers bypassed

the frontier town as a port. Direct loading of a bulky commodity such as tobacco saved much time and possible damage if loaded at the plantation. It also allowed the purchase of manufactured goods directly from the importer (Bridenbaugh 1950:8). Unlike most frontier areas, eastern Virginia possessed an ecological factor which constantly worked against the concentration of trading activities in the social and political focus of the frontier. Despite the apparent advantages of dispersed landing of goods, it must be emphasized that the necessity of regulating a system, the centralization of which the very existence of the colony depended upon, was so apparent to the government and in the colony that measures were continually taken to maintain a single chief port. Throughout the seventeenth century, numerous attempts were made by the government to restrict dispersed trade, which had a tendency to isolate portions of the colony. In 1624 the General Assembly passed an act prohibiting any incoming vessel from breaking bulk or making any private sales until it had reached Jamestown (Kingsbury 1935/IV:583). A petition to the King's Privy Council twelve years later, however, complained that such a law had become unworkable in that the storage facilities there were inadequate (Sainsbury 1860:281).

Equally awkward was legislation such as the Act of Cohabitation of 1680 which sought to solve the problems of dispersed trading by creating a series of ports throughout the area of colonization and restricting all trade to them (Beverley 1947:72). Had it gone into effect, it would scarcely have improved upon the transportation problems involved in moving commodities to Jamestown (Bruce 1895/II:554). The Act of Ports passed eleven years later was somewhat more successful in that it allowed several potential port sites to be surveyed, including Yorktown, but within three years pressure on the government from merchants caused it to be repealed (Bruce 1895/II:561).

Additional light is shed on the role of early Virginia centers of trade by Soltow's (1958) recent study of Williamsburg. In it he argues that, although the riverine geography of the Virginia Coastal Plain encouraged the dispersal of the actual movement of goods in and out of the colony, the capital served as the clearinghouse for financial transactions and as the central market for the colony's export commodities. As the extension of credit was an essential part of a colonial economy based almost entirely upon the export sale of tobacco, the establishment of a single location for the clearing of credit transactions affecting both imports and exports

inherently linked trade within and outside of the colony to a single focus. In addition to fulfilling such a role, Jamestown's port continued to draw a portion of commerce greater than all other settlements and remained the chief port of embarkation for new settlers during the seventeenth century.

The redistribution of commodities within the area of colonization is also closely tied to the role of the frontier town. Because of the dispersed pattern of settlement in Virginia, all trading that was done directly between the planters and individual merchants was conducted through a network, the center of which was the port of Jamestown (Jones 1956:66). Even as late as 1697, Hartwell, et al. (1940:10) commented that the lack of markets outside this frontier town "encouraged dependence on subsistence alone and discouraged tradesmen." The distribution of imported goods, which comprised the bulk of the finished products in the colony, was conducted by individual agents who, representing themselves or English merchants, maintained stores in Virginia. Of the impact of this trade, Jones (1956:88) wrote:

This trade is carried on in the fairest and genteelest way of merchandize, by a great number of gentlemen of worth and fortune; who with the commanders of their ships, and several Virginians . . . make as considerable

and handsom a figure, and drive as great and advantageous a trade for the advancement of the publick good, as most merchants upon the Royal Exchange.

Apart from the rivers as routes of trade, a road network for land communication was begun when the colony expanded outward from Jamestown. The roads were designed to connect the frontier town with the plantations on both sides of the peninsula as well as to link the settlements with one another (Bruce 1895/I:418).

The earliest reference to highways appears in the Virginia Company's instructions of 1621 which instruct the governor to survey the best routes for future roads as well as the locations of necessary bridges and fords (Bemiss 1957:120). The construction of roads, however, was long delayed. Although the first ordinance for public roads was passed by the General Assembly in 1632 and made highway construction the responsibility of the parish (as in England), it was not until thirty years later that effective steps were taken to establish and maintain an adequate system of roads on the Virginia peninsula (Bruce 1895/I:419). This highway system was designed to connect the country churches in each parish or county with one another and finally to tie the entire road network to Jamestown. This ensured the communication of all parts of the colony with the seat of government.

Early roads were built along the watersheds above the heads of the many small streams in order to avoid the ravines along their courses, but by the end of the century bridges and ferries had been set up to shorten traveling distances and to allow direct access to most areas (Jones 1956:85). The network of roads expanding outward from Jamestown consisted of the "Great Road" leading from the town across the isthmus to the mainland where it branched into two major forks. One led westward to Green Spring and other settlements along the river, and the other turned north toward Middle Plantation and points to the north and east. A number of lesser branch roads to individual plantations also separated from the road near this point (Forman 1940:482-483). Finally, ferries were established at various places where bridges were impractical. In 1696 ferries crossed the James River at Jamestown as well as at Henrico and Bermuda Hundred (Bruce 1895/I:423).

In summary, colonization in Virginia was unique in that a complete network of rivers and their tributaries allowed access by oceangoing vessels to all parts of it. Despite the dilatory effect of this on internal exchange, Jamestown still emerged as a center of communication within the colony and conducted the largest amount of trade with the outside world.

Hypothesis 19. As in the case of the other three subsystems, the shift of the location of the frontier town through time entails a change in the focus of trade and communication within the area of colonization. In Virginia one would expect this change to be reflected in the decline of Jamestown as a center of such activity with its role being assumed by Middle Plantation (Williamsburg).

The decline of Jamestown at the end of the seventeenth century has already been discussed. With the removal of the government and most of the population to Middle Plantation at this time, the function of the early settlement as a port and focus of communication ceased (Tyler 1906:82).

The position of Williamsburg as a communication center was noted by Hugh Jones (1956:66):

Here he [Governor Nicholson] laid out the city of Williamsburgh on a ridge at the headsprings of two great creeks, one running into James, and the other into York River, which are each navigable for sloops, within a mile of the town: at the head of which creeks are good landings, and lots laid out, and dwelling houses and warehouses built; so that this town is most conveniently situated in the lower part of Virginia, commanding two noble rivers, not above four miles from either.

Not only was the new frontier town well situated for commerce with the outside world, but it also lay in a strategic location to allow access overland to inland settlements and

those along the York River. Of Williamsburg's role in exchange within the area of colonization, Jones (1956: 71) wrote: "Williamsburgh is now incorporated and made a market town, . . . and is well stocked with rich stores, all sorts of goods, and well furnished with the best provisions and liquors."

Since Williamsburg did not possess a deep-water port as did Jamestown, it was necessary to establish a link by which it could receive commodities from the metropolitan area prior to redistribution in the interior. The settlement of Yorktown on the York River seems to have been established to fulfill this role. Founded at the end of the seventeenth century, it served as the ocean port for Williamsburg. The link between the two towns is reflected not only in their parallel rise and growth but also in their common decline about the time of the American Revolution with the establishment of newer ports and interior towns further west (Reps 1974:84).

Documentary evidence supporting the conclusions reached by the archaeological analysis clearly indicates that the process of frontier change did occur in peninsular Virginia in the seventeenth century and did entail the systemic changes hypothesized in Chapter V. Of greatest significance perhaps is that it confirms the

conclusions arrived at through the use of archaeological methodology. The ability of an investigator utilizing two separate forms of data and two distinct methodologies to arrive at parallel results graphically illustrates the potential of both in the investigation of past sociocultural processes. History and archaeology need not be unequal partners in the study of culture change with archaeology playing the role of the "auxiliary science" as suggested by some (see Harrington 1955:1128), but rather, as Schuyler (1970:89) has pointed out, they may be viewed as comparable methods of investigation capable of producing equally meaningful results.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

In the preceding chapters of this study an ethnographic model of sociocultural change has been presented. It was developed to explain the adaptation of complex societies to the conditions encountered in the establishment of colonies in remote frontier areas. The frontier model describes a process of culture change deduced from the field observations of ethnographers and documentary research by historians. It is assumed here that the characteristics of the model are reflections of specific variations within the structure of the sociocultural systems of intrusive peoples in frontier situations. This system has been further broken down into four subsystems which provide a means by which to conveniently study separate though interrelated aspects of its structure. A series of nineteen hypotheses were constructed to describe expected changes in the four subsystems. These hypotheses

as they deal with structural changes upon which the patterning of archaeological and ethnographic data is based have been shown to be directly testable through an examination of the archaeological record.

In order to examine the accuracy and general applicability of archaeological methodology in the recognition of processes of change such as that described in the frontier model, the study of the archaeological data was conducted in a situation for which a source of information apart from the archaeological record was available as a check on the results obtained from the latter. The presence of adequate historical documentation concerning the development of the seventeenth century English frontier in Virginia was sufficient to serve as such an independent source of information. This documentation clearly indicates the occurrence here of the changes described in the frontier model.

The test of the archaeological method was accomplished by constructing a number of test implications for each of the nineteen hypotheses derived from the frontier model. The archaeological data were then examined in terms of each of the implications to determine whether or not the hypotheses could be verified. In order to corroborate the assumption that with archaeological methodology it is possible to recognize the process of change described by the

frontier model, it was necessary that each of the test implications be observable in the data. This is not to say that every implication was equally demonstrable, but rather that none were negated by the data. Some obviously appeared more amenable to scrutiny by archaeological analysis than others, but this seems to have been a function of the techniques by which the data were gathered and the problem-orientation of the investigators rather than a fault of the method of interpretation. This condition has, however, in no way impaired the results of the study, for each hypothesis has been confirmed.

In the case of the archaeological analysis of the Virginia frontier, all of the hypotheses were substantiated just as they were by the documentary evidence. Archaeological methodology has here been demonstrated as a means by which an investigator is able to interpret material remains in order to achieve the same type of results as the social anthropologist who works with a "living" culture or the historian who has access to extensive archival materials. Each has the ability to ask similar questions concerning patterns of human behavior and to formulate as well as to test equally cogent hypotheses about processes of sociocultural change.

A key to understanding an interpretation of the structural dynamics of culture is the realization that they

must be viewed as the reflection of human behavior within a larger ecosystem. Human populations are seen as one component within such a system which also includes the natural environment, other societies, and its own past adaptations. Each component is interrelated with all others in the system and responds in some way to changes in any of them.

[The entire system is self-regulating in that it tends toward a state of homeostasis.] Normally this involves responding in order to remain within a restricted range of variation but may also result in greater change due to the "deviation amplifying" nature of the response to the extensive alteration of certain variables. As culture is the means by which a human population adapts to its larger environment, this adaptation should reflect the nature of its interrelationship with the other components of the ecosystem. The patterning of man's adaptive response is readily perceivable by the ethnographer who directly observes behavior within a living society. It may also be discerned by the archaeologist who analyzes the distribution of the material remains left behind by a society of the past.

Because of the complexity of the system of which human society is a part, it is desirable to study it in terms of its constituent subsystems which are defined to include the interrelationship of only a certain number of

variables within the total system. In this way it is possible to deal with limited aspects of culture without ignoring the rest and to concentrate one's inquiry upon those data most relevant to the problem under consideration.

