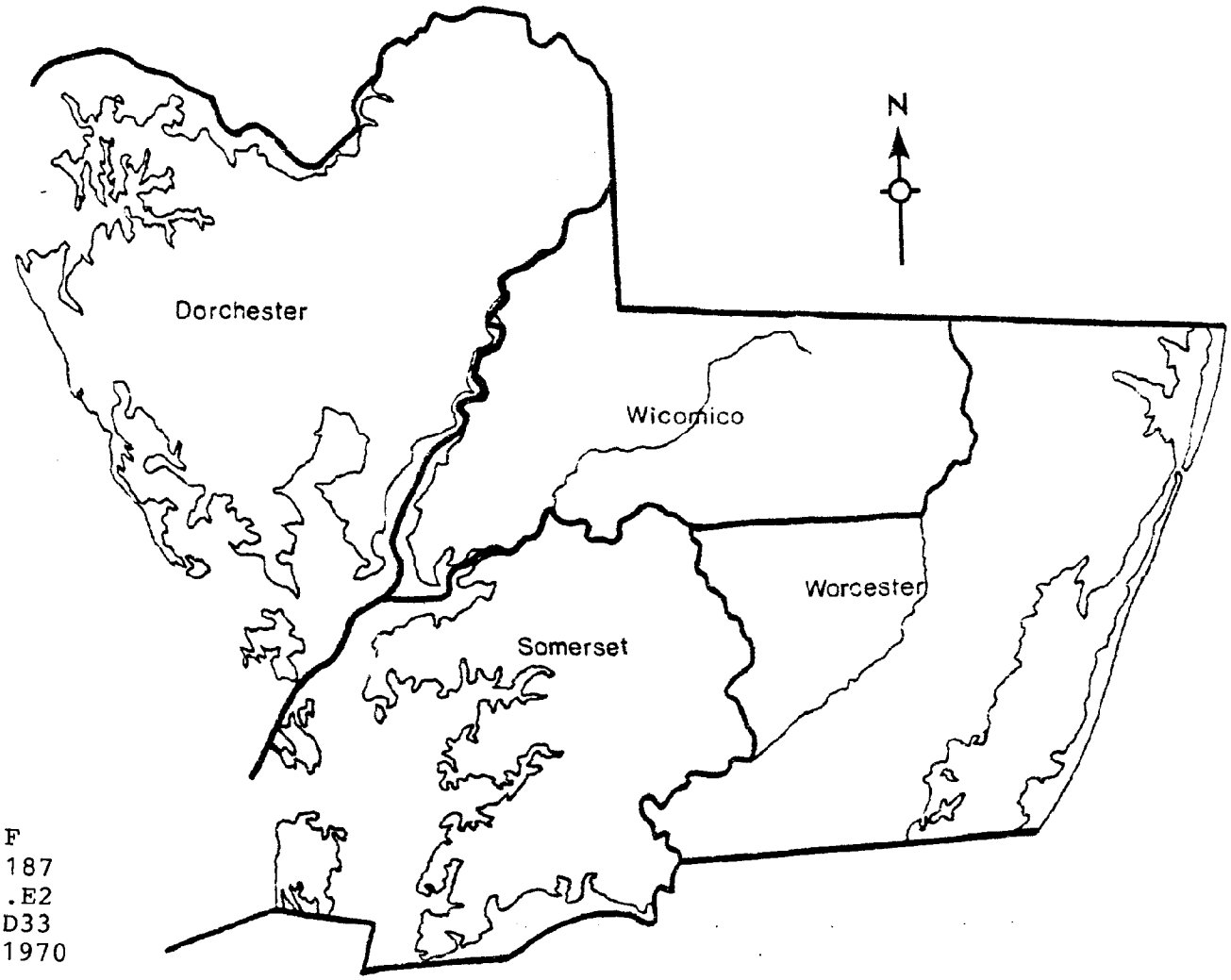
A CULTURAL RESOURCE MANAGEMENT PLAN FOR THE

LOWER DELMARVA REGION OF MARYLAND



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A CULTURAL RESOURCE MANAGEMENT PLAN

FOR THE LOWER DELMARVA REGION

OF MARYLAND

BY

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Maryland Historical Trust
and
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WITH CONTRIBUTIONS BY

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INTRODUCTION:

The surviving material evidence of man's past in America is a unique and fragile resource that is subject to constant pressure from a variety of destructive forces. Nowhere is this fact more evident than on the Lower Delmarva peninsula, where a combination of natural and man-made stresses threaten a rich and varied cultural record that for environmental reasons is particularly vulnerable. The cultural heritage of the Lower Delmarva found expression in a number of different material forms during the over 12,000 years that man has been living there, but the geological structure of the peninsula itself provides little natural protection for these accumulated cultural resources. Erosion causes severe damage in coastal areas, and the light, sandy soils of the inland regions offer little protection from natural and artificial degenerative processes once the original vegetation cover has been removed. Increased development of the region since the 1950's has accelerated the rate of destruction of cultural resources for both inland and coastal areas. Yet, substantial physical remains of past human activity can still be found throughout all parts of the Lower Delmarva region.

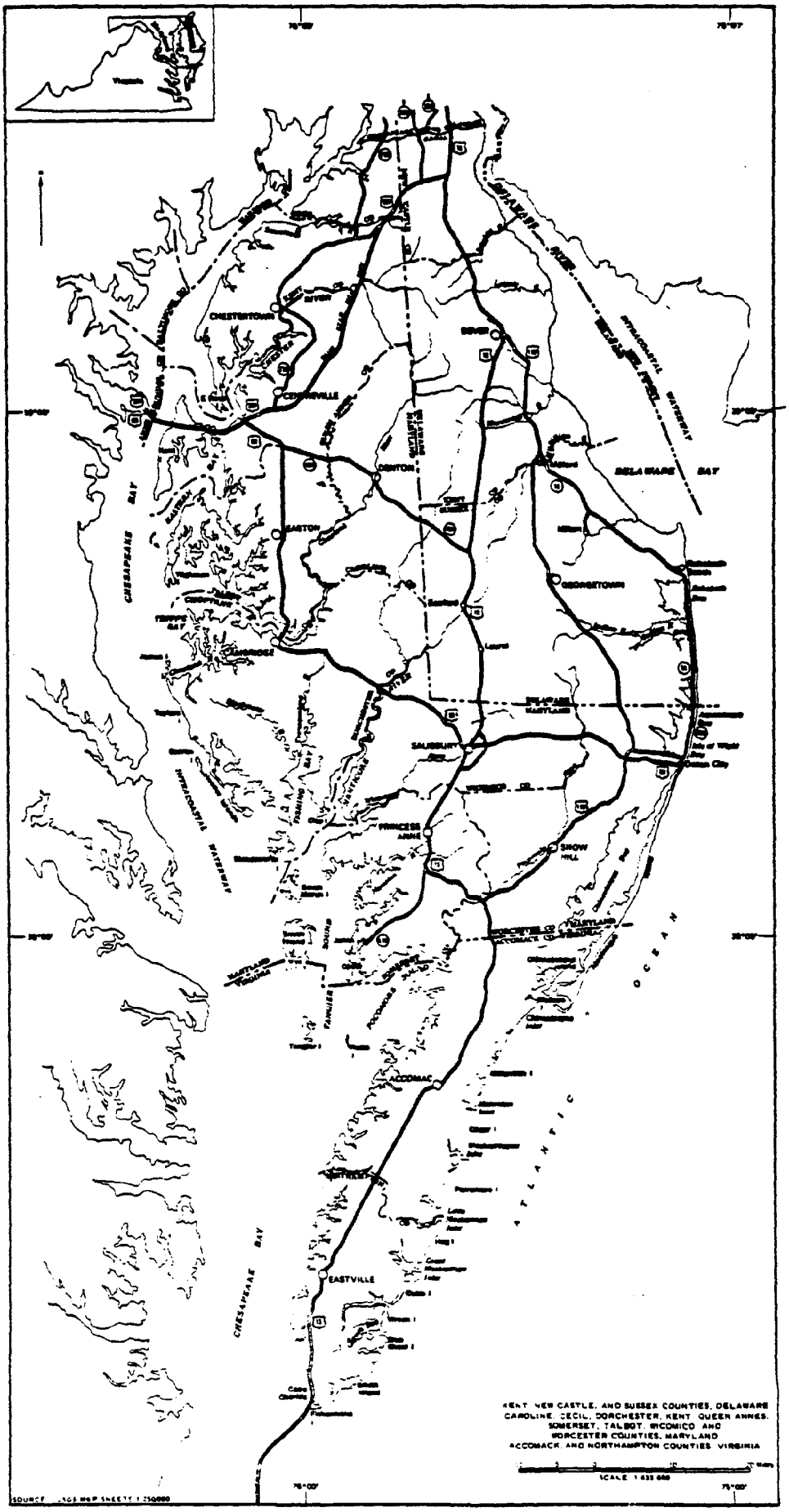
In order that the cultural resources of Maryland's portion of the Lower Delmarva peninsula might be preserved, the Maryland Historical Trust has taken on the task of developing a cultural resource management plan for the region. The National Historic Preservation Act of 1966 recognizes the need for management strategies of this sort, and it encourages the individual states to develop comprehensive preservation plans. The state of Maryland's initial approach to this problem was to designate seven regional management units within the state and to prepare separate regional management plans for them. These management units were designed to take into account both modern political divisions within the state and also environmental and cultural factors relevant to past human activity there.

Management Unit A within the state of Maryland is the Lower Delmarva Unit. This unit comprises a four county region that is bounded on the north by the Choptank River and the state of Delaware, and on the south by the Virginia border. The counties contained within the Lower Delmarva Unit are Dorchester, Somerset, Wicomico, and Worcester. The Lower Delmarva Management Unit is further divided into research units. These research units are 1, the Atlantic drainage; 2, the Pocomoke drainage; 3, the Nanticoke-Manokin-Wicomico-Annemessix drainage; and 4, the Choptank drainage. Research unit 4, the Choptank River drainage, is not

wholely contained within the Lower Delmarva Management Unit. It is divided between the Lower Delmarva unit and management unit B, the Upper Delmarva Unit, along the northern boundary of Dorchester County.

The Lower Delmarva region makes a logical unit for management purposes since both now and in the past a fairly high degree of cultural uniformity has characterized the region. Lower Delmarva is today a predominantly rural area that is economically dependant on agriculture and fishing. The industries that do exist in the area are concerned, for the most part, with food processing. Tourism, however, has become increasingly important in the economy over the past two decades, and this has created new and quite severe developmental stesses in some areas. While in most parts of the Lower Delmarva Region population has remained steady or even declined in recent years, other parts, especially in Wicomico County and northern Worcester County, have seen fairly rapid population increases. The total population growth rate of the region as a whole is misleading, because internal migration has created a very uneven population density pattern that is affecting the natural and the cultural environment of the Lower Delmarva in some quite significant ways.

At the present time the major stresses on the Lower Delmarva region's cultural resources do not result from urban or industrial development, even though these processes are much more of a factor than they were prior to the 1950's. The major impacts on the surviving cultural record of the region stem from changes in rural land use and from the continued erosion of the coastline. This fact causes the Lower Delmarva region to have some special management problems. It is difficult to monitor the effects of land use changes and of natural environmental processes on the cultural resources of the region since these stresses are geographically extensive and continue at a slow but fairly steady rate over a long period of time. Urban or industrial stresses are more likely to be intensive and intermittent, and to be better monitored within existing public planning structures. A management plan for the Lower Delmarva region must take into account diffuse, low level stresses which are depleting the cultural record of the region at a substantial rate, but which are not necessarily obvious if they are viewed within a short time frame. In the past historic preservation in America has been a site specific, ad hoc activity geared to respond to intense and localized impacts on the cultural record. Such an approach is particularly inappropriate for the Lower Delmarva region for the reasons discussed above. The design and implementation of a comprehensive management plan for the Lower Delmarva is absolutely essential if the cultural heritage of this unique area is to be preserved.


CHESTERTOWN
CENTREVILLE
EASTON
OXFORD
CAMBRIDGE
DENTON
GEORGETOWN
SALISBURY
PRINCESS ANNE
SNOW HILL
ACCOMAC
EASTVILLE
CHESAPEAKE BAY
DELAWARE BAY
ATLANTIC OCEAN
INTRACOASTAL WATERWAY
KENT, NEW CASTLE, AND SUSSEX COUNTIES, DELAWARE
CAROLINE, CECIL, DORCHESTER, KENT, QUEEN ANNES,
SOMERSET, TALBOT, WICOMICO AND
WORCESTER COUNTIES, MARYLAND
ACCOMACK AND NORTHAMPTON COUNTIES, VIRGINIA

FRAMEWORK FOR THE MANAGEMENT PLAN:

The management plan for the lower Delmarva region presented here will deal with three major topics. The first is the nature of the cultural record within the region. This section of the plan considers present levels of archaeological knowledge about the region, and reconstructs, insofar as this is possible, the culture history of the region. The culture history synthesis presented here attempts to isolate certain general themes that shaped the cultural record of the Lower Delmarva. This section aims to provide the necessary context within which the subsequent sections of the plan can be viewed.

The second major topic that is addressed in the plan is the nature and extent of the stresses that are being placed on the cultural record of the Lower Delmarva region. The Lower Delmarva's cultural resources are subject to a variety of destructive forces, and if correct management decisions are to be made, these forces must be identified and evaluated. Major categories of contemporary stresses are assessed for the whole of the Lower Delmarva region, and patterns of stress are projected for the future. This section also identifies some general areas of very high stress that should receive special attention.

The final major topic that is dealt with in this plan is the establishment of management priorities and procedures. Several recommendations are made about survey and assessment strategies for the region. A monitoring procedure for the Lower Delmarva is proposed, and some specific recommendations about how preservation goals should be achieved in the area are discussed.

This management plan does not advocate the adoption of a specific theoretical framework within which both management and research aims should be pursued in the Lower Delmarva region. The plan is intended to be a specific response to the cultural resource management needs of this particular region at this point in time. For the purposes of this plan management and research are regarded as separate, but complimentary, activities. It is hoped that the Lower Delmarva region management plan is sufficiently flexible in structure to be compatible with a range of differing research designs, but it is not in and of itself a research design.