The systems approach not only provides a means by which to analyze human societies in terms of the larger ecosystem of which they form an integral part but also allows the investigator to observe sociocultural change as an adaptive response to other variables within the system rather than as a random occurrence. This approach is especially relevant to the study of culture process as it provides the potential for establishing closer controls over the phenomena upon which the definition of such cross-cultural regularities is based. Clearly, it has been possible to elaborate upon the frontier model in this manner by reducing its basic generalizations to a series of hypotheses concerning the systemic variation that is likely to accompany them. These hypotheses should be of great utility in the investigation of other situations of culture contact and colonization, for it is possible to convert such hypotheses into expected observations for researchers dealing with diverse types of data. The approach illustrated here may aid in providing comparative information necessary to conduct future studies of frontier change as well as those of numerous other cultural processes.

The characteristics of the frontier model may clearly be seen as the result of the interaction of the four subsystems outlined in Chapter III. For example, the distinctive settlement pattern in the area of colonization is far more than simply a response to an excess of arable land by a society practicing mixed agriculture and capable of rapid expansion. Rather, it is also an adaptation of the trade and communications subsystem to a "trackless" countryside through which movement is severely limited for want of roads and other routes of communication. Habitation in coastal Virginia tended to be restricted to the edge of navigable rivers and streams and to those few overland roads, resulting in a dispersed pattern of settlement. The limitations of seventeenth century transportation and the relative isolation of the Virginia colony affected the subsystem by virtually forcing the colonists to adopt both New World cultigens and agricultural techniques during the initial period of colonization. Their employment encouraged the cultivation of lands most suitable to farming. The rapid exhaustion of soil resulting from the extensive growing of crops such as tobacco without subsequent fertilizing tended to steadily increase the area under cultivation and to further scatter settlement.

As the small size and primarily agricultural nature of the colony precluded the establishment of industry at the level present in England, the area of colonization remained tied to the economic subsystem of the metropolitan area in a markedly dependent relationship. This situation further discouraged the formation of nucleated settlements which would normally have grown up in the vicinity of industrial activities. Finally, the sociopolitical organization of seventeenth century England was streamlined in Virginia in an attempt to place colonists of diverse backgrounds into an organizational framework that would allow adequate control under the harsh frontier conditions. The abolishment of a multiplicity of statuses, many of which had overlapping functions, reflected an attenuation of the social subsystem developed by a society which had formerly lived in nucleated settlements.

The systemic changes present on the frontier appear to have been immediate, with no transitional stages between the colonial culture and that of the metropolitan area. The adaptations required by the settlement of a frontier in Virginia brought about often drastic modifications in the subsystemic structure of English culture resulting in a viable new equilibrium. This is not to say that colonial culture was no longer tied to the metropolitan area, for

the former could not exist apart from the latter. Many aspects of English culture proved very adaptive to the new environment, while others seem to have been retained despite their apparent disadvantage. The significance of change on the frontier is not to be found in the retention or loss of such isolated traits but rather in the changes of the patterns of these elements within the cultural whole. The alteration of these patterns is reflected in the archaeological record and is, therefore, as easily discernible in a past culture as in a presently existing one. Within the predictive framework of the frontier model, it has been possible to observe systematic change entailing a drastic restructuring of a past culture without overlooking the continuities which accompanied it.

Finally, it seems appropriate to discuss the relationship of the field of historic site archaeology to this study of the role of archaeological methodology. Recently, a number of authors have expressed varying opinions concerning the affiliation of historic site archaeology and the larger field of anthropology (see Dollar 1968; Walker 1968a and 1970; Cleland and Fitting 1968; and Binford 1972). Basically, they have taken two positions. The first, and more traditional historical approach, assumes that the comprehension of past events is based upon the investigator's

understanding of the unique circumstances under consideration. This understanding is generally arrived at empathically by imagining oneself in the place of the persons involved in the events which he wants to explain. Furthermore, it is argued, since historical events are unique, that it is impractical to attempt to explain them through the use of generalizations.

The second approach is generally followed by many anthropologists. They contend that it is nonproductive to attempt to analyze past events in terms of themselves, and instead it is necessary to formulate generalizations through which past phenomena may be interpreted and explained. This argument has been discussed in greater detail in Chapter I and has been followed in this study.

Perhaps the greatest difficulty in the path of the construction of general propositions upon which reliable historical interpretation of cultural phenomena can be based is a lack of understanding of those processes responsible for the formation of the archaeological record and those which determine change and maintain diversity in sociocultural systems. Deetz (1971:123) sees the solution to this problem chiefly as one of clarifying the relationships between the material and nonmaterial aspects of the archaeological record. He recognizes historic site

archaeology as unique in that it is able to provide a context in which this relationship may be examined. It can do so by providing the investigator with a form of data apart from the archaeological record alone. With regard to the significance of historic site archaeology in the study of this relationship and sociocultural change in general, Binford (1972:123) has written:

Historic sites work seems to be particularly suited to this type of development since many conditions of the past are known through written documentation. We are, therefore, in a more informed position to test the validity of generalizing propositions than many prehistoric archaeologists working in a less informed domain.

In this study an attempt has been made to utilize a historically documented situation in the investigation of a particular process of sociocultural change. Although our primary goal has been to demonstrate the utility of archaeological methodology, an important byproduct of this exercise has been the verification of Binford's assumption that historic site archaeology has the capability of testing generalizations concerning such changes. It is hoped that the vast potential offered by the investigation of historic sites may, in the future, be utilized in the exploration of other processes of sociocultural change. This virtually untapped source of data has an unlimited potential to reflect upon and increase anthropological knowledge in general.

APPENDIX A

NEAREST NEIGHBOR ANALYSIS OF SETTLEMENT PATTERNS

The nearest neighbor analysis is designed as a measure of the manner in which, and the degree to which, the distribution of individuals in a population on a given area departs from that of a random distribution. In the random distribution of a set of points on a given area, it is assumed that any point has the same chance of occurring in a particular place as any other.

The measure of spacing is based on the distance from an individual to its nearest neighbor, irrespective of direction. A mean distance for all of the distances between neighbors in a given population (r_A) is derived as is the expected value if the points are randomly distributed (r_E). The ratio of these two values serves as the measure of the departure from randomness in each of the populations to be compared. The other necessary values are: N = the number of measurements taken, and P = the density of the observed distribution. The calculation of R is:

$$P = \frac{N}{\text{Area}} \quad , \quad r_E = \frac{1}{2\sqrt{P}} \quad , \quad \text{and} \quad R = \frac{r_A}{r_E}$$

The following table illustrates these values for a portion of the English Midlands and coastal Virginia.

	<u>Midlands</u>	<u>Virginia</u>
N	69	26
P	.56	.01
r_A	.96	3.65
r_E	.67	5.00
R	1.43	.73

APPENDIX B
MEAN CERAMIC DATES AND PIPESTEM DATES
FOR STRUCTURES AT JAMESTOWN

The mean ceramic date formula was developed by Stanley South (1972:83) as a technique by which to measure the mean dates of English colonial American sites. It is based on the assumption that a ceramic type's popularity will represent a unimodal curve through time, reaching a peak between the time of its introduction and its discontinuance. The median date is represented by this peak in popularity. It is also assumed that the rapid distribution of ceramic types in the English colonies represents an horizon as defined by Willey and Phillips (1962:33) in which the ceramic culture traits in colonial american sites were approximately contemporaneous. Utilizing Noel Hume's A Guide to Artifacts in Colonial America (1970) as a source for the median dates for the use-span of ceramic types, the mean date (Y) for the group of ceramics present at a particular site is calculated by the following formula:

$$Y = \frac{\sum_{i=1}^n X_i \cdot f_i}{\sum_{i=1}^n f_i}$$

where: X_i = the median date of use

f_i = the frequency of each ceramic type

n = the number of ceramic types in the sample

An example of the use of this technique is illustrated for the ceramic sample from Refuse Pit 1 at Jamestown.

<u>Ceramic Type</u>	<u>Type Median (X_i)</u>	<u>Sherd Count (f_i)</u>	<u>Product</u>
	$(X_i - 1600)$		
Blue-grey stoneware	1668	68	920
Brown stoneware	1660	60	4080
Slipped earthenware	1650	35	1750
Decorated delft	1650	50	9200
		<u>184</u>	<u>9200</u>
		302	15950
			=
			$\sum_{i=1}^n X_i \cdot f_i$

$$Y = \frac{15950}{302} + 1600 = 52 + 1600 = 1652$$

The pipestem dating formula is based upon the observation that the stem hole diameters of English clay pipes became progressively smaller (4/64 to 9/64 inch) at a constant rate throughout the seventeenth and eighteenth centuries (see Harrington 1954). Lewis Binford (1962:19) has taken

the mean stem hole diameters and their equivalent chronological scale and computed the following straight line regression formula:

$$Y = 1931.85 - 38.26 X$$

where Y = the date to be determined

1931.85 = the theoretical date when the projected regression will reach 0.

38.26 = the intervening number of years between the means of any two of the metrical categories.

X = the average of the stem hole diameters of the sample (4/64 - 9/64 inch).

This formula is used to compute the mean date for Refuse Pit 1 at Jamestown.

<u>Stem Hole Diameter</u>	<u>Number of Specimens</u>	<u>Product</u>
6/64"	3	18
7/64"	31	217
8/64"	250	2000
9/64"	85	765
	<u>369</u>	<u>3000</u>

$$X = \frac{3000}{369} = 8.13$$

$$Y = 1931.85 - 38.26 \cdot 8.13$$

$$Y = 1931.85 - 311.05$$

$$Y = 1620$$

In an attempt to improve the utility of pipestem hole diameters as a means of dating archaeological sites, Heighton and Deagoan (1972:221) have presented another regression formula based upon a second degree polynomial

curve popularly known as the Compound Interest Rate Curve. They established seven units of twenty-two years each with values of -3 through +3, with the year 1711 as the midpoint of the curve. In this formula, X is the value the investigator wishes to date expressed in terms of these units. It is derived by utilizing the following formula:

$$X = \frac{-\log Y + 1.04435}{.05234}$$

in which Y is the mean stem hole diameter. To convert this value into a date, it must be multiplied by 22 and added to 1600, the origin date of the formula.

An example of the use of this technique is the application of the formula to the data from Refuse Pit 1 at Jamestown. From the Binford formula the mean diameter (Y) is known to be 8.13. The log of 8.13 = .91009. From this the value of X is derived as follows:

$$X = \frac{-.91009 + 1.04435}{.05234} = \frac{.13426}{.05234}$$

$$X = 2.56515$$

The date may then be calculated as follows:

$$\begin{aligned} \text{Date} &= 1600 + 22X \\ &= 1600 + 22 \cdot 2.56 \\ &= 1656 \end{aligned}$$

The three techniques yield the following results when applied to the data from Jamestown. Due to the inadequate

nature of the recording and preservation of some of the materials recovered in the early excavations, it has not been possible to calculate the mean dates for all of the units excavated.

A comparison of the results derived using the three techniques shows several interesting characteristics among the derived dates. First, the Binford formula dates are consistently earlier than those derived by the Heighton-Deagan formula in several instances, indicating occupations quite early in the seventeenth century. The 105-year range of the Binford dates is very broad, indicating an overall occupation for the site from 1606 to 1711, while the range of the latter has a more restricted range of seventy-four years, falling between 1647 and 1719. The dates obtained using the South ceramic formula indicate an occupation in the second half of the seventeenth century with a range of thirty-one years from 1649 to 1680.

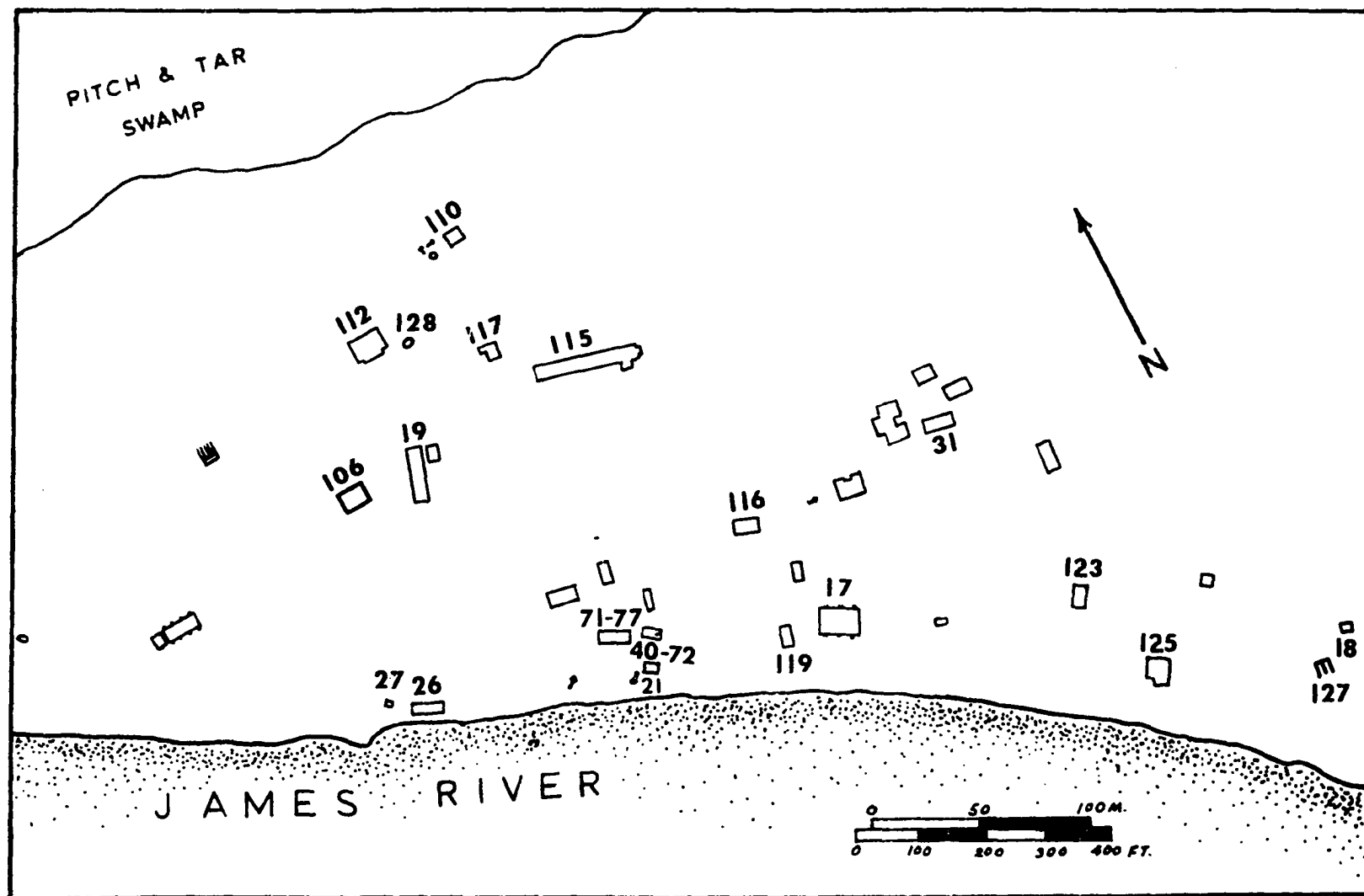
When compared graphically (Fig. 35), the distributions of the dates become somewhat more clear. If we eliminate the two units in the pipestem formulas for which there are no ceramic dates, the curves of the ceramic graph and the Heighton-Deagan graph show a noticeable similarity, while the curve of the Binford graph is widely spread with a number of low peaks. This seems to suggest that the straight line regression is less representative

Table 4Mean Dates for Structures at Jamestown Based Upon
Ceramic and Pipestem Hole Analyses

<u>Structure*</u>	<u>Use</u>	<u>Ceramic Date</u>	<u>Binford Date</u>	<u>Heighton and Deagan Date</u>
17	Row house (B)	1666	1688	1699
18	House (B)	1650	1662	1682
19	House & Kitchen (B)	1649	1660	1679
21	House (F)	1687	1659	1680
26	Warehouse (B)	1667	1649	1672
27	Pottery kiln (B)	1662	1655	1677
31	House (B)	Insufficient Data	1711	1719
40-72	House (B)	Insufficient Data	1693	1704
71-77	House (F)	1670	1667	1684
106	House (B)	Insufficient Data	1644	1670
110	Brewery ? (B)	1651	1628	1660
112	House (B)	1673	1628	1660
115	Row House (B)	1663	1682	1695
116	House (F)	1680	1655	1677
117	House (B)	1653	1635	1665
119	Workshop (B)	1678	1667	1685
123	House (B)	1672	1688	1698
125	House (B)	1673	1674	1690
127	Brick kiln (B)	1677	1606	1647
128	Ice pit (B)	1660	1621	1656

B = Brick construction, F = Frame construction

* See Figure 34.



437

Fig. 34. - Locations of Jamestown structures dated by ceramic and pipestem hole analyses.

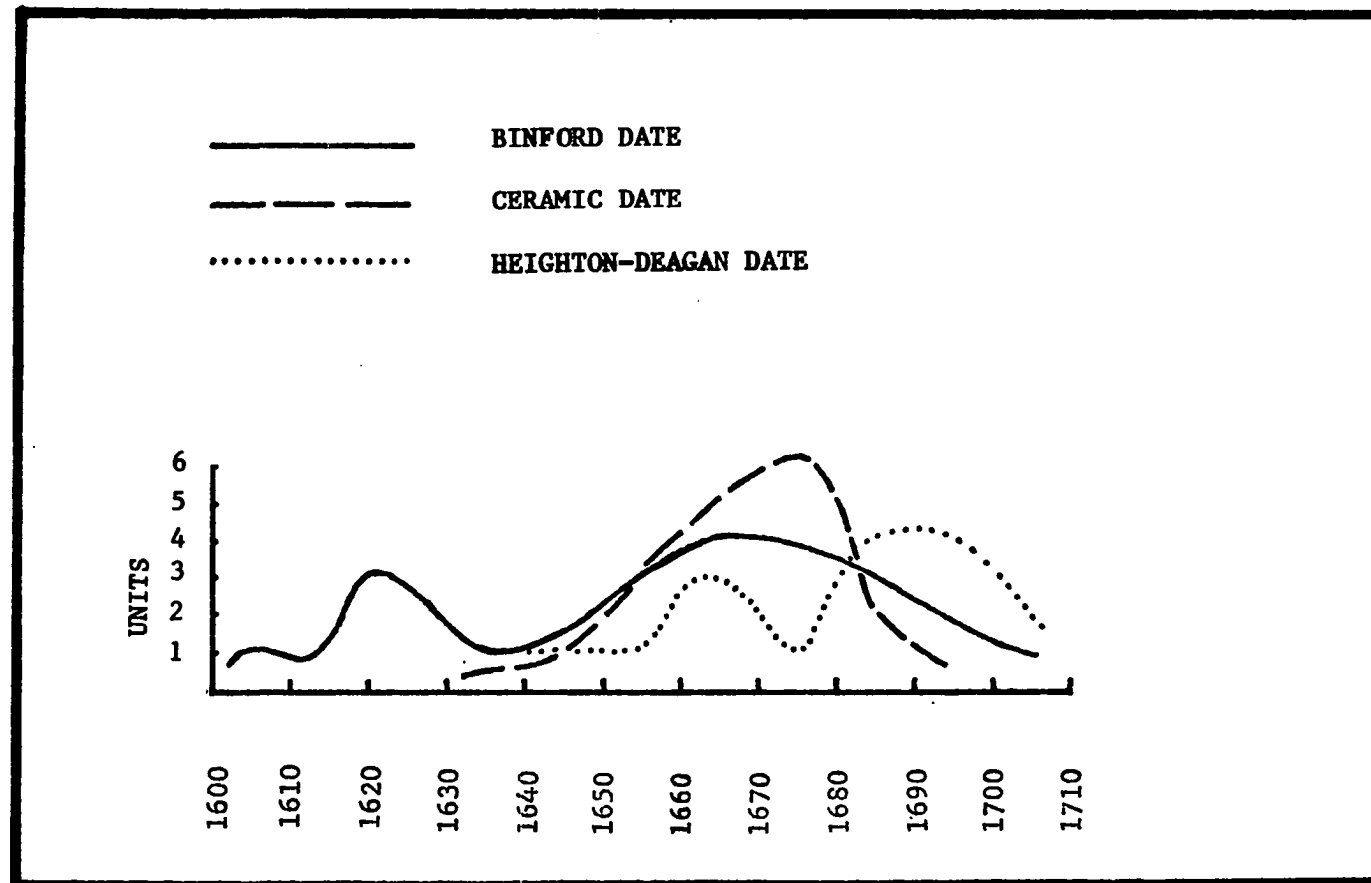


Fig. 35. -- Graphic comparison of dating techniques.

of the rate of change than is the polynomial curve. The ceramic and Heighton-Deagan curves show a peak in the fourth quarter of the seventeenth century, the peak of the latter is bimodal and suggests a slightly later occupation. Its mean date of 1673 is also slightly later than the 1663 mean date of the ceramic distribution.

These discrepancies may be due to several reasons. First, the artifact samples from the site may be incomplete due to inadequate or biased collection and preservation of materials from many of the units excavated in the early years of the archaeological work. The subsequent loss of artifacts and other data in storage prior to the completion of the final analysis may also have affected the sample. Second, the ceramic categories recorded for many of the more precisely defined types utilized by the South formula into larger groups. For this reason only certain wares may be defined, and all dates must be calculated on the basis of these. Third, the importation of non-English goods, especially by the Dutch, may very likely have contaminated the sample of white clay pipestems. Foreign pipes apparently did not follow the same trend toward decreasing bore diameter size as did their English counterparts and, therefore, would tend to skew the distribution of the sample. The possibility of post-1700 occupation may well be indicated by the presence of pipestems with holes measuring smaller than 5/64 inch, a

size common in the last quarter of the seventeenth century and throughout the eighteenth century (Walker 1968b:99), but the absence of stems measuring 4/64 inch seems to preclude an occupation later than 1725.

The close correspondence of the ranges and distributions of the ceramic dates and the Heighton-Deagan pipestem dates strongly implies an occupation of the excavated portion of Jamestown in the last half of the seventeenth century. This time, span is also indicated by other types of artifacts associated with the excavated structures. It strengthens the assumption that the town east of the church was constructed later than the original town, the site of which now lies beneath the 1861 fort or has been eroded by the James River.