THE CULTURAL RECORD

CURRENT LEVELS OF KNOWLEDGE

Prior to the 1970's virtually no systematic, professional archaeological research was done in the Lower Delmarva region. Since the 19th century it has been recognized that significant prehistoric archaeological resources were located in the region, but owing to the relative isolation of this part of the Delmarva peninsula before the completion of the Bay bridges, these resources did not generate a high level of scholarly interest. Until very recently the institutions of higher learning on the peninsula did not teach archaeology, and as a consequence no institutional base for academic archaeological research was present in the region.

However, the changes in the way archaeological research was organized and funded that occured as the result of federal environmental legislation enacted in the 1960's triggered a new interest in the archaeology of the Lower Delmarva region. Also the increased levels of archaeological activity in the neighboring state of Delaware in the 1970's provided a preliminary conceptual framework within which the prehistoric archaeology of Lower Delmarva could be studied. During the 1970's a number of compliance studies were undertaken in the Lower Delmarva region, and gradually a limited understanding of the prehistory of the region developed. The most significant advance in the prehistoric archaeology of the Lower Delmarva, however, occured only recently with the appearance of Richard Hughes' work on the region, entitled A Cultural and Environmental Overview of the Prehistory of Maryland's Lower Eastern Shore. Hughes' overview will provide the basis for the discussion of Lower Delmarva prehistory that follows.

At the present time the main sources of information on the archaeology of the Lower Delmarva region are to be found in Hughes' work and in the site files of the Office of the Maryland State Archaeologist in Baltimore. The site file information consists of short written descriptions of the archaeological sites in Dorchester, Somerset, Wicomico and Worcester Counties that have been reported to the State Archaeologist. A cross-referenced set of U.S.G.S. 7.5' quadrangle maps give the specific locations of the sites. Almost all of the reported sites are prehistoric. At the present time very little is known about historic archaeological sites in the Lower Delmarva region.

The site files maintained by the Office of the State Archaeologist contain a total of 328 entries for the Lower Delmarva region. On a county by county basis the archaeological site totals are; Dorchester County 85, Somerset County 69, Wicomico County 50, and Worcester County 124. Very few of these sites, less than 10% of the total number, were

initially located by professional archaeologists during the course of systematic archaeological investigations. Avocational archeologists resident in the Lower Delmarva area originally located the great majority of the archaeological sites that are now known for the region.

For the most part, therefore, the distribution of archaeological sites in the Lower Delmarva region as it is presently known is a product of unsystematic amateur survey activity. It can be assumed that this site file data does not accurately represent the actual cultural resource base of the region either in terms of numbers or distribution of sites. If the distribution of reported archaeological sites is considered for the whole region, it can be seen that this distribution is highly skewed. Large numbers of sites are known for the central Pocomoke drainage, for the Marshyhope Creek area and for the Dames Quarter/Deal Island area. Few sites are known for southern Somerset County, the northern coastal area of Worcester County, and for the islands of the Chesapeake Bay.

There are four possible reasons why this site pattern may have developed. First , it could be due to the fact that avocational archaeologists willing to report sites are not present in all parts of the region. Avocational archeologists tend to collect artefacts in areas near to their place of residence, and if no collectors are present in a particular part of the region, sites will not be reported there. Second, avocational archaeologists empirically construct models for site location. Only areas that conform to certain geomorphological criteria may be examined for possible sites. Third, present day land use, especially agriculture, makes the location of sites easier by removing the ground cover and turning over the soil. Sites can be located more easily in plowed fields than in scrub, forest or marsh areas. This may encourage site location in heavily agricultural areas and discourage it elsewhere. Fourth, the uneven distribution of reported sites might in fact stem from the uneven distribution of surviving cultural resources. A higher percentage of site occurance in a particular area might actually be related to better site preservation there.

As far as the Lower Delmarva is concerned it is the first of these four factors that has had the strongest effect on the distribution of reported sites in the region. If the number of sites that is recorded on each of the U.S.G.A. 7.5' quadrangle maps of the region is examined, it can be seen that 29% of all reported sites are located on just four maps, Deal Island, Dividing Creek, Girdletree and Rhodesdale. The principle residences of the four avocational archaeologists who have reported the largest number of sites from the region to the State Archaeologist are also located on the areas covered by these four maps. It is not simply the case that these four individulas happen to reside in areas where large numbers of sites remain to be located, or where present agricultural practices contribute to the discovery of sites. Sites have been found in the Deal Island, Dividing Creek, Girdletree and Rhodesdale areas because highly skilled avocational archaeologists have been looking for them. Since the death of Perry Flegel, the avocational archaeologist who reported large numbers of sites in the Marshyhope Creek area,

not a single new site has been added to the Rhodesdale map. This demonstrates the highly significant effect that the presence or absence of avocational archaeologists can have on the reporting of site location data.

Surprisingly, land use does not seem to have much of an effect on the number of sites that are reported from a given area. Regression analysis of the total number of sites reported within an area relative to the amount of agricultural land within that same area showed no correlation between these two variables for the Lower Delmarva Region. The site location models devised by the avocational archaeologists do have an effect on the geographical distribution of the reported sites within a specific area, but not so much for the region as a whole. Such models determine what parts of an area will be examined, but the area itself is usually not selected in this manner.

The most popular model in use for the Lower Delmarva region is the "sand ridge" model. Late Pleistocene sands are present over a large part of the region, and well drained ridges or knolls of this sand are common, particularly along the major rivers. These ridges are recognized as being the most likely areas for inland prehistoric sites. The majority of avocational archaeologists examine only the sand ridges within an area, ignoring other possible site locations. Even though sand ridges are recognized as good places to find sites, however, not all areas having these ridges are collected. The largest single area of Late Pleistocene sands is found in eastern Wicomico County, but very few sites have been reported from this area. The work of the Lower Delmarva Regional Preservation Office indicates that prehistoric sites do occur on the sand ridges of eastern Wicomico County, but because of a lack of interested avocational archaeologists in that area fewer than 10 sites have been reported from there. This is in contrast to the central Pocomoke drainage area immediately to the south, where 94 sites have been reported.

Avocational archaeologists who do not base their collecting behavior on the "sand ridge" model are for the most part those who collect coastline areas. The obvious association between shell middens and prehistoric artefacts in coastal areas provides the main key for the location of sites. Coastlines subject to heavy erosion are checked, sometimes on a regular basis, for traces of eroding shell middens. Most sites are not located until they are in the process of being destroyed by erosion. Tangier Sound is probably the area that receives the most attention from avocational archaeologists. Less interest is evidenced in the Atlantic side of the Lower Delmarva region, perhaps because erosion rates are generally lower there.

The site location practices of Lower Delmarva's avocational archaeologists introduce two distinct biases into the recorded pattern of site distribtuion for the Lower Delmarva region. First, not all areas within the region are being examined for sites because of the tendency of avocational archeologists to have geographically restricted areas of interest. Sites are not reported from areas lacking avocational archaeologists, and for areas where avocational archaeologists are present levels of site

location activity vary. Second, the site location models formulated by the avocational archaeologists of the region, whether explicit or implicit, tend to restrict site location activity to locales that conform to specific geomorphological criteria. The best example of this is the "sand ridge" model, which excludes poorly drained areas from consideration as possible locales for prehistoric sites. Prehistoric sites are most easily located on sand ridges, but this does not mean that such sites only occur on sand ridges.

Coupled with these two biases that affect the geographical distribution of reported sites is a further bias introduced by unsystematic surface collecting at these sites. Only certain classes of artefacts are collected from sites, chiefly complete projectile points and the more obvious types of ground stone tools, like grooved axes. Some avocational archaeologists collect potsherds and some do not. In many cases if the surfaces of the potsherds are badly worn, they are not even recognized as artefacts. Such differential surface collecting behavior makes the periodization of sites uncertain, and restricts possibilities for the diachronic study of site distribution.

Despite the uneven quality of the archaeological data that has been produced by the avocational archaeologists of the Lower Delmarva region, they will continue to play a vital role in the location and investigation of the cultural resources of this region. Some avocational archeologists, especially those who are members of the Archeological Society of Maryland, are extremely competent and responsible, and are capable of carrying out archaeological research of a high standard. If properly guided these individuals can become an integral part of a cultural resource management strategy for the region. Every effort should be made to involve responsible avocational archaeologists in the professional archaeological activities that take place in the Lower Delmarva region.

THE PREHISTORIC PERIOD IN THE LOWER DELMARVA REGION

In broad outline the prehistoric cultures of the Lower Delmarva region show the same patterns of change and development that have been observed elsewhere in the Middle Atlantic states. Fluted projectile points provide the earliest evidence of man's presence in the region during late glacial times. Subsequent changes in the characteristic material culture assemblages of the region conform to the general Paleo-indian/Archaic/Woodland sequence that has long been recognized for the Middle Atlantic Area. The prehistoric period proper ends in the 17th century A.D. with the coming of European explorers and settlers, although in the Lower Delmarva some aspects of prehistoric Indian culture survived into the 18th century.

The prehistory of the Lower Delmarva region seemingly follows a pattern whose macro-structure is common to a considerably larger area. The Delmarva peninsula was always part of a larger cultural universe, and interaction between groups both within and without the peninsula was the rule rather than the exception in prehistoric times. This does not mean, however, that the prehistoric cultures of the Lower Delmarva region were simply copies of a generalized Middle Atlantic prototype. The Lower Delmarva maintained a separate identity within this more extensive cultural universe.

In part this separate identity is a consequence of the geographical situation of the region. Maryland's Lower Eastern shore is part of the Atlantic coastal plain, and in terms of climate and geomorphology it is very similar to Maryland's western shore. Because the two shores are separated by the Chesapeake Bay, however, the lower Eastern shore interacts as freely with areas to the north as with Maryland west of the Bay. The north-south oriented rivers of the Delmarva Peninsula provide the easiest lines of contact with areas outside of the lower Delmarva region, and this fact certainly helped shape characteristic cultural patterns within the region.

Also the fact that the Lower Delmarva region is located on a relatively narrow peninsula between two large bodies of water must have had a major effect on the pattern of cultural development there. Certainly from late Archaic times on a range of subsistence options based on the exploitation of rich marine food resources were open to the inhabitants of this region. The inundation of the pre-Holocene Susquehanna River drainage basin produced a mosaic of micro-environmental zones on the Bay side that changed quite rapidly through time. The inundation process affected notjust the bay shore itself, but also the many rivers and creeks that drain into the Bay. Today estuarine conditions extend far up the major

rivers of the region like the Choptank, Nanticoke and Pocomoke. There are virtually no parts of the region's rivers that are not penetrated by anadromous fish. Inundation also produced large areas of very productive fresh and salt water marsh. The changes in material culture that are observable over the last 12,000 years in the Lower Delmarva region should be viewed within the context of the perpetually changing environmental conditions that existed there.

The general sea level rise that was responsible for the formation of the Chesapeake Bay and for many sorts of environmental change within the Lower Delmarva region has had a profound affect on the survival of the cultural resource data base there as well. The total land area of the Lower Delmarva region has been shrinking for a long time, and even though the rate of sea level rise today is considerably smaller than it was 3,000 years ago, sea level rise is still the major destroyer of the cultural record of the region. Reconstructions of prehistoric cultural patterns in the Lower Delmarva region are developed through the examination of a severely truncated data base. It is not just that large numbers of prehistoric sites have been lost; whole categories of sites have been lost. At the time of man's first entry into the region the Atlantic Coast of Delmarva probably extended more than 50 miles east of its present limit. This means that the Delmarva peninsula as it is known today was at that time an inland area that offered a very different set of resource exploitation options. This factor inevitably tends to distort views of the early prehistory of the Lower Delmarva region.

THE PALEOINDIAN PERIOD 12,000 B.P. - 9,500 B.P.

The only traces of the presence of Paleoindian groups within the Lower Delmarva region are provided by isolated finds of fluted projectile points. No actual occupation sites are known. Clovis points form the most numerous category of Paleoindian artefacts found in the region, followed by Middle Paleo points and then by Dalton-Hardaway points. Thus the earliest phase of the paleoindian period seems to be the best represented in terms of artefact numbers. This is probably a result of collector bias, however, since Clovis points are the most widely recognized of the paleoindian point types.

Paleoindian points are reported from two main areas, the coastline along Tangier Sound and the interior drainage of the middle Pocomoke River. The association of Paleoindian artefacts with interior areas of poor drainage like the Middle Pocomoke River has also been noted in Delaware. Extensive sea level rise since Paleoindian times makes the interpretation of the fluted point finds along Tangier Sound difficult, since what are coastline areas now were inland areas during the Paleoindian Period. It is likely that the Tangier Sound area, however, was a locale where several important streams and rivers flowed together in late Glacial times. It may

have been, as a consequence, an area that was particularly attractive to the varieties of game upon which Paleoindian groups subsisted.

The traditional assumption that the primary Paleoindian subsistence strategy was based on the hunting of large game animals would seem to hold for the Lower Delmarva region, at least during the early part of the Paleoindian period. By the Middle Paleo period, however, changing environmental conditions may have caused a shift away from dependence on large Pleistocene fauna. A more diversified subsistence strategy based on the exploitation of plant and marine/riverine resources as well as the hunting of both large and small animals would have been a logical response to changes in climate and vegetation cover during the latter part of the Paleoindian period. Changes of this nature in subsistence pattern would form a bridge to the characteristic adaptive patterns evidenced during the Archaic period in the Delmarva region.

THE ARCHAIC PERIOD 9,500 B.P. - 3,200 B.P.