APPENDIX C

PERCENTAGE OF OCCURRENCE OF SUBSISTENCE ARTIFACTS

IN JAMESTOWN STRUCTURES AND OTHER STRUCTURES

WHERE THEY OCCUR IN RELATION TO OTHER METAL ARTIFACTS

<u>Structure</u>	<u>Number of Subsistence Artifacts</u>	<u>Number of Other Artifacts</u>	<u>Total</u>
17 West	0	67	67
17 Central	1	121	122
17 East	0	60	60
18	2	22	24
19	0	39	39
21	1	31	32
31	0	96	96
26, 27, 28	0	32	32
40-72	0	(identified) 2	2
44-53-138	0	62	62
106	0	(identified) 6	6
110	3	100	103
112	0	293	293
115 Cellar 1	2	284	286
115 Cellar 2	0	59	59
115 West of Cellars	3	42	45
116	0	1	1
117	0	29	29
123	9	39	48
125	3	43	46
Totals	21	1328	1349
Clay Bank	6	36	42
Lightfoot Site	2	23	25
Kecoughton	9	18	27
Tutter's Neck	4	21	25
Totals	21	98	119

APPENDIX D

DERIVATION OF CHI SQUARE VALUE FOR THE RELATIONSHIP BETWEEN SITE LOCATIONS AND THE EXTENT OF AGRICULTURAL SUBSISTENCE

- H_1 The two variables are statistically independent (There is no relationship between site location and the association with agricultural subsistence activities).
- H_2 The two variables are not statistically independent (There is a relationship).

Data Tabulation on Contingency Table

Location	Association with agricultural subsistence activities		
	B_1	B_2	Totals
	Subsistence artifacts	Other artifacts	
A_1 Town Structure	21 (4.104)	1309.456	1349
A_2 Rural Structure	21 (2.936)	119.504	119
Totals	42	1426	1468

Numbers in parentheses are expected frequencies.

Estimation of expected frequencies if H_1 holds:

$$\bar{P}(A_1) = \frac{1349}{1468} \approx .92$$

$$\bar{P}(B_1) = \frac{42}{1468} \approx .03$$

$$\bar{P}(A_2) = \frac{119}{1468} \approx .08$$

$$\bar{P}(B_2) = \frac{1426}{1468} \approx .97$$

The estimated joint probabilities are:

$$\bar{P}(A_1 \text{ and } B_1) = (.92) (.03) = .028 \times 1468 = 4.104$$

$$\bar{P}(A_1 \text{ and } B_2) = (.92) (.97) = .892 \times 1468 = 1309.456$$

$$\bar{P}(A_2 \text{ and } B_1) = (.08) (.03) = .002 \times 1468 = 2.936$$

$$\bar{P}(A_2 \text{ and } B_2) = (.08) (.97) = .078 \times 1468 = 114.504$$

1.000

1431.000

TOTALS

The calculation of the test statistic:

Joint Class.	Sample Freq(f_s)	Est. Joint Prob. if H_1 holds	Est. Expec. Freq(f_e)	$f_s - f_e$ Deviation	$(f_s - f_e)^2$ Squared Devia.	Relative Sq Deviation $(f_s - f_e)^2 / f_e$
$\bar{A}_1$ and B_1	21	.028	4.104	16.896	285.475	69.560
A_1 and B_2	1328	.892	1309.456	18.544	343.880	.263
A_2 and B_1	21	.002	2.936	18.064	326.308	111.140
A_2 and B_2	98	.078	114.504	-16.504	272.382	2.379
TOTALS	1468	1.000	1431.000			183.342

$$V_1 = \sum \frac{(f_s - f_e)^2}{f_e} = 183.342$$

d. f. = 1 Error = .01

If $V_1 < 6.635$, conclude H_1

If $V_1 > 6.635$, conclude H_2

As $183.342 > 6.635$ there is a statistically significant relationship between the location of the structures and their association with agricultural subsistence activities.

BIBLIOGRAPHY

Allen, Jim

- 1973 The archaeology of nineteenth-century British imperialism: an Australian case study. World Archaeology 5(1):44-60.

Amadas, Philip and Arthur Barlowe

- 1904 The first voyage made to the coast of Virginia. In The principal navigations, voyages, traffiques, and discoveries of the English nation, edited by Richard Hakluyt, 8:297-309. James MacLehouse and Sons, Glasgow.

Andrews, Charles M. (ed.)

- 1915 Narratives of the insurrections, 1675-1690. Charles Scribner's Sons, New York.

Archer, Captain Gabriel

- 1969 A relatyon...written...by a gent. of ye colony, 21 May - 21 June, 1607. In the Jamestown voyages under the first charter, 1606-1609, edited by Philip L. Barbour, Hakluyt Society, Series 2(136):80-102.

Argoll, Sir Samuel

- 1906 A letter of Sir Samuel Argoll touching his voyage to Virginia, and actions there: written to Master Nicholas Hawes, June 1613. In Hakluytus posthumus or Purchas his pilgrimes, contayning a history of the world in sea voyages and lande travells by Englishmen and others, Vol. 19, edited by Richard Hakluyt, pp. 90-94. James MacLehouse and Sons, Glasgow.

Ashby, W. Ross

- 1956 An introduction to cybernetics. J. Wiley, New York.

Ault, W. O.

- 1972 Open-field farming in Medieval England, a study of village by-laws. Barnes and Noble, New York.

- Bagley, J. J. and P. B. Rowley
 1966 A documentary history of England, Vol. I: 1066-1540. Penguin Books, Harmondsworth, Middlesex.
- Bailey, Worth
 1937 A Jamestown baking oven of the seventeenth century. William and Mary College Quarterly, Series 2, 17(4): 496-500.
- 1938 Lime preparation at Jamestown in the seventeenth century. William and Mary College Quarterly, Series 2, 18(1):1-12.
- Bailyn, Bernard
 1969 Politics and social structure. In Bacon's rebellion, prologue to the Revolution?, edited by John B. Frantz, pp. 69-75. D. C. Heath and Co., Lexington, Massachusetts.
- Baldwin, R. E.
 1956 The pattern of development in newly settled regions. The Manchester School of Economic and Social Studies 24(1):161-179.
- Baker, Steven G.
 1972 Colono-Indian pottery from Cambridge, South Carolina, with comments on the historic Catawba pottery trade. University of South Carolina Institute of Archeology and Anthropology, Notebook 4(1):3-30.
- Banks, F. R.
 1963 English villages. B. T. Batsford, Ltd., London.
- Barbour, Philip L. (ed.)
 1969 The Jamestown voyages under the first charter, 1606-1609, 2 vols. Hakluyt Society, Series 2 (136-137).
- Barka, Norman F.
 1973 The kiln and ceramics of the "poor potter" of Yorktown: a preliminary report. In Ceramics in America, edited by Ian M. G. Quimby, pp. 291-318. University Press of Virginia, Charlottesville.
- Bartlett, K. S.
 1972 Excavations at Potovens, near Wakefield, 1968. Post-Medieval Archaeology 5:1-34.

- Baylor, J. B.
 1895 Survey of oyster grounds in Virginia. Report to the Governor of Virginia, 1895.
- Bean, J. M. W.
 1963 Plague, population and economic decline in the later Middle Ages. The Economic History Review 25 (3):423-437.
 1968 The decline of English feudalism, 1215-1540. Manchester University Press, Barnes at Noble, Inc., New York.
- Bemiss, Samuel (ed.)
 1957 The three charters of the Virginia Company of London; 1606-1621. Jamestown 350th Anniversary, Historical Booklet 4.
- Bennett, Hugh Hammond
 1921 The soils and agriculture of the southern states. The Macmillan Company, New York.
- Bennett, M. K.
 1968 British wheat yield per acre for seven centuries. In Essays in agrarian history, Vol. I, edited by W. E. Minchinton, pp. 53-72. David and Charles, Ltd., Newton Abbot, Devon.
- Beverly, Robert
 1947 The history and present state of Virginia (1705), edited by Louis B. Wright. The University of North Carolina Press, Chapel Hill.
- Binford, Lewis R.
 1962 A new method of calculating dates from kaolin clay pipestem samples. Southeastern Archaeological Conference, Newsletter 9 (1):19-21.
 1964 Archaeological and ethnohistorical investigation of cultural diversity and progressive development among aboriginal cultures of coastal Virginia and North Carolina. Ph.D. Dissertation, University of Michigan. University Microfilms, Ann Arbor.
 1965 Archaeological systematics and the study of culture process. American Antiquity 31(2):203-210.

- 1968 Archeological perspectives. In New perspectives in archeology, edited by Sally R. and Lewis R. Binford, pp. 5-32. Aldine, Chicago.
- 1972 Evolution and horizon as revealed in ceramic analysis in historical archaeology--a step toward the development of archaeological science. The Conference on Historic Site Archaeology, Papers 6:117-126.
- Blanchard, Ian
 1970 Population change, enclosure, and the early Tudor economy. The Economic History Review 23(3):427-445.
- Boserup, Esther
 1965 The conditions of agricultural growth: the economics of agrarian change under population pressure. Aldine, Chicago.
- Bouch, C. M. L. and G. P. Jones
 1961 A short economic and social history of the Lake Counties, 1500-1830. Manchester University Press, Manchester.
- Bowen, E. G.
 1971 The dispersed habitat of Wales. In Man and his habitat, essays presented to Emyr Estyn Evans, edited by R. H. Buchanan, Emrys Jones, and Desmond McCourt, pp. 187-201. Barnes and Noble, New York.
- Bowen, H. C.
 1961 Ancient fields, a tentative analysis of vanishing earthworks and landscapes. British Association for the Advancement of Science, London.
- Bridenbaugh, Carl
 1950 The colonial craftsman. New York University Press, New York.
- 1968 Vexed and troubled Englishmen, 1590-1642. Oxford University Press, New York.
- Brittingham, Joseph B. and Alvin W. Brittingham, Sr.
 1947 The first trading post at Kocotan (Kecoughtan), Hampton, Virginia. Hampton, Virginia.

Broomhead, C. N.

- 1956 Mining and quarrying to the seventeenth century. In A history of technology, Vol. 2: The Mediterranean civilizations and the Middle Ages, edited by Charles Singer, E. J. Holmyard, A. R. Hall, and Trevor I. Williams, pp. 1-40. Clarendon Press, Oxford.

Bruce, Philip Alexander

- 1895 Economic history of Virginia in the seventeenth century, 2 vols. The Macmillan Co., New York.
- 1910 Institutional history of Virginia in the seventeenth century, 2 vols. G. P. Putnam's Sons, New York.
- 1924 History of Virginia, Vol. 1: the colonial period, 1607-1763. American Historical Society, Chicago.

Buckley, Walter

- 1967 Sociology and modern systems theory. Prentice-Hall, Englewood Cliffs.

Campbell, Mildred

- 1942 The English yeoman under Elizabeth and the early Stuarts. Yale University Press, New Haven.
- 1960 "Of people either too few or too many," the conflict of opinion on population and its relation to emigration. In Conflict in Stuart England, essays in honor of Wallace Notestein, edited by William Appleton Aiken and Bask Duke Henning, pp. 169-201. New York University Press, New York.

Canner, Thomas

- 1906 A relation of the voyage made to Virginia, in the Elizabeth of London, a barke of fiftie tunnes by Captaine Bartholomew Gilbert, in the yeere 1603. In Hakluytus posthumus or Purchas his pilgrimes, containing a history of the world in sea voyages and lande travells by Englishmen and others, Vol. 18, edited by Richard Hakluyt, pp. 329-335. James MacLehose and Sons, Glasgow.