The early part of the Archaic period was a time when environmental conditions on the Lower Eastern Shore were changing quite markedly. The pre-Boreal conditions that characterized the late Paleoindian period gave way to full Boreal conditions on the peninsula. As a consequence of this change a plant cover much like that known for the region in the present day came into being. The early Archaic period inhabitants of the Lower Delmarva were probably less dependent upon hunting than the Paleoindian inhabitants had been, and probably made more use of plant foods. Site distribution for the early Archaic suggests that as well as exploiting the interior drainage of the Pocomoke River and the Tangier Sound area, which was the pattern during the Paleoindian period, Archaic groups were also locating along small streams in the Atlantic drainage area of southern Worcester County. This may indicate a further diversification of subsistence strategies.

The characteristic projectile point types of the early Archaic are quite different from those of the preceding Paleoindian period. Fluting disappears and corner-notched points, especially of Kirk type, become common. At a later stage in the early Archaic bifurcate base points appear with LeCroy points being the most numerous type in the Lower Delmarva region. As was the case with the Paleoindian points, locally available cherts seem to be the favored raw material for point making.

In the middle Archaic period there is little evidence of a change in settlement pattern or subsistence strategy from the early archaic. There does seem to be a real increase in the total number of sites between early and middle Archaic in the region, however. The most commonly found projectile point in the Lower Delmarva region, even when all prehistoric

ARCHAIC PERIOD CHRONOLOGY AND DIAGNOSTIC POINT TYPOLOGY

PHASE	TRADITION		DIAGNOSTIC POINT
B.C./A.D.			
500			
	Marcey Creek	Fishtail	
1000	Late Archaic VI		Orient & Dry Brook
1500	Late Archaic V	Broadspear	Perkiomen, Susquehanna
	Late Archaic IV		Clagett, Savannah River, Koens-Crispin
2000	Late Archaic III		Holmes
2500	Late Archaic II	Piedmont/ Laurentian	Vernon
3000			Brewerton SN,CN,EN,ET
3500	Late Archaic I		Piscataway
4000			Otter Creek
	Middle Archaic III		Guilford Lanceolate
4500	Middle Archaic II		Morrow Mountain I & II
5000			
5500	Middle Archaic I		Stanly
6000	Early Archaic V	Bifurcate	Kanawha
	Early Archaic IV		Le Croy
6500	Early Archaic III		St. Albans
	Early Archaic II		Kirk CN & Stemmed
7000	Early Archaic I	Corner-Notched	Palmer
7500	Dalton - Hardaway		Dalton
8000			Hardaway
	Middle Paleoindian		Middle Paleo
8500			
9000	Clovis		Clovis
9500			

periods are taken into account, is the Middle Archaic Morrow Mountain II point. Also during the middle Archaic large quantities of non-local lithic materials start to be used. A significant number of the Middle Archaic points found in the Lower Delmarva are made of rhyolite and Argillite, materials that are rarely used in the early part of the Archaic period.

During the first part of the Late Archaic there is no indication of any fundamental changes in subsistence strategy or site distribution from the preceding middle Archaic. Two different traditions are recognizable within the region at this time; the Piedmont tradition with affinities to the south and west and the Laurentian with affinities to the north. The artefacts that are characteristic of these two traditions essentially have the same distributions and occur on many of the same sites in the region.

The latter part of the Late Archaic does show a significant shift in settlement pattern away from the swampy upper reaches of inland streams and towards the mouths of major streams and rivers. This shift may mark a change in subsistencestrategy. It suggests that more use was being made of marine and riverine food resources. By this phase of the Late Archaic anadromous fish would be present in the lower reaches of streams and rivers and oysters were present in exploitable quantities in the Bay. The most numerous point type of the Late Archaic, the Koens-Crispin, shows this downstream shift of Archaic settlement. Carved steatite bowls also appear at this time.

The transition between Late Archaic and Early Woodland periods in the Lower Delmarva region is marked by projectile points of the Fishtail Tradition. They seem to occur in both pre-ceramic and ceramic contexts. There is no evidence that sites of this time period were different in subsistence base or distribution from the earlier Broadspear tradition sites, although fewer of these sites are known from coastal areas. These Fishtail points are often associated with steatite bowl fragments.

THE WOODLAND PERIOD 3,200 B.P. - circa 1600 A.D.

The beginning of the Woodland Period in the Lower Delmarva region is marked, in essence, by the earliest occurences of pottery there. A steatite tempered pottery called Marcey Creek Ware is recognized as being the earliest variety of ceramic that occurs in areas adjacent to the Lower Delmarva. This ceramic is not known to be present at all in the Lower Delmarva region, however. Selden Island and Ware Plain ceramics, characteristic pottery types of the early Woodland period in surrounding areas, were also absent from the Lower Delmarva region. The earliest ceramic of the region seems to be Dames Quarter pottery, which was originally defined on the basis of sherds recovered from the Lower Delmarva. The

point type association of Dames Quarter pottery lies with the Fishtail tradition. This is the same association that has been recognized for Marcey Creek Ware elsewhere. Dames Quarter pottery seemingly marks the beginning of the Woodland period on Maryland's Lower Eastern shore. Distribution patterns for the early Woodland there are much the same as terminal Archaic period distribution patterns in the region. Dames Quarter pottery would appear to be the regional equivalent of Marcey Creek Ware.

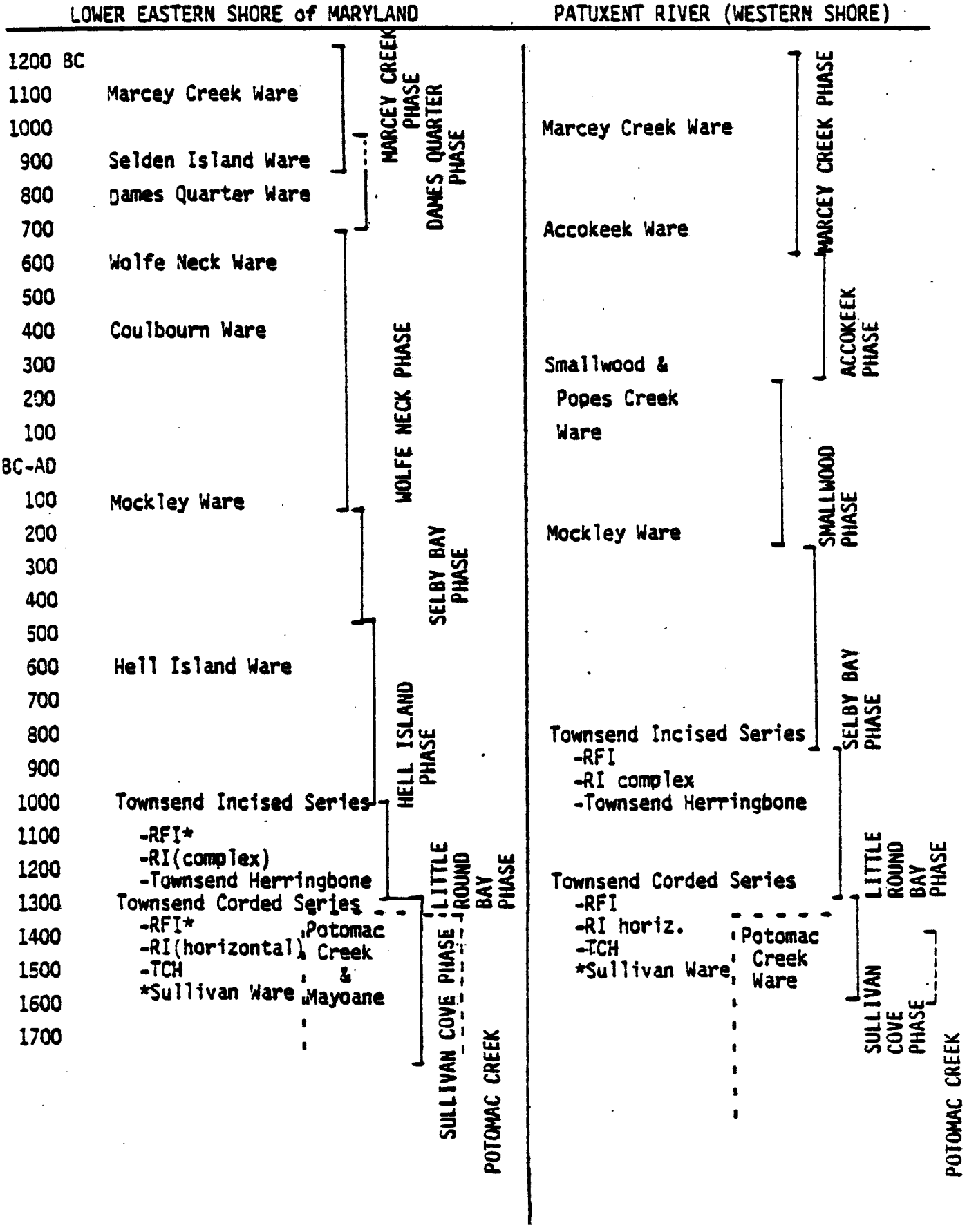
The Middle Woodland period in the Lower Delmarva region starts with the appearance of Wolfe Neck Ware, which represents the beginning of a recognizably different pottery making tradition that is continued by Coulbourne Ware and Mockley Ware. These three wares are very often found together at the same site. The major projectile point types of the Middle Woodland in the Lower Delmarva are the Rossville and the Selby Bay Stemmed point.

The number of known Middle Woodland sites in the Lower Delmarva region is very much larger than the number of known Early Woodland sites there. Middle Woodland sites also show a much stronger tendency to occur in coastal areas, which may suggest a strong dependence on marine food sources. It is during the Middle Woodland period that the Atlantic coastal drainage area first appears as a major zone of settlement, although small numbers of sites were present in this area as far back as the Early Archaic. Middle Woodland subsistence activities may well have included horticulture, although there is no direct evidence of this yet from the Lower Delmarva region. There is also increased evidence of contacts with groups outside of the Delmarva area at this time. This can be seen in the more extensive use of non-local raw materials and in the apparent adoption of mortuary practices characteristic of Adena/Hopewell groups to the west.

The Late Woodland Period is marked by a number of significant changes in both subsistence practices and settlement patterns. Corn agriculture definitely is established by this time, although the Late Woodland peoples of the Lower Delmarva pursued a diversified subsistence strategy that included hunting, gathering and the exploitation of both fish and shellfish. Palisaded villages and permanent house structures are characteristic of the Late Woodland, and it is likely that the total population was growing in the Lower Delmarva region. The material culture of the Late Woodland is more elaborate than that of earlier prehistoric periods, and seemingly there is a greater emphasis on non-utilitarian items.

The characteristic artefact types present during the Late Woodland in the Lower Delmarva region are Townsend series ceramics and triangular projectile points, among which Levanna and Madison points predominate. Townsend pottery with incised decoration is associated with the early part of the Late Woodland. In the latter part of the Late Woodland a cord marked decorative tradition inspired by Potomac Creek Ceramics from the western shore is adopted by many of the groups making Townsend ceramics in the Lower Delmarva region. The incised decorative tradition is not

WOODLAND PERIOD CHRONOLOGY AND CERAMIC TYPOLOGY



completely displaced, however, and incised Townsend series ceramics continue to be made, especially in the northern part of the Lower Delmarva region. The Potomac Creek inspired corded tradition pottery is more common, though, and incised decoration is virtually nonexistent in the southern part of the region.

Late Woodland sites typically are found immediately adjacent to major streams and rivers. Areas of high Late Woodland settlement concentration are Marshyhope Creek, Dividing Creek and the middle Pocomoke river. A number of Late Woodland sites are also known from along Sinepuxent Bay. During the course of the Late Woodland period the total number of sites seems to increase, although a shift in overall settlement pattern is not observable during the period.

THE POST-CONTACT PERIOD circa 1600 A.D. - circa 1800 A.D.

European contact with the inhabitants of the Lower Delmarva region did not result in an immediate disruption of the Late Woodland cultural pattern there. The earliest penetration of the region was by Europeans interested in exploration and trade rather than in settlement. Colonization of the Lower Delmarva region did not begin until the late 17th century. From that time on the indigenous population of the region was under steady pressure from incoming Euro-Americans, but relations between the two groups were generally peaceful.

A material culture that was basically Late Woodland in character continued through the 17th century, although increasing amounts of European made goods were utilized alongside traditional artefacts. Contact with the Euro-American colonists induced some profound social and economic changes, however. Historical records show that the major indian tribes of the region were displaced from coastal areas relatively rapidly, and that in the surviving inland settlements the procuring of furs for trade with Euro-Americans became a major economic activity. The Colonial government of Maryland also interfered with the socio-political structure of the indian tribes of the region, selecting tribal chiefs without regard for traditional authority patterns.

The Pocomoke, Assateague, Nanticoke and Choptank were the major indian tribal divisions recognizable in the 17th century. By 1750 A.D. all except the Choptanks had either migrated out of the region or lost a separate cultural identity and merged with the Euro-American majority. A small group of Choptanks remained on a reservation at Locust Neck in Dorchester County until the end of the 18th century. After the dissolution of this reservation the remaining indians in the Lower Delmarva region disappear into the general population of the region.

THE HISTORIC PERIOD IN THE LOWER DELMARVA REGION

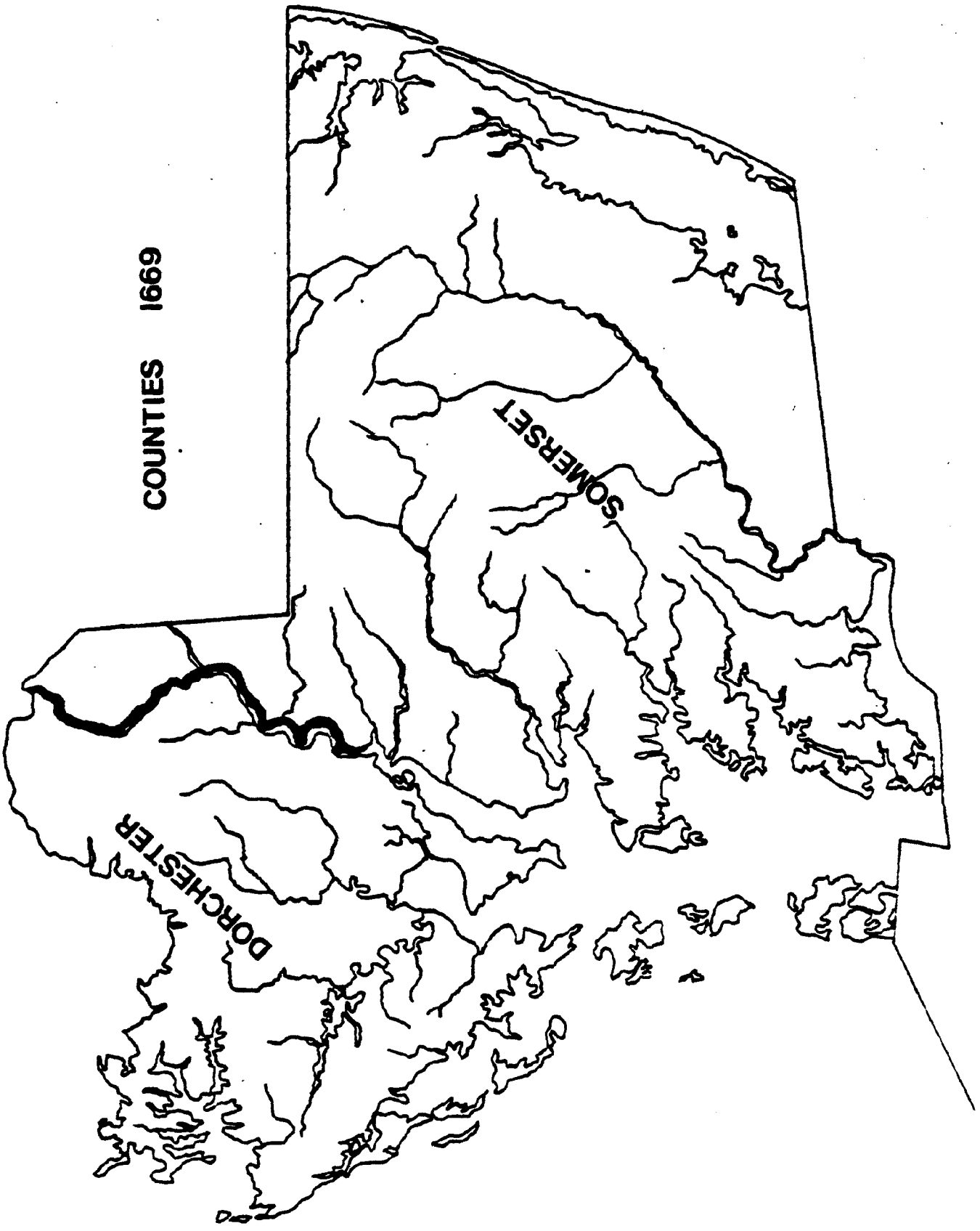
DISCOVERY PHASE PRE-1660

The Lower Delmarva region makes its first brief entrance into the historical record in 1524, when Giovanni da Verrazzano landed at a place called "Arcadia" on the Atlantic coast of North America. "Arcadia" was almost certainly located on the eastern seaboard of the Delmarva Peninsula in what is now either Worcester County, Maryland or Accomack County, Virginia. Subsequent to Verrazzano's exploration of a part of the Atlantic coast of Delmarva, the region dissapears from history until the early 17th century. Spanish explorers, notably Menendez-Marques and Gonzales, visited the Chesapeake Bay region in the late 16th century but they tell us nothing specific about the Lower Delmarva Peninsula.

In 1608 a party of explorers from the Jamestown settlement led by Capt. John Smith sailed along the Bay coast of the region and examined two large rivers on the Eastern Shore that drain into the Bay, the Pocomoke and the Nanticoke. Information gathered during this exploration was used in the preparation of the Smith Maps of 1612 and 1624. Smith's voyage was not followed up by further systematic exploration or by European settlement of the region. However, after this initial examination of the area trading contacts began between the Indians of the Eastern Shore and the European settlers of the Western Shore. There is evidence that traders from the Virginia colony were sailing to the Manokin River area in present day Somerset county by 1620. Sporatic references to trade with the Eastern Shore Indians continue up to the time of the actual settlement of Dorchester and Somerset counties.

COLONIZATION PHASE 1660-1690

The date of the earliest settlement by Euro-Americans in the Lower Eastern Shore region of Maryland is uncertain. Officially Dorchester county was thrown open for settlement by the Lord Proprietor in 1659 and Somerset County, then taking in present day Somerset, Wicomico and Worcester Counties, was opened in 1661. In fact both Somerset and Dorchester Counties probably were first settled before these dates. In the case


COUNTIES 1669
SOMERSET
DORCHESTER

of Somerset County, settlers from Accomack/Northampton County, Virginia had apparently already taken patents on lands there under Virginia law. The Maryland Archives note that in 1668 there were 26 Virginia land patents totaling 24,800 acres in all that had been made illegally within the bounds of Maryland. Most of these were in what is now southern Worcester County. The boundary between the Maryland and Virginia sections of the Eastern shore had not been surveyed properly at this time, and knowingly or unknowingly residents of Accomack/Northampton had migrated northward into Maryland territory. In the case of Dorchester County, two prominent local historians assert that settlement there probably began in the late 1640's with a few colonists crossing the bay from the Patuxent region and settling on the islands off the Dorchester Coast. As far as Taylor's Island is concerned there is some evidence to support this assertion. This earliest phase of settlement in Dorchester and Somerset counties cannot have involved many people nor is it likely to have preceded officially sanctioned settlement in either county by more than about a decade.

Maryland's Proprietary government began granting patents for Dorchester County lands on a systematic basis in 1659. In 1661 a proclamation was issued which authorized the granting of lands to people resident in Northampton and Accomack County, Virginia who wished to remove to the Maryland part of the eastern shore. Under this proclamation groups from Northampton and Accomack had formed settlements at Manokin and Annemessix in Somerset County by the year 1662. The early settlers of Dorchester and Somerset Counties had different origins,with the Somerset residents being predominantly Virginians from Northampton and Accomack while the Dorchester people were mainly Marylanders from the western shore. There seems to have been little contact between these two groups, and within a few years the lands that they occupied were divided into two counties. Somerset County was created in 1666 and Dorchester County in 1668.

CONSOLIDATION PHASE 1690-1730

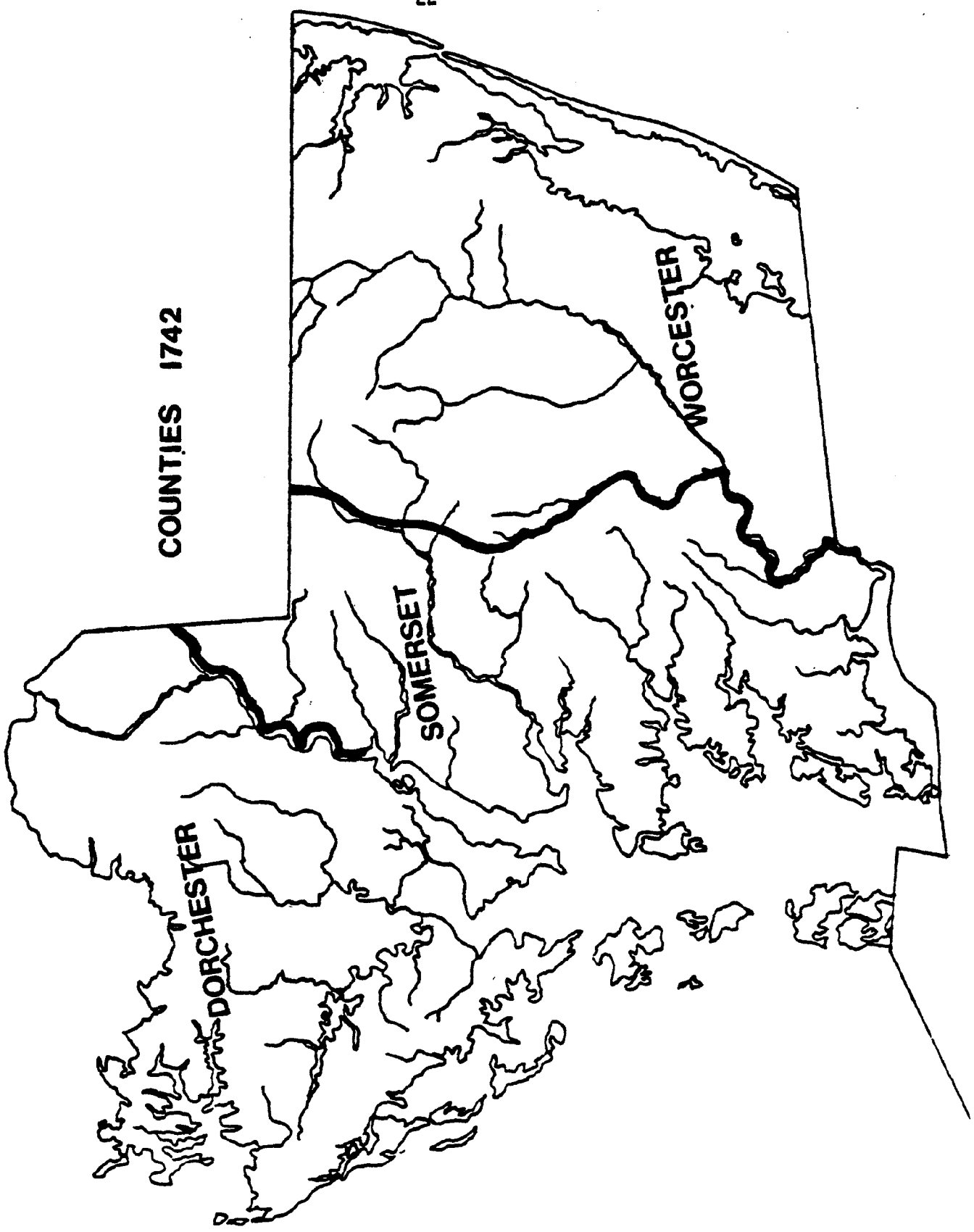
After circa 1690 the phase of initial colonization on Maryland's Lower Eastern Shore effectively ends. Euro-American settlement had extended to all parts of the region, although many areas were still very lightly inhabited. A new phase characterized by internal consolidation and development begins. It is during this time that the Lower Eastern Shore ceased to be a frontier region and began to develop the economic, social and political structures that gave this region a separate identity from surrounding regions. Industrial development began, towns were established, characteristic religious institutions were created, and an internal road system took shape.

The early part of this phase coincides with a major disruption of Maryland's economy caused by fluctuations in the tobacco market and by the interruption of normal overseas trading patterns due to war in Europe. Also this is the time of the Glorious Revolution in England that had the consequence of ending the dominant role of the Lords Baltimore in the affairs of Maryland. These events had a considerable effect on the development of the Lower Eastern Shore counties and serve to divide two periods of rapid growth, 1660-1690 and 1710-1730, from a middle period, 1690-1710, of low growth and economic readjustment. Important institutional changes, however, were taking place throughout the 1690-1730 period.

LATE COLONIAL PHASE 1730-1783

After circa 1730 the Lower Delmarva region entered a period of relative stability that endured until the revolutionary war period. Economic, political and social developments followed in the pattern set during the preceding phase. Institutions elaborated but did not generally undergo fundamental structural changes. Population increased steadily, with most growth going to the northern and eastern parts of the region. One political effect of population increases in the eastern part of the peninsula was the creation of Worcester County. The original Somerset County was divided in half, and the Atlantic seaboard portion became the new county of Worcester with its county seat at Snow Hill. In the 1760's the boundary dispute between Maryland and what was to become the state of Delaware was resolved, and by the time of the revolution the Lower Delmarva region's political boundaries had stabilized at their present limits.

Although population in all parts of the Lower Delmarva region grew during the late colonial period, no large towns came into being. Cambridge, Salisbury and Snow Hill were important commercial and administrative centers, but none supported resident populations of more than a few hundred. Transportation and communication within the region improved with the extension of the road network and with the construction of more bridges. Water transportation still remained the major means of carrying commodities in and out of the region, however. Economic links to the north with Delaware and Pennsylvania tended to get stronger during this period. It is also at this time that political and economic friction between the eastern and western shores of Maryland began to build up, especially after circa 1750.


COUNTIES 1742
WORCESTER
SOMERSET
DORCHESTER

POST REVOLUTIONARY PHASE 1783-1820

The Revolutionary War triggered an abrupt reorientation of the Lower Eastern Shore's economy by effectively ending pre-war patterns of production and trade. The conversion from tobacco production to grain and livestock production had been going on gradually for several decades, but with the coming of the war this process was accellerated greatly. While no important battles were fought in the region the activities of the British navy and local Tory pirates ended pre-existing patterns of seaborne trade. This forced diversification with the agricultural economy by eliminating one set of markets and creating a new demand for food products. The end of the war brought increased trade with the growing urban centers of Baltimore and Philadelphia to the north and west. In the period between the Revolutionary War and era of canal building in the early 19th century the Lower Delmarva region experienced a boom as a supplier of agricultural products.

At the same time the Lower Delmarva region was declining in terms of political and economic power relative to the western shore of Maryland. No urban centers emerged on the Lower Eastern Shore, and although population continued to increase there, this increase was slight compared to that of Baltimore and its surrounding counties. One result of the Revolution was to make available more land in the Lower Eastern Shore counties, since the extensive holdings of Lord Baltimore were confiscated and made available for patenting. Consequently a fair number of original land grants were made during the post-Revolutionary period, especially in interior areas.

PRE-CIVIL WAR PHASE 1820-1860

After 1820 total population in the Lower Delmarva region reached a plateau that endured until the time of the Civil War. Although these do not appear to have been times of economic hardship in the region, the relative economic and political position of the Lower Eastern Shore continued to decline with respect to other parts of the state. Attempts to establish canal and railroad systems for the region were economic failures. Grain and livestock production and lumbering remained the economic mainstays of the Lower Delmarva. After 1820 the institution of slavery declined very sharply although this decline does not seem to have been associated with any strong abolitionist sentiment on the part of the inhabitants. Communication with the western shore were improved by the establishment of regular steamboat routes, and the internal road system continued to develop.