Carson, Jane

- 1965 We were there, descriptions of Williamsburg, 1699-1859. Colonial Williamsburg, Williamsburg, Virginia.

Casagrande, Joseph B., Stephen I. Thompson, and Philip D. Young

- 1964 Colonization as a research frontier: the Ecuadorian case. In Process and pattern in culture, essays in honor of Julian H. Steward, edited by Robert A. Manners, pp. 281-325. Aldine, Chicago.

Caywood, Louis R.

- 1955 Green Spring plantation, archeological report. United States Department of the Interior, National Park Service, Yorktown, Virginia.

- 1957 Green Spring Plantation. Virginia Magazine of History and Biography 65(1):67-83.

Challis, C. E.

- 1967 The debasement of the coinage, 1542-1551. The Economic History Review 20(3):441-466.

Chisholm, M. M.

- 1962 Rural settlement and land use: an essay in location. Hutchinson, London.

Clark, Philip J. and Francis C. Evans

- 1954 Distance to nearest neighbor as a measure of spatial relationships in populations. Ecology 35(4):445-453.

Clarke, David L.

- 1968 Analytical archaeology. Methuen and Co., LTD, London.

- 1972 A provisional model of an Iron Age society and its settlement system. In Models in archaeology, edited by David L. Clarke, pp. 801-869. Methuen and Co., LTD, London.

Cleland, Charles E. and James E. Fitting

- 1968 The crisis of identity: theory in historic site archaeology. The Conference on Historic Site Archaeology, Papers 2:124-138.

Clow, Archie

- 1972 The influence of technology on environment. In Ecology in theory and practice, edited by Jonathan Benthall, pp. 50-80. Viking Press, New York.

Coornaert, E. L. J.

- 1967 European economic institutions and the New World: the chartered companies. In The Cambridge economic history of Europe, Vol. 4: The economy of expanding Europe in the sixteenth and seventeenth centuries, edited by E. E. Rich and C. H. Wilson, pp. 223-275. Cambridge University Press, Cambridge.

Cornwall, Julian

- 1970 English population in the early sixteenth century. The Economic History Review 23(1):32-44.

Correr, Marc' Antonio

- 1904 Dispatch from Marc' Antonio Correr, Venetian Ambassador to England, to the Doge and Senate of Venice, March 26, 1609. In Calendar of State Papers and Manuscripts, relating to English affairs, existing in the archives and collections of Venice and in other libraries of northern Italy, Vol. 2: 1607-1610, edited by Horatio F. Brown, pp. 248-249, No. 466. Mackie and Co., LTD, London.

Cotter, John L.

- 1957 Excavations at Jamestown, Virginia, site of the first permanent English settlement in America. Antiquity 31:19-24.
- 1958 Archeological excavations at Jamestown, Virginia. National Park Service, Research Series 4.
- 1973 Current research: Northeast Virginia. The Society for Historical Archaeology, Newsletter 6(2):7-9.

Crane, Verner W.

- 1956 The Southern frontier, 1670-1732. University of Michigan Press, Ann Arbor.

Craven, Wesley Frank

- 1957 The Virginia Company of London, 1606-1624. Jamestown 350th Anniversary, Historical Booklet 5.
- 1964 Dissolution of the Virginia Company, the failure of a colonial experiment. Peter Smith, Gloucester, Massachusetts.
- 1971 White, red, and black, the seventeenth century Virginian. University Press of Virginia, Charlottesville.

- Creegeen, E. R.
 1968 The changing role of the house of Argyll in the Scottish Highlands. In History and social anthropology, edited by I. M. Lewis, pp. 153-192. Tavistock Publications, London.
- Crossley, David W.
 1968 Glassmaking in Bagot's Park, Staffordshire, in the sixteenth century. Post-Medieval Archaeology 1:44-83.
- 1972 A sixteenth century Wealden blast furnace: A report on excavations at Panningridge, Sussex, 1964-1970. Post-Medieval Archaeology 6:42-68.
- Crossley, D. W. and F. A. Aberg
 1972 Sixteenth century glass-making in Yorkshire: excavations at furnaces at Hutton and Rosedale, North Riding, 1968-1971. Post-Medieval Archaeology 6: 107-159.
- Cunliffe, B. W.
 1972 The Tudor store-house at Portchester castle, Hampshire. Post-Medieval Archaeology 5:188-190.
- Darby, H. C. and I. B. Terrett (eds.)
 1971 The Domesday geography of Midland England. Cambridge University Press, Cambridge.
- Darby, H. C. and R. Welldon Finn (eds.)
 1967 The Domesday geography of South-west England. Cambridge University Press, Cambridge.
- Darling, F. Fraser (ed.)
 1955 West Highland survey, an essay in human ecology. Oxford University Press, Oxford.
- Day, P. C.
 1920a Summary of the climatological data for the United States, by sections, Section 92: Southern Virginia east of Blue Ridge. U. S. Department of Agriculture, Weather Bureau, U. S. Government Printing Office, Washington, D.C.
- 1920b Summary of the climatological data for the United States, by sections, Section 93: Central Virginia. U.S. Department of Agriculture, Weather Bureau, U.S. Government Printing Office, Washington, D.C.

Deetz, James

- 1967 Invitation to archaeology. The Natural History Press, Garden City, New York.
- 1971 Archeology as a social science. In Current directions in anthropology, edited by Ann Fischer. American Anthropological Association, Bulletin 3(3) pt. 2:115-125.
- 1973 Ceramics from Plymouth, 1635-1835: the archaeological evidence. In Ceramics in America, edited by Ian M. G. Quimby, pp. 15-40. University Press of Virginia, Charlottesville.

Diderot, Denis

- 1959 A Diderot pictorial encyclopedia of trades and industry 1763, 2 vols., edited by Charles Coulston Gillispie. Dover Publications, Inc., New York.

Dollar, Clyde D.

- 1968 Some thoughts on theory and method in historical archaeology. The Conference on Historic Site Archaeology, Papers 2:3-30.

Earle, Alice Morse

- 1898 Home life in colonial days. The Macmillan Co., New York.

Ellison, A. and J. Harriss

- 1972 Settlement and land use in the prehistory and early history of southern England: a study based on locational models. In Models in archaeology, edited by David L. Clarke, pp. 911-962. Methuen and Co., LTD, London.

Ernle, Lord

- 1917 English farming, past and present. Longman's, Green and Co., London.

Evans, Cerinda W.

- 1957 Some notes on shipbuilding and shipping in colonial Virginia. Jamestown 350th Anniversary Historical Booklet 22.

Evans, E. Estyn

- 1939 Some survivals of the Irish open field system. Geography 24.

- Evans, E. Estyn
 1956 The ecology of peasant life in western Europe. In Man's role in changing the face of the earth, edited by William L. Thomas, Jr., pp. 217-239. Chicago University Press, Chicago.
- Everson, J. A. and B. P. FitzGerald
 1969 Settlement patterns. Longman Group, Ltd., London.
- Farrar, Emmie Ferguson
 1957 Old Virginia houses along the James. Bonanza Books, New York.
- Fenneman, Nevin M.
 1938 Physiography of the eastern United States. McGraw-Hill, New York.
- Fiennes, Celia
 1967 Through England on a side saddle (1695). In Early tours of Devon and Cornwall, edited by R. Pearse Chope, pp. 111-137. David & Charles, Ltd., Newton Abbot, Devon.
- Finberg, H. P. R.
 1969a The open field in Devon. In West County historical studies, pp. 129-151. David and Charles, Ltd., Newton Abbot, Devon.
 1969b Tavistock Abbey, a study in the social and economic history of Devon. David and Charles, Ltd., Newton Abbot, Devon.
- Fisher, F. J.
 1965 Influenza and inflation in Tudor England. The Economic History Review 18(1):120-129.
- Fiske, John
 1897 Old Virginia and her neighbors, 2 vols. Houghton, Mifflin, and Co., Boston.
- Flannery, Kent V. and Michael D. Coe
 1968 Social and economic systems in formative Mesoamerica. In New perspectives in archeology, edited by Sally R. and Lewis R. Binford, pp. 267-283. Aldine, Chicago.
- Flannery, Kent V.
 1971 Archeological systems theory and early Mesoamerica. In Prehistoric agriculture, edited by Stuart Struever, pp. 80-100. Natural History Press, Garden City, New York.

Flannery, Kent V.

- 1972 The cultural evolution of civilizations. Annual Review of Ecology and Systematics 3:399-426.

Flatres, P.

- 1971 Hamlet and village. In Man and his habitat, essays presented to Emyr Estyn Evans, edited by R. H. Buchanan, Emrys Jones, and Desmond McCourt, pp. 165-185. Barnes and Noble, New York.

Flinn, M. W.

- 1965 An economic and social history of Britain, 1066-1939. Macmillan, New York.

Forbes, R. J.

- 1956 Metallurgy. In A history of technology, Vol. 2: The Mediterranean civilizations and the Middle Ages, edited by Charles Singer, E. J. Holmyard, A. R. Hall, and Trevor I. Williams, pp. 41-80. Clarendon Press, Oxford.
- 1958 Roads to c. 1900. In A history of technology, Vol. 4: The industrial revolution, edited by Charles Singer, E. J. Holmyard, A. R. Hall, and Trevor I. Williams, pp. 520-547. Oxford University Press, London.

Force, Peter (ed.)

- 1847 Tracts and other papers, relating principally to the origin, settlement, and progress of the colonies in North America, from the discovery of the country to the year 1776, 4 vols. Peter Smith, New York.

Ford, James A.

- 1962 A quantitative method for deriving cultural chronology. Pan American Union, Technical Manual 1.

Forman, Henry Chandlee

- 1935a Report on structure seventeen, architectural remains, Unit B, Sub-units 89 & 97, Jamestown Island, James City County, Virginia. National Park Service Files, Colonial National Historical Park, Virginia, typescript.
- 1935b The narrative and descriptive report, architectural remains, Unit B, Sub-units 59 & 73 (Structure 26). National Park Service Files, Colonial National Historical Park, Virginia, typescript.

- Forman, Henry Chandlee
 1938 Jamestown and St. Mary's, buried cities of romance.
Ph.D. dissertation, University of Pennsylvania.
 Johns Hopkins Press, Baltimore.
- 1940 The bygone "subberbs of James Cittie." William and Mary Quarterly, Series 2, 20(1):475-486.
- Fowler, H. W.
 1945 Studies of the fishes of the southern piedmont and coastal plain. Academy of Natural Sciences of Philadelphia, Monograph 7.
- Fox, H. S. A.
 1973 Going to town in thirteenth century England. In
Man made the land, essays in English historical
geography, edited by Alan R. Baker and J. B. Hartley,
pp. 69-78. Rowman and Littlefield, Totowa, New Jersey.
- Fried, Morton H.
 1952 Land tenure, geography and ecology in the contact
of cultures. American Journal of Economics and
Sociology 11:391-412.
- 1967 The evolution of political society, an essay in
political anthropology. Random House, New York.
- Fritz, John M. and Fred T. Plog
 1970 The nature of archaeological explanation. American
Antiquity 35(4):405-412.
- Fussell, G. E.
 1951 Four centuries of farming systems in Devon; 1500-
1900. The Devonshire Association, Transactions 83,
179-204.
- 1952 The farmer's tools, 1500-1900, the history of British
farm implements and machinery before the tractor
came. Andrew Melrose, London.
- Gannon, Michael V.
 1965 The cross in the sand, the early Catholic Church in
Florida. University of Florida Press, Gainesville.
- Geertz, Clifford
 1963 Agricultural involution. University of California
 Press, Berkeley.