POST CIVIL WAR PHASE 1860 to PRESENT

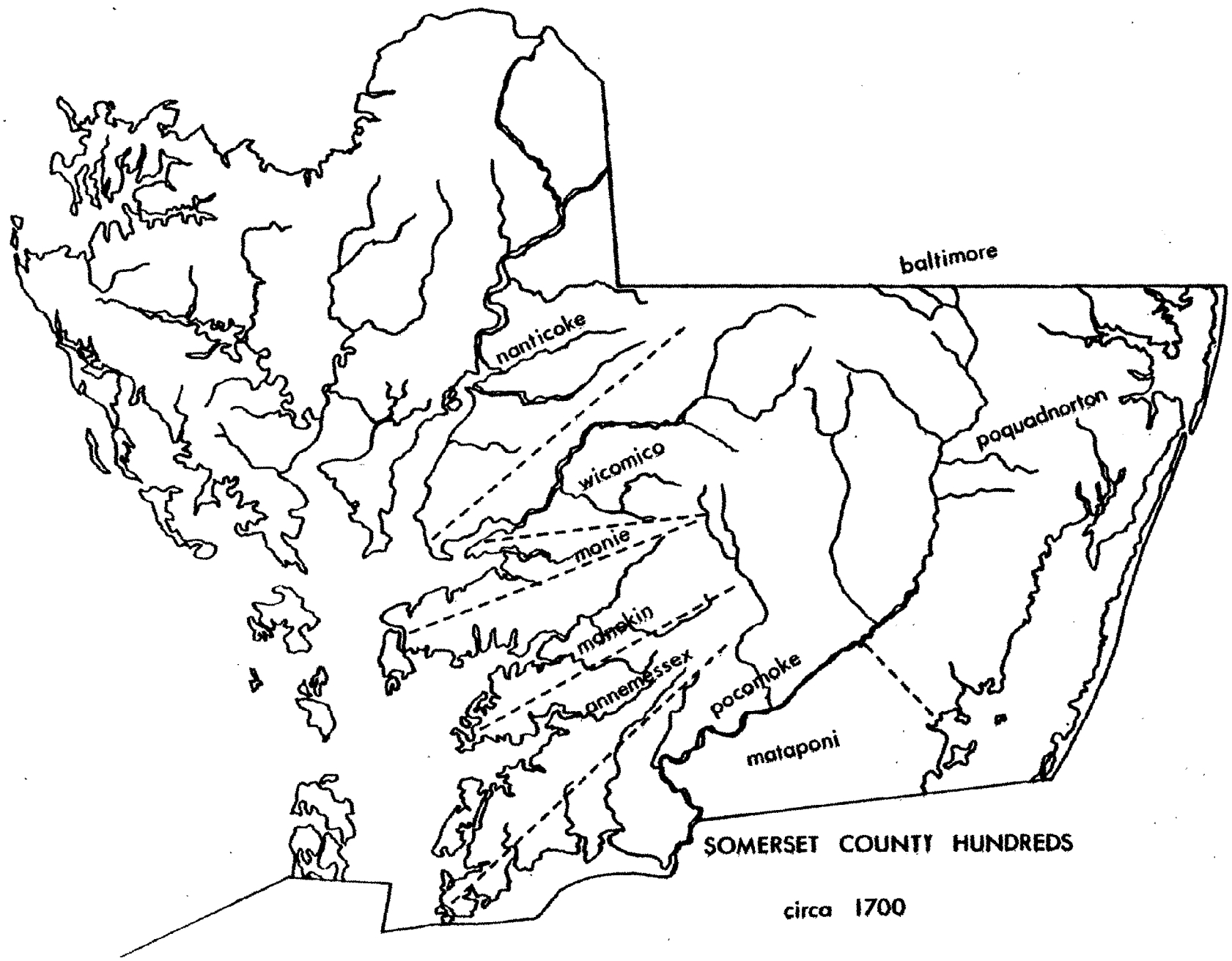
This phase in the history of the Lower Delmarva actually begins just before the Civil War, with the arrival of the first railroad link to the region. The effects of this event were deferred by the war until the late 1860's, but there can be little doubt that the coming of the railroads was a pivotal event in the development of the region. The Civil War for a time arrested the normal course of economic development but it did not have the enormous economic and social consequences in the Lower Delmarva that it had in the deep south. Most inhabitants of the region remained loyal to the Union. Slavery was abolished without severe damage being done to the agricultural economy, and the immediate post-war years were in fact a time of relative prosperity.

The outstanding political event of the post-war period was the creation of Wicomico county. This act was in fact just the official recognition of an economic and social reality that had been evolving for some time. In the late 19th century the Lower Eastern Shore region was transformed into a social and economic unit that is ancestral, in a very direct way, to the present day Lower Eastern Shore. The economy became concerned with the production and processing of foodstuffs for sale to surrounding regions with greater populations and more developed manufacturing economies. In the late 19th century this brought considerable prosperity and encouraged population growth. For most of the 20th century this has not been as successful an economic strategy and the Lower Eastern Shore has tended to grow more slowly than the rest of the state of Maryland.

Improved access to surrounding areas has tended to end the relative isolation of the lower Eastern Shore and to integrate the region's economy more closely with the economy of the Middle Atlantic states as a whole over the last three decades. The region still preserves an economic and social character of its own, however. The post Civil War period seems to have been the time when social and economic patterns underwent their last great transformation on Maryland's Lower Eastern Shore.

DEMOGRAPHY

The Euro-American colonization of the Lower Delmarva region began from the Chesapeake Bay side, with the almost simultaneous settlement of the lower parts of the Great Choptank and Little Choptank drainages and of the lower reaches of the Manokin and Annemessix rivers. The rivers of the Lower Delmarva acted as the major corridors for settlement during the initial colonization phase (1660-1690). The lack of



SOMERSET COUNTY HUNDREDS

circa 1700

an internal road system made access to the bay by boat an important economic consideration. Lands along the navigable portions of the rivers flowing into the Chesapeake were occupied very rapidly. The lands along the relatively short Annemessix and Manokin Rivers that had good agricultural potential were completely claimed by 1670. The longer rivers of the Lower Delmarva region, the Great Choptank, the Nanticoke, the Wicomico and the Pocomoke, were navigable for a much greater part of their length than were the Annemessix, Manokin and Little Choptank Rivers, but even so the most desirable lands along these rivers were occupied before 1680.

Apart from water access, the other important characteristic selected for by the early colonists of the Lower Delmarva region when occupying land was good drainage. Much of the land along the bay side of the region is poorly drained and is not suitable for agriculture without extensive modification. These poorly drained lands tend to occur at the mouths of rivers and were passed over in the earliest wave of colonization. Therefore, although settlement tended to follow the course of the rivers inland, there was no regular temporal progression of settlement up these rivers. Desirable lands were claimed very rapidly up to the limits of navigation on these rivers, while less desirable lands farther down the rivers were not occupied, even though they had better access to the Bay.

During the 1670's settlement began on the Atlantic side of the Delmarva region as well. Early centers of settlement were the St. Martin's River, Trappe Creek and Brockatonorton Bay. There was a spread of population inland during the 1680's both from these Atlantic drainage settlements and from the settlements along rivers flowing into the Bay. With agriculturally desirable lands along the coasts and along the major rivers already occupied, for the most part, the major focus of settlement activity shifted to the lands of the interior that had good agricultural potential even though they lacked direct water access. Simultaneously poorly drained lands near the mouths of rivers on the bay side begin to be settled, although the main thrust of new settlement was inland.

By 1690 virtually all areas of the Lower Delmarva region were settled, although very few people were living in the interior portion of southern Dorchester County or in what is now eastern Wicomico County at that time. Large tracts of unoccupied land were still present throughout the region, but these were lands that were in some respect undesirable, and either lacked good access or high agricultural potential. As the population of the lower Delmarva region grew, and an internal road system developed, these less desirable lands eventually were occupied. This process was not complete, however, until well into the 18th century.

The earliest population figures for the Lower Delmarva region date to 1671, or about ten years after initial settlement. At that time the total population of the region was just under 2000 persons. The bulk of Dorchester County's population was concentrated along the Great and

Little Choptank rivers. Population in Somerset County was concentrated within the drainages of the Annemessix, Manokin, southern Pocomoke and southern Wicomico Rivers, and in the Monie Creek area.

Population increased rapidly over the next two decades, and by the 1690's there were over 6500 persons in the Lower Delmarva region. Economic and political events outside of the region caused a dramatic reduction in the population growth rate over the next twenty year period, but rapid growth began again after 1710. Between 1710 and 1733 population more than doubled, and by the latter date over 20,000 persons were living in the Lower Delmarva region.

The population increases of the 1690-1730 period were not evenly distributed geographically. In Somerset County most new growth took place in the Nanticoke and Wicomico drainage areas and on the Atlantic seaboard side, in what is now northern Worcester County. The areas showing the lowest growth were the areas of initial colonization, Annemessix, Manokin and Monie. A similar phenomenon is observable in Dorchester County, with the largest population increases tending to occur in the northern and eastern parts of the county rather than in the Little Choptank area. This pattern of higher growth rates for the northern and eastern parts of the lower Delmarva region than for the longer settled southern and western areas continued until the time of the Civil War.

The shift of population eastward led to the creation of a new county, Worcester, in 1742. Worcester took in the whole of the Atlantic seaboard and most of the Pocomoke River drainage. Population growth continued at a steady rate through the middle part of the 18th century, although not at the explosive rate of the circa 1710-1730 period. Total population did not pass the 40,000 mark until after the Revolutionary War. Somerset was the fastest growing of the three Lower Eastern Shore counties, but most of that growth was confined to the northern part of the county, especially around Salisbury.

Slavery increased rapidly in the middle and late 18th centuries, with the percentage of slaves relative to total population going from less than 20% before 1730 to 38% in 1790. Throughout the 18th and 19th centuries Somerset County contained the highest percentage of slaves and Worcester contained the smallest percentage. The main slaveholding areas within Somerset County were located between the Wicomico and the Annemessix Rivers, and this pattern persisted up until the abolition of slavery in the 1860's. Slavery did not show a marked decline in the Lower Delmarva region until after 1820. By 1850, however, the percentage of slaves relative to total population had been reduced to 22%.

After the Revolutionary War population growth rates slowed for Dorchester and Somerset Counties, but increased for Worcester County. This situation persisted up to circa 1820. In the period between 1820 and the Civil War population growth slowed markedly in all parts of the Lower Delmarva region, but there appears to have been a considerable internal shift in population towards the Salisbury region. By 1850 Salisbury had

surpassed Cambridge as the largest town in the Lower Delmarva region. At that time Salisbury had circa 1500 inhabitants, Cambridge circa 1200, and Berlin and Snow Hill circa 700-800 each. These figures underline the basically rural character of the Lower Delmarva region's population. All of the previously mentioned towns were in existence by 1750, and Cambridge and Snow Hill were first established before 1700, but none of these places attracted large populations until the second half of the 19th century. After the Civil War Salisbury and Cambridge experienced periods of almost explosive growth as a result of the economic reorientation of the Lower Delmarva region caused by the arrival of the railroads and the rising importance of the canning and packing industries. During this century, however, Salisbury began growing at a much faster rate than Cambridge, and at the present day Salisbury is clearly the major urban center of the region.

The growth of the Salisbury region during the 19th century led to the creation of a fourth county on Maryland's Lower Eastern Shore in 1867. Northern Somerset County and northwestern Worcester County were joined to create Wicomico County, with its county seat at Salisbury. The creation of Wicomico County was a logical outcome of a process that had been going on for over a century. Population and economic power had tended to concentrate in the north-central part of the Lower Delmarva region, while the county seats of both Somerset and Worcester were located in the southern part of the region where earliest settlement occured. The different economic orientations of the northern and southern parts of the region inevitably led to friction between the two areas, and this ultimately resulted in the separation of the two areas.

Economic developments of the late 19th century for a time interrupted this tendency for the north to outstrip the south in growth. The boom in the seafood industry after the Civil War caused the southern part of Somerset county to increase its population at a substantial rate. In fact, southern Somerset actually grew faster than Wicomico county during the 1870's. This trend did not last long, however, and throughout the 20th century Wicomico County has tended to grow faster than Dorchester, Somerset or Worcester.

At the present time only Wicomico County continues to grow at a significant rate. The total population of the lower eastern shore is about 140,000 persons, more than 45% of whom live in Wicomico County. Somerset County has been loosing population for several decades, while Dorchester and Worcester show a very slow overall growth. Wicomico, however, should continue to add approximately 10,000 persons per decade to her population, with most growth occuring in the central part of the county. In residential pattern the Lower Delmarva region is still overwhelmingly rural and this state of affairs should continue until the end of the century, at least.

THE AGRICULTURAL ECONOMY

The traditional view of the 17th and early 18th century economy of Maryland emphasizes the primacy of tobacco production. Tobacco was the mainstay of the export trade for the overwhelmingly agricultural economy of the Chesapeake Bay region, and also served as an internal medium of exchange for the inhabitants of that region. The overall economic health of Maryland was tied to the level of tobacco prices. Eras of low tobacco prices coincide with eras of low, or even no, growth. However, not all areas of the state were equally suited for tobacco production. The eastern shore generally was a less favorable area for tobacco growing than was the western shore, and on the lower eastern shore, in particular, tobacco never seems to have had the same importance that it achieved in the western shore's economy. Tobacco was grown in Dorchester and Somerset Counties throughout the 17th and 18th centuries, but other commodities were also produced for export, especially grain, timber products and cloth.

The economy of Somerset County, in particular, more closely resembled that of the eastern shore of Virginia than it did the rest of the state of Maryland. Accomack/Northampton, from the late 17th century on, increasingly turned away from tobacco production to concentrate on grain and livestock production. By the 1660's considerable trade in these commodities had developed between Virginia's Eastern Shore and both New England and the West Indies. A number of ships built and owned by Accomack/Northampton residents were involved in the coastal trade, and the export of port, indian corn and wheat apparently offered a profitable alternative to the tobacco trade.