Gimingham, C. H.

- 1970 British heathland ecosystems: the outcome of many years of management by fire. Tall Timbers Fire Ecology Conference, Proceedings 10:293-321.

Glassow, Michael A.

- 1972 Changes in the adaptations of Southwestern basket-makers: a systems perspective. In Contemporary archaeology, edited by Mark P. Leone, pp. 289-302. Southern Illinois University Press, Carbondale.

Goggin, John M.

- 1951 Fort Pupo: a Spanish frontier outpost. Florida Historical Quarterly 30(2):139-192.

Goodchild, R. G.

- 1956 Roads and land travel. In A history of technology, Vol. 2: The Mediterranean civilizations and the Middle Ages, c. 700 B.C. to A.D. 1500, edited by Charles Singer, E. J. Holmyard, A. R. Hall, and Trevor I. Williams, pp. 493-536. Clarendon Press, Oxford.

Gould, R. A.

- 1971 The archaeologist as ethnographer: a case from the Western Desert of Australia. World Archaeology 3 (2):143-177.

Gray, Howard Levi

- 1915 English field systems. Harvard University Press, Cambridge.

Great Britain, Air Ministry

- 1952 Climatological atlas of the British Isles. Meteorological Office, M.O. 488, Her Majesty's Stationary Office, London.

Hall, John W.

- 1962 Feudalism in Japan: a reassessment. Comparative Studies in Society and History 5(1):15-51.

Hallowell, A. Irving

- 1957a The impact of the American Indian on American culture. American Anthropologist 59:201-216.
- 1957b The backwash of the frontier: the impact of the Indian on American culture. In The frontier in perspective, edited by Walker D. Wyman and Clifton B. Kroeber, pp. 229-258. University of Wisconsin Press, Madison.

Hariot, Thomas

- 1955 Thomas Hariot's notes on corporations for trade and for plantations (1585). In The Roanoke voyages, Vol. 1, edited by David Beers Quinn, Hakluyt Society, Series 2(104):389.

Harrington, J. C.

- 1940 Notes to accompany preliminary historical base map, Jamestown Island to Green Spring. National Park Service Files, Colonial National Historical Park, Virginia, typescript.
- 1941 Archeological report: excavations in Unit A, Jamestown Island, Virginia. National Park Service Files, Colonial National Historical Park, Virginia, typescript.
- 1942 Progress report on the 1941 excavations in the A. P. V. A. grounds. Jamestown Island, Virginia. National Park Service Files, Colonial National Historical Park, Virginia, typescript.
- 1948 Archeological explorations at Glass House point--Jamestown Island. Progress report on 1948 excavations. National Park Service Files, Colonial National Historical Park, Virginia, typescript.
- 1950 Seventeenth century brickmaking and tilemaking at Jamestown, Virginia. Virginia Magazine of History and Biography 58(1):16-39.
- 1951 Tobacco pipes from Jamestown. Archaeological Society of Virginia, Quarterly Bulletin 5(4):np.
- 1952 Historic site archeology in the United States. In Archeology of eastern United States, edited by James B. Griffin, pp. 335-344. University of Chicago Press, Chicago.
- 1955 Archeology as an auxiliary science to American history. American Anthropologist 57(5):1121-1130.
- 1957 The tools of America's first glassblowers. The Chronicle of the early American Industries Association 10(1):4-5, 11.
- 1972 A tryal of glasse, the story of glassmaking at Jamestown. The Dietz Press, Richmond.

- Harriot, Thomas
1972 A briefe and true report of the new found land of Virginia (1590 Dubry Edition). Dover Publications, New York.
- Harris, Helen
1968 The industrial archaeology of Dartmoor. Augustus M. Kelley Publishers, New York.
- Harris, Susan
1968 Settlements and field systems in Guernsey. In Studies in regional consciousness and environment, edited by Iorwerth C. Peate, pp. 97-112. Books for Libraries Press, Freeport, New York.
- Harrison, William
1968 The description of England (1587, edited by Georges Edelen. Cornell University Press, Ithaca, New York.
- Hartley, Marie and Joan Ingilby
1971 Vanishing folkways. A. S. Barnes and Co., New York.
- Hartwell, Henry, James Blair, and Edward Chilton
1940 The present state of Virginia, and the college (1697), edited by Hunter Dickenson Farish. Colonial Williamsburg, Inc., Williamsburg.
- Hassall, W. O. (ed.)
1962 How they lived, an anthology of original accounts written before 1485. Basil Blackwell, Oxford.
- Hatch, Charles E., Jr.
1949 The great road: earliest highway used and developed by the English at Jamestown. Virginia Magazine of History and Biography 57(1):14-21.

1957 Jamestown, Virginia, the townsite and its story. National Park Service, Historical Handbook Series 2.
- Hatcher, John
1969 A diversified economy: later Medieval Cornwall. Economic History Review, Series 2, 22:208-227.

1970 Rural economy and society in the Duchy of Cornwall, 1300-1500. Cambridge University Press, Cambridge.

- Heighton, Robert F. and Kathleen A. Deagon
 1972 A new formula for dating kaolin clay pipestems. The Conference on Historic Site Archaeology, Papers 6: 220-229.
- Hempel, Carl G.
 1966 Philosophy of science. Prentice-Hall, Englewood Cliffs.
- Hempel, Carl G. and Paul Oppenheim
 1948 Studies in the logic of explanation. Philosophy of Science 15:135-175.
- Henshall, Janet D.
 1967 Models of agricultural activity. In Models in geography, edited by Richard J. Chorley and Peter Haggett, pp. 425-458. Methuen and Co., LTD, London.
- Herskovits, Melville J.
 1948 Man and his works, the science of cultural anthropology. Alfred A. Knopf, New York.
- Hewett, C. A.
 1970 Some East Anglian prototypes for early timber houses in America. Post-Medieval Archaeology 3:100-121.
 1973 The development of the Post-Medieval house. Post-Medieval Archaeology 7:60-78.
- Hibbard, Roy W.
 1941 Climates of Virginia. Climate and man: Yearbook of Agriculture 1941. U.S. Department of Agriculture, pp. 1159-1169.
- Hildebrand, Samuel F. and William C. Schroeder
 1927 Fishes of Chesapeake Bay. U.S. Bureau of Fisheries, Bulletin 43, pt. 1.
- Hill, James N.
 1970a Broken K Pueblo, prehistoric social organization in the American Southwest. Anthropological Papers of the University of Arizona 18.
 1970b Prehistoric social organization in the American Southwest: theory and method. In Reconstructing prehistoric Pueblo societies, edited by William A. Longacre, pp. 11-58. University of New Mexico Press, Albuquerque.

Hill, James N.

- 1972 The methodological debate in contemporary archaeology: a model. In Models in archaeology, edited by David L. Clarke, pp. 61-107. Methuen and Co., LTD, London.

Hodgen, Margaret T.

- 1952 Change and history, a study of the dated distributions of technological innovations in England. Viking Fund Publications in Anthropology 18. Wenner Gren Foundation for Anthropological Research, Inc., New York.

Hofstadter, Richard

- 1968 The progressive historians: Turner, Beard, and Parrington. Alfred A. Knopf, New York.

Holmes, Martin

- 1969 Elizabethan London. Frederick A. Praeger, New York.

Homans, George C.

- 1960 English villagers of the thirteenth century. Russell and Russell, New York.

Hoskins, W. G.

- 1954 Devon. Collins, London.
- 1957 The Midland peasant, the economic and social history of a Leicestershire village. Macmillan and Co., London.
- 1968 Devon and its people. Augustus M. Kelley, Publishers, New York.
- 1970 History from the farm. Faber and Faber, London.

Hoskins, W. G. and L. Dudley Stamp

- 1963 The common lands of England and Wales. Collins, London.

Hudson, J. Paul

- 1956 The story of iron at Jamestown, Virginia--where iron objects were wrought by Englishmen almost 350 years ago. The Ironworker 20(2):2-14.
- 1957 A pictorial booklet on early Jamestown commodities and industries. Jamestown 350th Anniversary Historical Booklet 23.

- Hudson, J. Paul
 1962 English glass wine bottles of the 17th and 18th centuries. Southeastern Archaeological Conference, Newsletter 9(1):6-9.
- Jacobs, Wilbur R. (ed.)
 1965 Frederick Jackson Turner's legacy, unpublished writings in American history. Huntington Library, San Marino, California.
- Jelks, Edward B.
 1958 Ceramics from Jamestown. In Archaeological excavation at Jamestown, by John L. Cotter, pp. 201-212. National Park Service, Archeological Research Series 4.
- Jester, Annie Lash
 1957 Domestic life in Virginia in the seventeenth century. Jamestown 350th Anniversary Historical Booklet 17.
- Jones, Gwyn
 1968 History of the Vikings. Oxford University Press, New York.
- Jones, Hugh
 1956 The present state of Virginia (1753), edited by Richard L. Morton. University of North Carolina Press, Chapel Hill.
- Karraker, Cyrns Harreld
 1930 The seventeenth-century sheriff, a comparative study of the sheriff in England and the Chesapeake colonies, 1607-1689. University of North Carolina Press, Chapel Hill.
- Katz, Daniel and Robert L. Kahn
 1966 The social psychology of organizations. Wiley, New York.
- Kayll, A. J.
 1967 Moor burning in Scotland. Tall Timbers Fire Ecology Conference, Proceedings 6:28-39.
- Kearney, Thomas H., Jr.
 1901 Report on a botanical survey of the Dismal Swamp region. Contributions from the U.S. National Herbarium 5(6):321-350.

Kelso, William M.

- 1966 Excavation of a late seventeenth century domestic refuse pit near Lightfoot in James City County, Virginia, 1964-65. Archaeological Society of Virginia, Quarterly Bulletin 20(4):103-114.

Kerridge, Eric

- 1973 The farmers of old England. Rowan and Littlefield, Totowa, New Jersey.

Kingsbury, Susan M.

- 1906-
1935 The records of the Virginia Company, 4 vols. Library of Congress, United States Government Printing Office, Washington.

Komarek, E. V.

- 1968 Lightning and lightning fires as ecological forces. Tall Timbers Fire Ecology Conference, Proceedings 8:169-197.

Laslett, Peter

- 1965 The world we have lost. Methuen and Co., LTD, London.
- 1972 Mean household size in England since the sixteenth century. In Household and family in past time, edited by Peter Laslett, pp. 125-158. Cambridge University Press, Cambridge.

Lawson, John

- 1860 The history of Carolina. Strother and Marcom, Raleigh.

Leland, John

- 1967 The itinerary of John Leland the antiquary (1534-1543). In Early tours of Devon and Cornwall, edited by R. Pearse Chope, pp. 1-82. David & Charles, Newton Abbot, Devon.

Leyburn, James G.

- 1935 Frontier folkways. Yale University Press, New Haven.

Lindroth, Carl H.

- 1957 The faunal connections between Europe and North America. John Wiley & Sons, Inc., New York.

Linton, Ralph

- 1945 The scope and aims of anthropology. In The science of man in the world crisis, edited by Ralph Linton, pp. 3-18. Columbia University Press, New York.

Longacre, William A.

- 1971 Current thinking in American archaeology. In Current directions in anthropology, edited by Ann Fisher, American Anthropological Association, Bulletin 3(3) pt. 2:126-138.

Lurie, Nancy Oestreich

- 1959 Indian cultural adjustment to European civilization. In Seventeenth century America, edited by James Morton Smith, pp. 33-60. University of North Carolina Press, Chapel Hill.

MacLeod, William Christie

- 1928 The American Indian frontier. Alfred A. Knopf, New York.

Magalotti, Count L.

- 1967 The travels of Cosmo III, Grand Duke of Tuscany, through England. In Early tours of Devon and Cornwall, edited by Alan Gibson, pp. 92-111. David & Charles, Newton Abbot, Devon.

Mankowitz, Wolf and Reginald G. Haggard

- 1957 The concise encyclopedia of English pottery and porcelain. Frederick A. Praeger, Publishers, New York.

Manley, Gordon

- 1973 Climate in Britain over 10,000 years. In Man made the land, essays in English historical geography, edited by Alan R. Baker and J. B. Hartey, pp. 9-21. Rowman and Littlefield, Totowa, New Jersey.

Manucy, Albert

- 1962a The houses of St. Augustine, notes on the architecture from 1565 to 1821. The St. Augustine Historical Society, St. Augustine, Florida.
- 1962b The fort at Frederica. Florida State University, Notes in Anthropology 5

Maruyama, Magoroh

- 1963 The second cybernetics: deviation-amplifying mutual causal processes. American Scientist 51:164-179.

- Masselman, George
1963 The cradle of colonialism. Yale University Press, New Haven.
- Maxwell, Hugh
1910 The use and abuse of the forests by the Virginia Indian. William and Mary College Quarterly 19(1): 73-103.
- Mayes, Philip
1969 A 17th-century kiln site at Pottersbury, Northamptonshire. Post-Medieval Archaeology 2:55-82.
- McCary, Ben C.
1957a Indians of the seventeenth century. Jamestown 350th Anniversary Historical Booklet 18.
1957b John Smith's map of Virginia, with a brief account of its history. Jamestown 350th Anniversary Booklet 3.
- McCullagh, Patrick
1969 The east Midlands, a regional study. Oxford University Press, London.
- McIlwaine, H. R. (ed.)
1924 Minutes of the Council and General Court of colonial Virginia, 1622-1632, 1670-1676. Virginia State Library, Richmond.
- Meade, William
1857 Old churches, ministers and families of Virginia. J. B. Lippincott Co., Philadelphia.
- Miskimin, Harry A.
1969 The economy of early Renaissance Europe, 1300-1460. Prentice-Hall, Englewood Cliffs.
- Morison, Samuel
1971 The European discovery of America, the northern voyages, A.D. 500-1600. Oxford University Press, New York.
- Morrison, A. J.
1921 The Virginia Indian trade to 1673. William and Mary Quarterly, second series, 1(4):217-236.

Morton, Richard L.

- 1960 Colonial Virginia, Vol. 1: The Tidewater period, 1607-1710. University of North Carolina Press, Chapel Hill.

Neumann, George K.

- 1958 Notes on an Indian cranium from Jamestown. In Archeological excavations at Jamestown, by John L. Cotter, pp. 213-217. National Park Service, Archaeological Research Series 4.

Noël Hume, Ivor

- 1962a An Indian ware of the colonial period. Archaeological Society of Virginia, Quarterly Bulletin 17(1): 2-14.
- 1962b Excavations at Rosewell, Gloucester County, Virginia, 1957-1959. Contributions from the Museum of History and Technology, United States National Museum Bulletin 225, paper 18:153-229.
- 1963 Here lies Virginia, an archaeologist's view of colonial life and history. Alfred A. Knopf, New York.
- 1964 Historic archaeology in Virginia, 1961-1962. Florida Anthropologist 17(2):50-55.
- 1965 An interim report on excavations at Denbigh Plantation in Virginia. Florida Anthropologist 18(3), part 2:8-14.
- 1966a Excavations at Clay Bank in Gloucester County, Virginia, 1962-1963. Contributions from the Museum of History and Technology, United States National Museum Bulletin 249, paper 52:1-28.
- 1966b Excavations at Tutter's Neck in James City County, Virginia, 1960-61. Contributions of the Museum of History and Technology, United States National Museum Bulletin 249, paper 53:29-72.
- 1968 Historical archaeology in America. Post-Medieval Archaeology 1:104-105.

Noël Hume, Ivor

- 1969a The wells of Williamsburg: colonial time capsules. Colonial Williamsburg Archaeological Series 4.
- 1969b Archaeology and Wetherburn's tavern. Colonial Williamsburg Archaeological Series 3.
- 1969c Historical archaeology. Alfred A. Knopf, New York.
- 1970 A guide to artifacts of colonial America. Alfred A. Knopf, New York.
- 1973 1972 excavations at the colonial public hospital site in Williamsburg, Virginia. Post-Medieval Archaeology 7:91-92.

Odom, Eugene P.

- 1955 Fundamentals of ecology. W. B. Saunders Co., Philadelphia.

Oldmixon, John

- 1741 The British empire in America, containing the history of the discovery, settlement, progress and state of the British colonies on the continent and islands of America, 2 vols. London.

Olsen, Stanley J. and John Penman

- 1972 Faunal remains in association with early Massachusetts colonists. Occasional Papers in Old Colony Studies 3:22-23.

Oppenheim, M. M.

- 1968 The maritime history of Devon. Devonshire Press, Torquay, England.

Oswald, Adrian

- 1961 The evolution and chronology of English clay tobacco pipes. Archaeological Newsletter 7(3):55-62.

Outhwaite, R. B.

- 1966 The trials of foreign borrowing: the English crown and the foreign money market in the mid-sixteenth century. The Economic History Review 19(2):289-305.

Painter, Floyd

- 1956 The Helmet site. Archaeological Society of Virginia, Quarterly Bulletin 10(3):n.p.

Painter, Floyd

- 1965 Artifacts from the Thoroughgood site. The Chesopiean 3:130-135.
- 1970 Archaeological investigation of the Fort Boykin well. The Chesopiean 8(5-6):128-156.

Parry, J. H.

- 1963 The age of reconnaissance. Mentor Books, New York.

Percy, George

- 1967 Observations gathered out of "A discourse of the plantation of the southern colony in Virginia by the English, 1606" (1625), edited by David Beers Quinn. University Press of Virginia, Charlottesville.
- 1922 A trewe relacyon of Virginia from 1609-1612. Tyler's Quarterly 3:259-282.

Peterson, Harold L.

- 1949 New evidence on colonial firearms from Jamestown excavations. The Gun Collector June:313-316.
- 1956 Arms and armor in colonial America, 1526-1783. Bramwell House, New York.

Phillips, Paul Chester

- 1961 The fur trade, 2 vols. University of Oklahoma Press, Norman.

Pococke, Dr. Richard

- 1967 Travels through England, 1750. In Early tours in Devon and Cornwall, edited by R. Pearse Chope, pp. 178-215. David & Charles, Newton Abbot, Devon.

Pope, Clifford H.

- 1939 Turtles of the United States and Canada. Alfred A. Knopf, New York.

Postan, M. M.

- 1972 The Medieval economy and society, an economic history of Britain, 1100-1500. University of California Press, Berkeley.

Puckle, Bertram S.

- 1926 Funeral customs, their origin and development. T. Werner Laurie, Ltd., London.

- Purchas, Samuel (ed.)
 1906 Hakluytus posthumus or Purchas his pilgrimes, containing a history of the world in sea voyages and lande travells by Englishmen and others (1625), 20 vols., edited by Richard Hakluyt. James MacLehose and Sons, Glasgow.
- Quinn, David Beers (ed.)
 1935 The Roanoke voyages, 1584-1590, 2 vols., Hakluyt Society, Series 2 (104-105).
 1974 England and the discovery of America, 1481-1620. Alfred A. Knopf, New York.
- Raftis, J. A.
 1965 Social structures in five east Midland villages. The Economic History Review 18(1):83-99.
- Rainbolt, John C.
 1969 The absence of towns in seventeenth century Virginia. The Journal of Southern History 35(3):343-360.
- Rappaport, Roy A.
 1968 Pigs for the ancestors, ritual in the ecology of a New Guinea people. Yale University Press, New Haven.
- Redfield, Robert
 1956 Peasant society and culture, an anthropological approach to civilization. University of Chicago Press, Chicago.
- Redfield, Robert, Ralph Linton, and Melville J. Herskovitts
 1936 Memorandum for the study of acculturation. American Anthropologist 38:149-152.
- Rees, Henry
 1966 The British Isles, a regional geography. George C. Harrap & Co., Ltd., London.
- Renfrew, Colin
 1972 The emergence of civilization: the Cyclades and the Aegean in the third millennium B.C. Methuen and Co., LTD, London.
- Reps, John W.
 1969 Town planning in frontier America. Princeton University Press, Princeton, New Jersey.

Reps, John W.

- 1972 Tidewater towns, city planning in colonial Virginia and Maryland. The Colonial Williamsburg Foundation, Williamsburg.

Roberts, Brian K.

- 1973 Planned villages from Medieval England. In Man made the land, essays in English historical geography, edited by Alan R. Baker and J. B. Hartley, pp. 46-58. Rowman and Littlefield, Totowa, New Jersey.

Robotti, Frances Diane

- 1948 Chronicles of old Salem, a history in miniature. Bonanza Books, New York.

Robinson, W. Stiff, Jr.

- 1957 Mother earth--land grants in Virginia, 1607-1699. Jamestown 350th Anniversary Historical Booklet 12.

Rolf, John

- 1951 A true relation of the State of Virginia left by Sir Thomas Dale Knight in May last 1616 (1617). University Press of Virginia, Charlottesville.

Rouse, John E.

- 1970 World cattle, 2 vols. University of Oklahoma Press, Norman.

Rowse, A. L.

- 1950 The England of Elizabeth. Macmillan, London.

Russell-Wood, A. J. R.

- 1974 Local government in Portuguese America: a study in cultural divergence. Comparative Studies in Society and History 16(2):187-231.

Sahlins, Marshall D. and Elman R. Service

- 1960 Evolution and culture. University of Michigan Press, Ann Arbor.

Sainsbury, W. Noel (ed.)

- 1860 Calendar of state papers, colonial series, 1574-1660, preserved in The State Paper Department of Her Majesty's Public Record Office. Longman, Green, Longman & Roberts, London.

- Sanders, William T. and Barbara J. Price
1968 Mesoamerica, the evolution of a civilization.
Random House, New York.
- Savage, George
1960 Seventeenth and eighteenth century French porcelain.
Spring Books, London.
- Schmitt, Karl
1952 Archaeological chronology of the Middle Atlantic states. In Archeology of eastern United States, edited by James B. Griffin, pp. 59-70. University of Chicago Press, Chicago.
- Schuyler, Robert L.
1970 Historical and historic sites archaeology as anthropology: basic definitions and relationships. Historical Archaeology 4:83-89.
- Service, Elman R.
1962 Primitive social organization: an evolutionary perspective. Random House, New York.
- Shea, John Gilmary
1854 History of the Catholic missions among the Indian tribes of the United States, 1529-1854. E. Dunigan & Brother, New York.
- Shelford, Victor E.
1963 The ecology of North America. University of Illinois Press, Urbana.
- Shiner, Joel L.
1957 Early cemetery on "third ridge" at Jamestown. Virginia Magazine of History and Biography 65:150-153.
- Shorter, A. H., W. L. D. Ravenhill, and K. J. Gregory
1969 Southwest England. Thomas Nelson, London.
- Shreve, Forrest, M. S. Chrysler, F. H. Blodgett, and F. W. Besley
1910 The plant life of Maryland. Maryland Weather Service, Johns Hopkins Press, Baltimore.