Since this pattern had already developed in Virginia's Eastern Shore by the 1660's, when the Manokin and Annemessix settlements in Somerset County first came into being, it can be assumed that the early Somerset county residents also took advantage of the New England and West Indies Markets. Some of the wealthier settlers who came to Somerset County had been active in the coastal trade before they left Accomack/Northampton, and it is unlikely that they abandoned existing markets merely because they changed their place of residence. In 1684 there is a request to the Maryland Council for permission to export wheat out of Somerset County. A few years later there is a record of a ship being seized for illegally exporting barrels of pork from Somerset County, and in 1692 there is a report of thirty Scottish, Irish and New England ships trading illegally with Somerset County. This strongly suggests that the Accomack/Northampton pattern is being repeated on the Lower Eastern Shore of Maryland, and that tobacco is only one of the comodities being exported from that region.

It is easier to make inferences about the export trade in the case of Somerset County than it is in the case of Dorchester County. The counties of Maryland during the 17th and 18th centuries were divided into different Naval Districts by the Proprietary government to facilitate the collect-

ion of taxes, and initially Somerset was the only county in the Pocomoke Naval District. This means that Somerset's exports can be considered separately from the rest of Maryland, since exports are recorded by naval districts. Dorchester on the other hand was part of the Patuxent and later the Oxford naval districts, which means that Dorchester exports cannot be separated from the exports of several other counties. The other naval districts show much more tobacco being exported than does the Pocomoke District, but it is impossible to discover how much of this tobacco is coming from Dorchester. The eastern shore of Maryland as a whole moved away from tobacco production from the early 18th century onward, and in general it seems that the southern counties moved away from primary dependance on tobacco faster than did the northern counties of the eastern shore. Dorchester probably followed a course of agricultural change somewhere between that of Talbot County to the north and Somerset County to the south. Substantial quantities of low quality tobacco are still being exported from the Great Choptank area in the 1760's, but by the time of the Revolution at least, grain products have become more important.

The relative importance of tobacco as a crop to the different parts of the Lower Delmarva region is suggested by the levels of expenditure for tobacco inspection in these counties. Maryland's colonial government maintained a system of official tobacco inspection warehouses in each county that produced tobacco, and fees to support the inspectors were taken from county tax revenues. During the 1760's Dorchester County had seven tobacco inspection warehouses and paid tobacco inspectors a total of 42,400 pounds of tobacco annually. The rest of the whole Lower Delmarva Region had a total of only six tobacco inspectors and paid these officials only 31,600 pounds of tobacco. This indicates that Dorchester was producing substantially more tobacco than the rest of Maryland's Lower Eastern Shore combined.

The Revolutionary War finally brought an end to tobacco as a major crop in the lower Delmarva region. Tobacco continued to be produced in small quantities after the war, but even in Dorchester this production is unimportant relative to other agricultural products. The post-Revolutionary period is one of relative prosperity on the Lower Eastern Shore. The basic agricultural products are cereal grains, especially wheat and indian corn, and livestock. Hogs were the most important type of livestock raised, and some of the grain grown in the area was specifically produced for feeding hogs.

During the years after the Revolutionary War and up to about 1820 slavery maintained the same level of importance in the Lower Eastern Shore's economy that it had evidenced before the Revolution. The decline of tobacco as a major product does not seem to have affected the demand for slaves. In Worcester County the percentage of slave owners within the total population goes up significantly after the Revolutionary War. Slave labor must have been used effectively in the production of crops on the Lower Eastern Shore, and perhaps also in the lumber industry. The total number of slaves does not decline in the region until after

1820, and as late as 1860 slaves still account for approximately 20% of the total population of the region.

The raising of grain and livestock remained the basic agricultural activities of the Lower Delmarva region until after the Civil War. However, from circa 1840 on signs of increasing crop diversification are apparent. More flax is produced, and orchard and dairy products become more important. Grain prices remained high through the 1850's, but competition from western grain producers brought prices down after the Civil War, and the dominance of grain on the Lower Eastern shore ended in the late 1860's.

The decline of grain as a cash crop actually benefitted the farmers of the Lower Delmarva region, since most were able to make a rapid and successful shift to fruit and vegetable production. This was possible since from the 1860's on the region had access to urban markets, notably Wilmington and Philadephia, by rail. The coming of the railroads made the production of truck garden crops very profitable, and in the late 19th century the region produced melons, orchard fruits, tomatoes, table vegetables, strawberries and potatoes in large quantities. The trend towards a diversification of crops actually had begun before the Civil War, but it was the coming of the railroad that made a transition from grain crops viable economically.

The boom in fruit and vegetable production did not mean the total end of grain and livestock production on the Lower Eastern Shore. Wheat, corn and livestock raising continued on a more limited scale throughout the region. The next major change in the agricultural economy of the Lower Delmarva reversed this trend away from grain farming and animal husbandry. Between World War I and World War II the region rapidly became a preeminent producer of broiler chickens. Broiler chicken production has continued to increase up to the present day, and it is now the single most important agricultural activity on the Lower Eastern shore. Along with broiler production, the raising of corn and soybeans has also increased. These crops are used mainly for poultry feed.

As of 1974 approximately 90% of all farms on Maryland's Lower Eastern Shore raised either poultry, corn or soybeans. This percentage will probably continue to increase in the future. As is the case for the United States as a whole, the total number of farms in the Lower Delmarva region is declining while the average size of a farm is increasing. The total number of acres being farmed in the region has steadily declined in recent years, going from 520,788 in 1959 to 443,217 in 1974. The greatest decline in farmland acreage was in Wicomico County which went from 131,363 acres to 102,523 acres. Agriculture provides employment for a smaller number of persons each year. The rural farm population of the Lower Delmarva declined from 21.6% of total population to 6.1% of total population between 1950 and 1970. These declines in total acreage farmed and numbers of persons employed in agriculture do not reflect a substantial decline in the importance of agriculture within the Lower Delmarva

economy. Instead they show the effects of increased mechanization and the adoption of less labor intensive crops. Agriculture and related economic activities will continue to have a dominant role in the economic makeup of the Lower Eastern shore for the forseeable future.

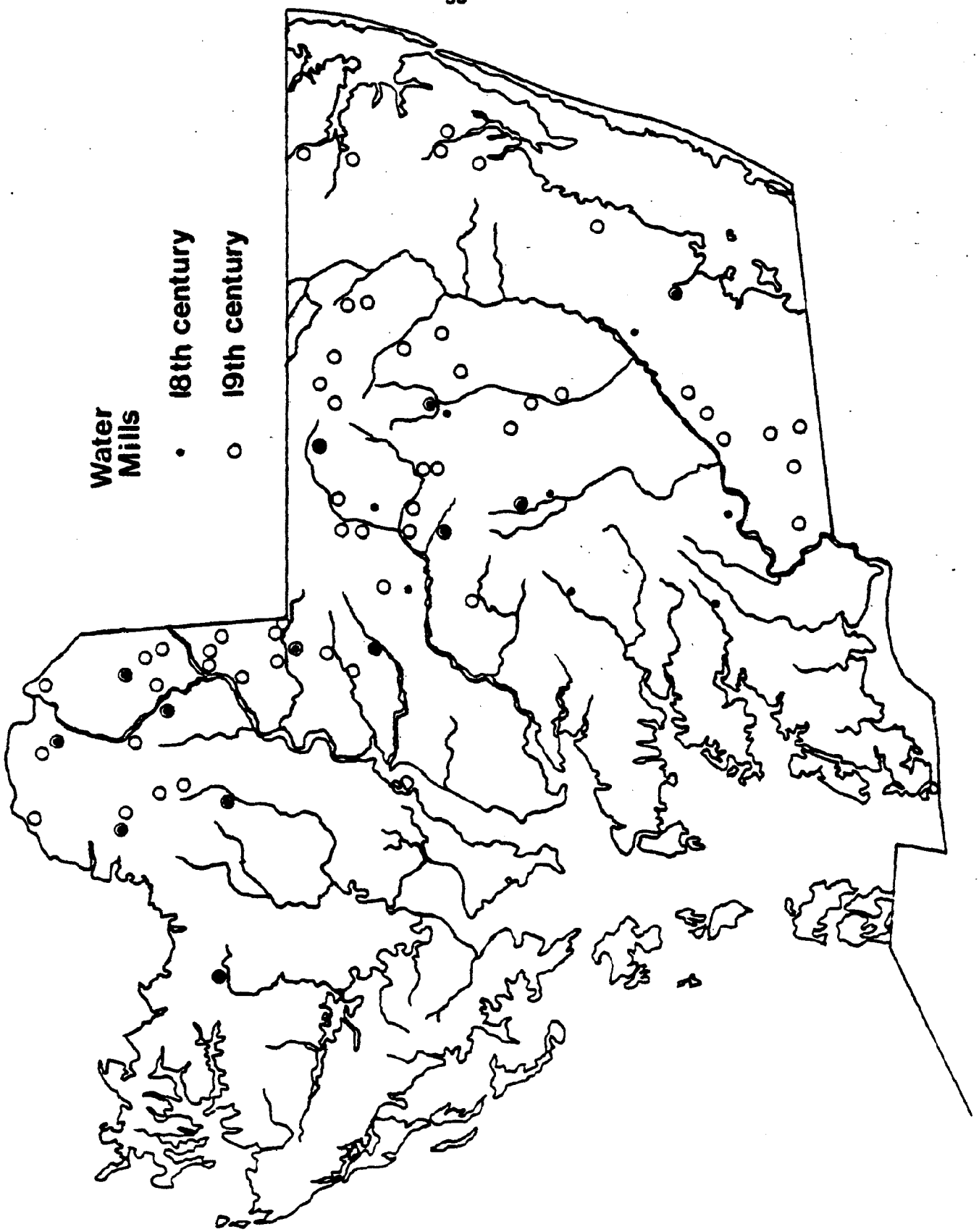
INDUSTRY

The industries of the Lower Delmarva region, from the 17th century to the present day, mainly have been concerned with the processing of locally available raw materials rather than with the manufacture of finished goods. The one notable exception to this rule is the shipbuilding industry, which was important in the late 18th and 19th centuries, especially in Dorchester County. The Lower Delmarva Peninsula had little to offer in terms of either metallic ores or fossil fuels. Attempts to extract iron from the bog iron deposits of the Pocomoke River drainage never achieved financial success. The quarrying of sand and gravel, basically for local use, has been going on in the region since the 18th century, but the main extractive economic activities of the Lower Delmarva area are agriculture, fishing and forestry.

Delmarva's industries concentrate on the processing of marine and terrestrial food products and also lumber and textile products. This pattern is one that formed quite early in the history of the region. Even in the 17th century the Lower Delmarva region did not have agricultural economy overwhelmingly dependent on tobacco, as the western shore of Maryland did. Lower Delmarva's agricultural economy was a mixed one, with livestock and grain products serving as cash crops as well as tobacco. The Lower Eastern Shore's cereal grains in particular seem to have been valued as exports.

Grain crops grew steadily in importance throughout the 18th century while tobacco declined, and by the Revolutionary war period tobacco had been totally eclipsed as a cash crop. The increasing importance of grain in the 18th century economy of the region encouraged the establishment of grist mills. These mills were usually water powered, although especially in Dorchester County some mills were wind powered. The earliest mills to be built in the Lower Delmarva region were probably established by individual planters to produce flour for local consumption rather than for commercial purposes, but by the 1720's larger mills operated by professional millers on a full time basis had come into being. Large water powered saw mills also appear early in the 18th century.

The topography of the Lower Delmarva region placed some major constraints on the development of the milling industry. The region generally lacks fast flowing natural watercourses that are capable of generating large amounts of head pressure for water mills. The most favorable lo-


Water
Mills
18th century
19th century

cations for water mills were in Northern Dorchester County and in Wicomico County, where streams flowing into the Choptank, the Nanticoke and the Wicomico Rivers had the most potential as power sources. Large water mills established before 1750 would include Lockerman's Mill west of Vienna, Venables Mill near present day Salisbury on the Wicomico, Kennerly's Mill on the Transquakin River and Hitches Mill on Rockawalkin Creek.

In the latter part of the 18th century this tendency for large water mills to locate in northern Dorchester and Wicomico Counties continued, but southern Dorchester County also supported a number of smaller mills whose agregate production must have been significant.

After the Revolutionary War the final demise of tobacco as a cash crop, the increased demand for Delmarva's cereal products, and the growing importance of the timber industry all encouraged rapid development of water mills in the Lower Delmarva region. Wicomico County, then part of Worcester and Somerset Counties, emerged as the major milling center of the region, rivaled only by the Nanticoke drainage area of northeastern Dorchester County. Vast tracts of oak and pine were cut for lumber in Wicomico, northern Dorchester, and Worcester Counties during the 19th century, and saw mills became increasingly important to the region's economy. The introduction of steam powered mills into the Lower Delmarva area about 1840 gave a further impetus to the lumber industry there, although these steam mills did not replace water mills as the major source of power.

In 1840, the first year for which we have reliable census data on mills, there were a total of 51 grist and saw mills within the area that was to become Wicomico County. Worcester County had 18 mills, Somerset County had 19 mills and Dorchester County had 42 mills. Within Dorchester County, however, large commercial saw and grist mills were basically confined to the part of the County north of Vienna. The dominance of Wicomico and northern Dorchester Counties in the milling industry continued throughout the 19th century. In 1880 Wicomico County supported 17 water powered grist mills and 21 water powered saw mills generating a total of 519 horsepower, while Somerset County contained only one significant water powered grist mill with a horsepower rating of 12. In the late 19th century a number of small portable steam saw mills were put to use in the Lower Delmarva region, but with the exhaustion of the most profitable stands of timber, these portable mills soon went out of business. Water powered saw and grist mills survived in the region up until World War II, but these mills had lost their economic importance by the 1920's.