Smith, Cyril Stanley and Anneliesa Sisco

- 1961 Iron and steel in 1627: the "fidelle ouverture de l'art de serrurier" of Mathurin Jousse. Technology and Culture 2(2):131-145.

Smith, David M.

- 1965 The industrial archaeology of the east Midlands.
David & Charles, Dawlish, Devon.

Smith, Hale G.

- 1956 The European and the Indian, European-Indian contacts in Georgia and Florida. Florida Anthropological Society Publications 4.

- 1951 A Spanish mission site in Jefferson County, Florida. In Here once they stood, by Mark F. Boyd, Hale G. Smith, and John W. Griffin, pp. 107-136. University of Florida Press, Gainesville.

Smith, John

- 1907a A true relation of such occurrences and accidents of noate as hath hapned in Virginia since the first planting of that collony, which is now resident in the south part thereof, till the last returne from thence (1608). In Narratives of early Virginia, 1606-1625, edited by Lyon G. Tyler, pp. 30-71. Charles Scribner's Sons, New York.

- 1907b A map of Virginia: with a description of the country, the commodities, people, government and religion (1612). In Narratives of early Virginia, 1606-1625, edited by Lyon G. Tyler, pp. 76-118. Charles Scribner's Sons, New York.

- 1907c The proceedings of the English colonies in Virginia: (1612). In Narratives of early Virginia, 1606-1625, edited by Lyon G. Tyler, pp. 119-204. Charles Scribner's Sons, New York.

- 1969 A map of Virginia. In The Jamestown voyages under the first charter, 1606-1609, edited by Philip L. Barbour, Hakluyt Society, Series 2, (137):327-464.

Soininen, Arvo M.

- 1959 Burn-beating as the technical basis of colonization in Finland in the 16th and 17th centuries. Scandinavian Economic History Review 7:150-166.

South, Stanley

- 1972 Evolution and horizon as revealed in ceramic analysis in historical archaeology. Conference on Historic Site Archaeology, Papers 6:71-116.

Speck, Frank G.

- 1928 Chapters on the ethnology of the Powhatan tribes of Virginia. Museum of the American Indian, Indian Notes and Monographs 1(5):394-418.

Stamp, L. Dudley

- 1946 Britain's structure and scenery. Collins, London.
- 1948 The land of Britain, its use and misuse. Longman's Green and Co. LTD., London.
- 1955 Man and the land. Collins, London.

Steensberg, Axel

- 1943 Ancient harvesting implements, a study in archaeology and human geography. Nationalmuseets Skrifter, Arkoelogisk-Historisk Roekke 1.

Steers, J. A.

- 1948 The coastline of England and Wales. Cambridge University Press, Cambridge.

Steward, Julian H.

- 1949 Cultural causality and law: a trial formulation of the development of early civilizations. American Anthropologist 51:1-27.
- 1955 Theory of culture change. University of Illinois Press, Urbana.

Stewart, Norman R.

- 1967 Japanese colonization in eastern Paraguay. National Academy of Sciences, National Research Council, Publication 1490.

Stock, Leo Francis (ed.)

- 1924 Proceedings and debates of the British parliaments respecting North America, Vol. 1: 1542-1688. Carnegie Institution, Washington, D.C.

Stoddard, Herbert L., Sr.

- 1963 Maintenance and increase of the eastern Wild Turkey on private lands of the coastal plain of the deep southeast. Tall Timbers Research Station, Bulletin 3.

- Stoddart, D. R.
 1967 Organism and ecosystem as geographical models. In Models in geography, edited by Richard J. Chorley and Peter Haggett. Methuen, London.
- Stone, Lawrence
 1961 Marriage among the English nobility in the 16th and 17th centuries. Comparative Studies in Society and History 3(2):182-206.
- Stouffer, Samuel A., Edward A. Suchman, Leland C. DeVinney, Shirley A. Star, and Robin M. Williams
 1949 The American soldier, Vol. 1: Adjustment during Army life. Princeton University Press, Princeton.
- Strachey, William
 1953 The history of travell into Virginia Britania (1612), edited by L. B. Wright and Virginia Freund. Hakluyt Society, Series 2(103).
- Supple, B. E.
 1959 Commercial crises and change in England, 1600-1642. Cambridge University Press, Cambridge.
- Sutherland, Stella H.
 1966 Population distribution in colonial America. A. M. S. Press, Inc., New York.
- Talpalar, Morris
 1960 The sociology of colonial Virginia. Philosophical Library, New York.
- Tansley, A. G.
 1949 The British Isles and their vegetation, 2 vols. University Press, Cambridge.
- Taylor, F. Sherwood and Charles Singer
 1956 Pre-scientific industrial chemistry. In A history of technology, Vol. 2: The Mediterranean civilizations and the Middle Ages, edited by Charles Singer, E. J. Holmyard, A. R. Hall, and Trevor I. Williams, pp. 347-373. Clarendon Press, Oxford.
- Taylor, Walter W.
 1967 A study of archeology. Southern Illinois University Press, Carbondale.
- Thirsk, Joan and J. P. Cooper (eds.)
 1972 Seventeenth century economic documents. Clarendon Press, Oxford.

- Thompson, Stephen I.
 1970 San Juan Yapacani: a Japanese pioneer colony in eastern Bolivia. Ph.D. dissertation, University of Illinois. University Microfilms, Ann Arbor.
- 1971 Change in family and household organization in an overseas Japanese pioneer community. Journal of Comparative Family Studies 2:165-177.
- 1973 Pioneer colonization, a cross-cultural view. Addison-Wesley Modules in Anthropology 33.
- Thrupp, S.
 1951 The grocers of London, a study in distributive trade. In Studies in English trade in the fifteenth century, edited by Eileen Power and M. M. Postan, pp. 247-292. Routledge & Kegan Paul, LTD, London.
- Trewartha, Glenn T.
 1946 Types of rural settlement in colonial America. Geographical Review 36:568-596.
- Trotter, Eleanor
 1968 Seventeenth century life in the country parish. Frank Cass & Co., LTD, London.
- Trudell, Clyde F.
 1971 Colonial Yorktown. The Chatham Press, Inc., Old Greenwich, Connecticut.
- Turner, Frederick Jackson
 1893 The significance of the frontier in American history. Annual Report of the American Historical Association for the Year 1893, pp. 199-227.
- Tyler, Lyon G.
 1906 The cradle of the republic, Jamestown and James River. The Hermitage Press, Inc., Richmond.
- Tyler, Lyon G. (ed.)
 1907 Narratives of early Virginia, 1606-1625. Charles Scribner's Sons, New York.
- Uhlig, Harold
 1971 Fields and field systems. In Man and his habitat, essays presented to Emyr Estyn Evans, edited by R. H. Buchanan, Emrys Jones, and Desmond McCourt, pp. 93-125. Barnes and Noble, New York.

Verrazzano, Giovanni Da

- 1850 The relation of John Verarzanos, a Florentine, of the land by him discovered in the name of his majesty, written in Diepe the eighth of July 1524. In Divers voyages touching the discovery of America and the lands adjacent, by Richard Hakluyt, edited by John Winter Jones, Hakluyt Society, Series 1(7): 55-71.

Virginia Gazette

- 1974 Trash deposit dating to 1690 found intact near Jamestown. January 4, 1974.

Virginia Historic Landmarks Commission

- 1971 Governor's Land Archaeological District, inventory of historic sites. Virginia Historic Landmarks Commission Files, Richmond, typescript.
- 1973 Notes on Virginia (7), Spring.
- 1974 Notes on Virginia (9), Spring.

Vogt, Evon

- 1960 On the concepts of structure and process in cultural anthropology. American Anthropologist 62:18-33.

von Bertalanffy, Ludwig

- 1951 An outline general system theory. British Journal for the Philosophy of Science 1:134-165.

Yonge, Samuel H.

- 1904 The site of old "James Towne," 1607-1698. Association for the Preservation of Virginia Antiquities, Richmond.

Walker, Iain C.

- 1968a Historical archaeology--methods and principles. Historical Archaeology 1:23-24.
- 1968b Statistical methods for dating clay pipe fragments. Post-Medieval Archaeology 1:90-101.
- 1970 The crisis of identity--history and anthropology. The Conference on Historic Site Archaeology, Papers 3:62-63.

Washburn, Dorothy Koster

- 1974 Nearest neighbor analysis of Pueblo I-III settlement patterns along the Rio Puerco of the East, New Mexico. American Antiquity 39(2):315-335.

- Watkins, C. Malcolm
 1962 North Devon pottery and its export to America in the 17th century. Contributions from the Museum of History and Technology, United States National Museum Bulletin 225, paper 18:13-59.
- Watkins, C. Malcolm and Ivor Noël Hume
 1967 The "poor potter" of Yorktown. Contributions from the Museum of History and Technology, United States National Museum Bulletin 249, paper 54:73-111.
- Wells, Robin F.
 1973 Frontier systems as a sociocultural type. University of Oklahoma Papers in Anthropology 14(1):6-15.
- Wentworth, Chester K.
 1930 Sand and gravel resources of the coastal plain of Virginia. Virginia Geological Survey, Bulletin 32.
- Wertenbaker, Thomas T.
 1922 The planters of colonial Virginia. Princeton University Press, Princeton.
 1954 The archaeology of colonial Williamsburg. Smithsonian Institution, Annual Report for 1953:447-454.
- Wharton, James
 1957 The bounty of the Chesapeake, fishing in colonial Virginia. Jamestown 350th Anniversary Historical Booklet 13.
- Whiffen, Marcus
 1958 The public buildings of Williamsburg, colonial capital of Virginia. Colonial Williamsburg, Williamsburg Virginia.
 1960 The eighteenth-century houses of Williamsburg. Colonial Williamsburg, Williamsburg, Virginia.
- Whitaker, Alexander
 1906 Part of a tractate written at Henrico in Virginia by Master Alex. Whitaker, Minister to the colony there, 1613. In Hakluytus posthumus or Purchas his pilgrimes, contayning a history of the world in sea voyages and lande travells by Englishmen and others, Vol. 19, edited by Richard Hakluyt, pp. 110-116. James MacLehose and Sons, Glasgow.

White, Lynn, Jr.

- 1969 The historical roots of our ecologic crisis. In The subversive science, essays toward an ecology of man, edited by Paul Shepard and Daniel McKinley, pp. 341-354. Houghton Mifflin Co., New York.

Wingfield, Edward Maria

- 1969 Discourse, 21 May, 1608. In The Jamestown voyages under the first charter, 1606-1609, edited by Philip L. Barbour, Hakluyt Society, Series 2(136): 213-234.

Wolf, Eric R.

- 1966 Peasants. Prentice-Hall, Englewood Cliffs.
- 1967 Understanding civilizations. Comparative Studies in Society and History 9(4):446-465.