Although the milling industry was important to the Lower Delmarva area in the 18th and 19th centuries, water power does not seem to have been much used for manufacturing there. Maryland's Eastern Shore produced significant quantities of cloth during the 17th, 18th and early 19th centuries, but seemingly this cloth was manufactured on manually

powered looms in the home. Somerset County was exporting both linen and woolen cloth as early as 1698, and the growth of cloth manufacture in this county can be seen as part of the general economic diversification that led away from dependance on tobacco as a cash crop. By 1800 all of the counties of the Lower Eastern shore are producing significant amounts of cloth. In 1810 Worcester County was the third largest producer of cloth in Maryland, with over a thousand looms operating. There were, however, no fulling mills in the region at the time, indicating that cloth making had remained a cottage industry. During the 19th century large scale machine production of textiles outside of the region caused the decline of Lower Delmarva's cloth industry. Textile production persisted on a much reduced scale, however, and even today textiles and apparel are manufactured in the Salisbury region.

Another of Lower Delmarva's industries which flourished in the early 19th century but declined thereafter was the tanning industry. Maryland's Lower Eastern Shore produced livestock in quantity and also had extensive oak forests, the two essential raw materials for the manufacture of leather. After the Revolutionary War an expanding market on the western shore for both finished leather and oak bark to be processed for tannin caused the rapid development of commercial tanneries and of related businesses such as shoemaking and bark harvesting. These new enterprises concentrated in Northern Dorchester and Worcester Counties and in the area that was to become Wicomico County. These are the same areas that were experiencing the most growth in the lumbering and milling industries, and clearly all of these industries were complimentary. The time of greatest growth for the tanning industry appears to have been the 1820's. Many of the tanneries founded in the early 18th century survived until after the Civil War, but by that time this industry was already in decline on the Lower Eastern Shore.

Shipbuilding is one of the oldest industries of the Lower Eastern Shore. From the beginning of settlement in the region ships and boats were important to the economy, since the internal road system of the lower peninsula was not capable of handling heavy wheeled vehicles until the late 18th century. Also the coastal trade was well developed on the lower Eastern shore even in the 17th century, and several of the more substantial planters owned ships with which to export their produce to markets on the western shore or to other parts of the Atlantic coast of America. Dorchester County was the most important manufacturer of ships among the lower Eastern Shore counties. Ships were being manufactured for sale in the Choptank River area early in the 18th century. By the 19th century shipyards existed at Cambridge, Church Creek, Madison, Taylor's Island and along the Nanticoke River and Marshyhope Creek. Dorchester County's main rival in shipbuilding was Wicomico County, with shipyards located along the east bank of the Nanticoke River. The rise of the commercial fishing industry in the 19th century encouraged the growth of shipyards throughout the region, but the depletion of the forests in Dorchester County coupled with changes in the technology of shipbuilding led to a steep decline in the industry by the beginning of the 20th century. As late as 1880 shipyards accounted for about 20% of total

capital investment in industry for Dorchester County, but by the 1920's shipbuilding investment was neglibible.

The processing of marine and terrestrial food products, which is today Delmarva's biggest industry, began in its present form in the late 19th century. The key factor in this development was the construction of railroads linking the lower Delmarva region with the urban centers to the north, although the establishment of regular steam packet service to the western shore also contributed to the transformation of the region's economy. Up until the Civil War grain and livestock were the principal agricultural products of the Lower Delmarva. The opening up of new lands in the western United States caused increased supplies of these products to become available in Delmarva's traditional export markets, however, having the effect of severely reducing profit margins. After the Civil War the Lower Delmarva region rapidly went over to the production of fruit and vegetables for nearby urban areas like Baltimore and Philadelphia. The railroads provided a means of getting these products to market rapidly. Easy accessability to markets coupled with the development of large scale canning techniques, also mainly a post-Civil War phenomenon, completely changed the agricultural economy of the region.

More rapid access to markets and improved preservation techniques also had a major effect on the fishing industry in the Lower Delmarva region. Fish, oysters and crabs had always been a part of the diet of the inhabitants of this region but until the 19th century such products were not significant exports. No regular market for oysters, the most important single seafood product, existed before the 1830's, when oyster packing houses became established in Baltimore. Initially oysters harvested in the Lower Delmarva region were sent to Baltimore by boat and processed there, but after mid-century oyster houses increasingly tended to be located on the lower eastern shore. The canning of oysters also began in the late 19th century, which further extended the markets open to Eastern Shore products. Although never as important as oystering, another commercial enterprise that developed in the 19th century was commercial seining for shad. Large scale seining continued on the rivers of the lower Delmarva into the present century.

The emphasis placed on seafood and orchard and vegetable crops during the late 19th century caused increased growth in the large towns of the region, especially Cambridge and Salisbury. At the same time southern Somerset and southern Dorchester counties, which had been declining in economic importance relative to the northern parts of the region, experienced a period of rapid growth. Oyster processing facilities were located at a number of small towns along Tangier sound like Fishing Island, Kingston, Fairmount, and Marion. Crisfield, at the southern end of the Eastern Shore Railroad, developed into the largest town in present day Somerset County. Southern Somerset County, which had been experiencing much lower rates of population growth than the northern part of the county for over a century, grew faster than the northern part of the county after 1850. This boom lasted only a few

decades however, and by the end of the century major development tended to occur in the north again.

The industries of the Lower Delmarva region in the 20th century are basically those that predominated in the late 19th century, canneries, packing houses for both seafood and truck garden crops, and lumber mills. The one major addition to this list that dates to this century is the broiler industry. The raising of broiler chickens has become the single most important agricultural activity in the region, and processing plants for broilers as well as plants for the manufacture of poultry feed have become a major part of the total industrial makeup of the Lower Delmarva.

At the present time the main industrial center of the Lower Delmarva region is the Salisbury Metropolitan area. The Salisbury Metro Core, as it is called by the Salisbury and Wicomico Planning and Zoning Commission, is a 23,880 acre area around the city of Salisbury that contains 62% of the total population and circa 80% of the total industrial base of Wicomico County, the most industrialized of the four Lower Eastern Shore counties. The Metro Core is essentially all of the area that lies within the line of the Rt. 13 Bypass. At the present time less than half of the total land area of the Metro Core can be classed as intensively used, but the area is slated for rapid growth over the next decade, and industrial development will continue to concentrate there.

STRESSES ON THE CULTURAL RECORD

MANAGEMENT UNITS

For the initial collection and interpretation of management data the Lower Delmarva region is both too large and too heterogeneous to be considered as a single unit. In order to monitor and assess adverse impacts on the cultural resources of this region, it must be subdivided into smaller units. This will facilitate the recognition of critical areas within the larger region and provide a basis for the development of individualized cultural resource management strategies for these critical areas. It is desirable that the management units be defined in such a fashion that data from these units can be cross-referenced with the archaeological site file data for the region in an efficient way, since correct management decisions require the integration of available archeological data with data on past, present and future land use in the same areas. Additionally, because the Lower Delmarva Region will be making extensive use of remote sensing to monitor environmental and developmental stresses, these smaller management units should share a common frame of reference with the remote sensing systems that are to be employed. Compatability between the different data systems saves time and avoids many of the data storage and retrieval problems that would result from the development of parallel systems that could not readily be cross-referenced.

The considerations outlined above led to the adoption of a system of management units based on standard U.S.G.S 7.5 minute quadrangle maps for the Lower Delmarva Region. Each of the smaller management units in the region was taken to be coterminous with one of the quadrangle maps covering a portion of that region. This in effect divided the Lower Delmarva Region into over fifty smaller units, each of which was named and delineated according to the already established practice of the United States Geological Survey. The U.S.G.S quadrangles already serve as the standard geographical referencing system for the state archaeological site files, and the remote sensing systems used by the Lower Delmarva Regional Center produce data that could be related to the quadrangle areas quite easily. The adoption of quadrangle based management units therefore satisfied all the necessary criteria for an efficient division of the Lower Delmarva Region into smaller management units.

These quadrangle units are small enough to permit the recognition of highly localized conditions affecting cultural resources while at the same time being large enough to represent, in a meaningful fashion, general trends in land use within an area. The units are of a standard size, which makes possible the comparison and ranking of the units by quantitative means. They can be combined to permit the study of large scale processes, like the evolution of transportation networks, as well. None of the existing political divisions within the Lower Delmarva region are especially meaningful in terms of development either during the present day or in the recent past, so the adoption of a system of subdivisions based on county or election district boundaries is inappropriate to the management procedures being developed by the Lower Delmarva Regional Office. On the other hand it also seemed to be inefficient to create

a completely new system of subdivisions based on present day environmental variables, since this would create severe practical monitoring and administration problems and be incompatible with the archaeological site file data system. The quadrangle units represent a practical compromise between the various possible bases for the subdivision of the Lower Delmarva Management Unit.

What follows is a description of a present day land use and natural coastline erosion rates in each of the quadrangle units located within the Lower Delmarva Management area. These descriptions are meant to provide a base line or frame of reference for the assessment of both natural and artificial stresses on the cultural resources of the Lower Delmarva region. A comparison of the scope of these stresses for each separate unit will permit the identification of the areas that, from an historic preservation point of view, are being most severely damaged by natural and man-made forces.

For management puposes the "present" will be defined as the month of April, 1977. An examination of the Landsat and high level aerial photographic coverage for the area that is now obtainable through the National Aeronautics and Space Administration pinpointed the April, 1977 date as being best for which both types of remote sensing data were available. Very good coverage from both Landsat and high level aerial photography was needed for this initial baseline classification of the Lower Delmarva region since Landsat imagery is received in digitized form rather than in the form of actual pictures of the land surface. The initial classification of the light frequencies recorded by Landsat is much simplified if comparison can be made with aerial photographs of the same region. After this initial classification has been made, however, the Landsat imagery can serve as the mainstay for the monitoring of further environmental change within the region.

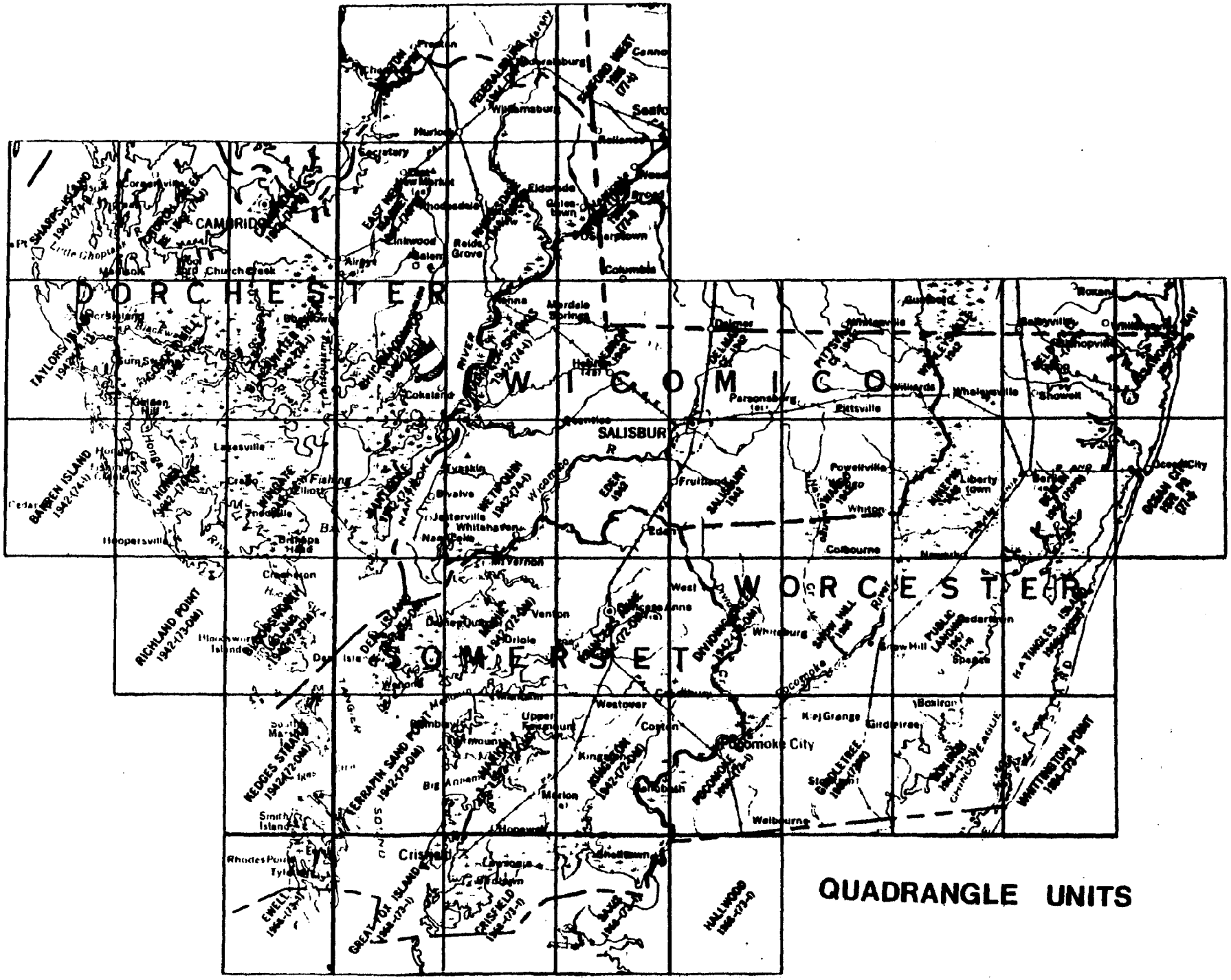
The stresses that adversely affect the cultural resources of the Lower Delmarva region have been divided into three general categories for monitoring purposes. Two of these categories are concerned with different types of land use and the third with the principle natural force that is responsible for the destruction of the region's cultural record, erosion. Briefly, the two man induced stresses on the environment of the region are defined as Intensive Land Use (Category 1) and Extensive Land Use (Category 2). An area of intensive land use is one in which the principle use made of land is for industrial, commercial or residential purposes. Intensive Land Use (Category 1) areas would include cities and towns, industrial parks and plant sites, quarries, housing developments or any other places where the land surface has been intensively modified by construction or excavation. Specifically excluded from this category are parks and other open areas within towns and cities that have not been substantially modified. The geographical limits of towns and cities are defined here in terms of land use rather than in terms of political boundaries.

Extensive Land Use (Category 2) areas are areas from which the native plant cover has been cleared, but which have not been substantially modified by construction or excavation. Most extensive land use areas are farms, but this classification would include cut over forest areas or any other cleared areas, whatever their present use might be. Most extensive land use areas are subject to regular plowing and to seasonal erosion during those periods when the ground surface is not covered by plant life. The rate of surface degradation varies depending on the kind of use and on the characteristics of the soil. The impact on the cultural record of extensive land use is at a lower level of intensity and spread out over a longer period of time than is the case for Intensive Land Use areas.

In the descriptions of land use characteristics that follow numerical percentages are given for the total amounts of land within each quadrangle unit that are affected by category 1 and category 2 stresses. The boundaries of the quadrangle units do not coincide in all cases with the boundaries of the Lower Delmarva management unit as a whole, however. In cases where the quadrangle units include areas outside of the limits of the Lower Delmarva region, the percentages refer only to those areas of the quadrangle units that fall with the four county region of the Lower Delmarva. Also, these percentages were calculated on the basis of total land area, not on the basis of total unit area. Several quadrangle units include substantial areas of open water, but the percentages of category 1 and category 2 land use refer only to the total land area within the quadrangle units.

The lands of the Lower Delmarva region that do not fall into either the category 1 or the category 2 classifications basically are swamp, marsh and forest areas. Most of the forested land of the Lower Delmarva has on one or more occasions in the past been cut over for timber or even totally cleared for agricultural purposes, however, and much of this land is likely to be utilized again in the future. Forested land that is privately owned is likely to be subject to intermittent category 2 stress, therefore. Swamp and Marsh lands are generally more secure than forested areas, but when drained or filled can be made suitable for either category 1 or category 2 use.

Apart from the Intensive and Extensive Land Use classifications the third major category of stress on cultural resources is natural coastline erosion. Both the Chesapeake Bay and the Atlantic Ocean coastlines of the Lower Delmarva region are eroding at a substantial yearly rate, and this process severely damages the cultural record of the region. Cultural resources are not simply submerged in a more or less intact form by the rising water level; they are torn apart by storm and tide action and their original context is lost. The coastline erosion process has been going on for several millennia at varying rates of speed. The rate and pattern or erosion during recent history has been studied by the Maryland Coastal Zone Management Unit, though, and future erosion rates can be predicted with some accuracy. Coastal erosion data will be discussed along with the land use data for the individual quadrangle units.



QUADRANGLE UNITS

% Category I Land Use

By Unit

			2	5	NA					
4	3	16	2	.8	NA					
0	.3	0	0	1	2	17	4	3	14	25
0	5	2	4	1	1	17	.2	.3	9	34
	0	.7	4	.8	4	0	2	1	.2	
		0	0	1	.6	4	2	0	0	
		4	0	18	.7	NA				

% Category 2 Land Use

By Unit

			76	73	NA					
28	57	36	63	62	NA					
21	22	35	26	37	56	51	55	55	63	4
9	14	5	10	33	51	38	34	46	50	14
	0	0	8	31	38	28	37	38	23	
		0	0	28	39	76	43	25	0	
		0	0	12	12	NA				

PRESENT STRESSES ON THE MANAGEMENT UNITS

Assawoman Bay Quadrangle- Land Use is dominated by commercial and residential development of Fenwick Island, with 25% of the total land area receiving Category 1 land use. Only 4% of the land receives Category 2 use, with most of the rest of the land area being as yet unutilized wetlands. In all 89% of the shoreline falls into the slight and low erosion categories (less than 4 feet per year) with the most severe erosion occuring on the Atlantic Shore of Fenwick Island.

Barren Island Quadrangle- This unit is characterized by an absence of category 1 land use and only 9% of category 2 land use, all of which is confined to Meekins Neck. Erosion is the major destroyer of sites here, with 42% of the total shoreline being subject to heavy (more than 8 feet a year) erosion. In the Tarr Bay area erosion is classified as heavy for 80% of the shoreline. Barren Island itself has lost almost half its total area since 1848.

Berlin Quadrangle- This unit has had a fairly rapid growth of category 1 land use due to the expansion of the town of Berlin and the building of the Ocean City Expressway and the Ocean Gateway Highway. Category 1 use accounts for 9% of the total land area and 50% of the area receives category 2 land use. Erosion rates for all of the shoreline area is in the slight or low categories (less than 4 feet a year) with the most severe erosion on the Atlantic side of Assateague Island.

Blackwater River Quadrangle- There is virtually no Category 1 land use in the Blackwater unit, but 35% of the total area is subject to Category 2 use. The southern part of this unit is unutilized marsh and swamp, with agriculture possible only in the northern part. Coastline erosion is not a factor that affects the unit.

Bloodsworth Island Quadrangle- Most of the land area of the Bloodsworth Island unit is unutilized. Less than 1% of the land receives Category 1 use and there is virtually no Category 2 use. The only areas of category 1 use are on Bishop's Head in the vicinity of Crocheron and Hog Island. Shore erosion rates are not available for this unit but a good estimate would be that circa 25% of the bay shoreline falls into the heavy (more than 8 feet a year) category. The use of Bloodsworth Island as a military target range should also be considered a significant impact.

Boxiron Quadrangle- Boxiron is basically an agricultural region as far as land use is concerned with Category 2 use amounting to 25% of the total area. Category 1 land use is negligible within the Boxiron Unit. Erosion rates are slight to low (less than 4 feet a year) for 79% of the shoreline. Erosion is most severe on the islands in Chicoteague Bay especially Mills Island and Big Bay Marsh.

Cambridge Quadrangle- This unit is subject to category 1 use that amounts to 16% of the total land area. Such land use is basically confined to the city of Cambridge itself and to the Rt. 50 highway corridor running east from the city. The area south of Cambridge is characterized by Category 2 use that accounts for 36% of the total land area of the unit. Erosion is categorized as slight (less than 2 feet a year) for 83% of the shoreline.

Chicamacomico Quadrangle- Category 1 land use is negligible in the Chicamacomico unit, while category 2 use accounts for 26% of the total land area. Much of the southern part of Chicamacomico consists of unutilized wetlands. This unit is one of the areas that has been least affected by development in the Lower Delmarva region. Coastline erosion is not a factor that affects the unit.

Church Creek Quadrangle- Although no large towns are contained within this unit, a total of 3% of the land area is subjected to category 1 use owing to the presence of several small coastal towns. There are many vacation homes in this area, and tourism and recreation are becoming increasingly important to the local economy. Apart from the 3% of Category 1 development, a further 57% of the unit is subject to Category 2 land use. Coastline erosion is slight for 70% of the unit, with the highest erosion rates occuring along the Little Choptank River.

Crisfield Quadrangle- Crisfield is the major area of Category 1 land use in the southern half of the Lower Delmarva region, with 18% of the total land area being intensively utilized. Crisfield is a major seafood processing center and an important center for recreational boating in the lower Chesapeake. A further 12% of the Crisfield region receives Category 2 use. Erosion is slight or low for 81% of the shoreline of the region, but the shoreline immediately adjacent to the town of Crisfield has been extensively modified by man over the last century.

Deal Island Quadrangle- A total of 4% of this unit falls into the category 1 classification with the main use being residential rather than industrial or commercial. A further 8% of the unit receives Category 2 use, but most of the unit is too poorly drained for agricultural purposes. Although 83% of the shoreline has an erosion rate classed as either slight or low (less than 4 feet a year), localized areas experience considerably higher rates. A number of places along the north shore of Dames Quarter and the west shore of Stump Point Marsh have erosion rates of up to 8 feet a year.

Delmar Quadrangle- The Delmar unit is experiencing rapid Category 1 development along the Rt. 13 highway corridor that runs from the city of Salisbury to the town of Delmar on the Maryland-Delaware border. Presently 17% of this unit is subject to Category 1 land use and 51% is subject to Category 2 land use. With the continued expansion of the city of Salisbury in a northeasterly direction it can be predicted that more and more category 2 land will be converted to category 1 uses. The area

between Delmar and Salisbury is increasingly being utilized for new residential developments and soon the Rt. 13 corridor north of Salisbury will be entirely converted to residential, commercial and light industrial use. Coastline erosion is not a factor that affects this unit.

Dividing Creek Quadrangle- Dividing Creek is one of the least utilized inland units of the Lower Delmarva, with 28% of the area receiving Category 2 use and virtually none of the area receiving Category 1 use. Much of this unit is contained within the boundaries of the Pocomoke State Forest. Coastline erosion does not affect this unit.

East New Market Quadrangle- Category 2 land use in the East New Market unit is quite heavy, with 63% of the total land area being devoted to such use. Category 1 use occurs on 2% of the unit, but this figure is likely to increase with the continued development of the Rt. 50 corridor that runs through the southern part of the unit. Presently the East New Market area is characterized by quite heavy agricultural use. Erosion is slight (less than 2% a year) for 83% of the relatively small shoreline area of the unit.

Eden Quadrangle- This unit is located just west of the Salisbury Metropolitan area, but as yet category 1 land use is confined to only 1% of the total land area. The unit contains three small towns, Allen, Eden and Quantico, but land use is basically agricultural, with Category 2 use being found on 51% of the area. U.S. Rt. 13 runs through the southeastern corner of the unit, and additional residential and commercial development along this highway can be expected. Coastline erosion does not affect this unit.

Ewell Quadrangle- The Ewell unit takes in the inhabited parts of Smith Island, basically the towns of Ewell, Tylerton, and Rhodes Point. These towns give a total of 4% for Category 1 land use in the unit. Category 2 land use is negligible. Erosion on the western side of Smith Island is a severe problem, with 21% of the shoreline falling into the heavy (more than 8 feet a year) category, and 22% falling into the moderate (4 to 8 feet a year) category. On the north, east and south parts of the island erosion is much less serious, and is generally in the slight (less than 2 feet a year) category.

Federalsburg Quadrangle- (Data is only available for the portion of this unit that lies west of Marshyhope Creek). Although the town of Federalsburg proper is located in Caroline County, development associated with this town extends into Dorchester County. Category 1 land use in the area south of Federalsburg and around the town of Hurlock give the unit a 5% Category 1 land use classification. A further 73% of the unit is subject to Category 2 land use. Extensive gravel quarrying south of Federalsburg poses a serious threat to the cultural resources of the Upper Marshyhope Creek area. Coastline erosion does not affect this unit.

Girdletree Quadrangle- Category 1 land use within this unit accounts for 2% of the total area, with most of this use concentrated in the towns of Stockton and Girdletree. Another 43% of the unit receives Category 2 use. Timbering is fairly important in this area and significant quantities of forest land have moved into the Category 2 classification in the last few years. Coastline erosion affects only a small part of this unit and the rate of this erosion is classified as slight.

Golden Hill Quadrangle- There is less than 0.5% of Category 1 land use in this unit and only 22% of Category 2 land use. Most of the unit is located within the swamps and marshes of the Blackwater river drainage. Coastline erosion is classified as slight (less than 2 feet per year) for 69% of the total shoreline, and 30% of the shoreline is subject to aggredation rather than degradation by water action.

Great Fox Island Quadrangle- There is no land use of either Category 1 or Category 2 type within the Great Fox Island Unit. Nearly all the land area of this unit is contained within the Jones Island Park or the Cedar Island Wildlife Management Area. Erosion is a major threat to cultural resources here, with 51% of the total coastline assigned to the moderate (more than 4 feet a year) or heavy (more than 8 feet a year) categories. Erosion is most severe along Tangier Sound, and the rate of erosion appears to be increasing in recent years.

Hebron Quadrangle- Hebron as yet has only 2% of its total land area undergoing Category 1 use, but the expansion of the Salisbury metropolitan area into this unit will bring increased intensive land use in the future. Commercial and residential use has grown steadily along Rt. 50 between Salisbury and the town of Hebron, and this trend should continue. An additional 56% of the Hebron unit receives Category 2 land use. Coastline erosion is not a factor for this unit.

Honga Quadrangle- The Honga unit receives a relatively high (5%) level of Category 1 land use for a coastal region that is not near a city or large town. This is because of fairly dense residential use on Hoopers Island. Category 2 land use characterizes only 14% of this unit, mainly because much of the total land area is marsh or swamp. Erosion is classified as slight for 72% of the Honga River shoreline, but it is more severe on the Bay side of Hoopers Island, and especially along Middle Hoopers Island.

Kedges Straights Quadrangle- The Kedges Straights unit is uninhabited, and receives neither Category 1 nor Category 2 use. Information is not available on erosion rates, but these can be presumed to be similar to rates for the Ewell unit, with erosion along the west side of the islands being moderate to heavy.

Kingston Quadrangle- Category 1 land use occurs on less than 1% of the total area of the Kingston unit. The unit contains a number of very small towns, but agriculture is the predominant land use in the area, with 39% of the unit receiving Category 2 use. Much of the land within the unit is unutilized because it is located within the extensive areas

of swamp that are associated with Marumsco Creek and the Pocomoke River. Coastline erosion does not affect this unit.

Mardela Springs Quadrangle- Category 1 land use occurs on 1% of the Mardela Springs unit while Category 2 land use takes in an additional 37% of the unit area. Two towns along U.S. Rt. 50, Vienna and Mardela Springs, account for virtually all of the Category 1 land use within this unit. Further development can be expected along the Rt. 50 corridor through the northern part of the unit. The area immediately north of the bridge in Vienna is the only area of industrial development in the unit at the moment, but increased residential and commercial development should be expected. Coastline erosion does not affect this unit.

Marion Quadrangle- The presence of several small towns with the Marion unit gives a total of 1% for Category 1 land use there. Further Category 1 development will probably tend to occur along Rt. 413, the main road connecting Crisfield with Rt. 13. Category 2 land use presently occurs on 28% of this unit. The marsh areas of Fairmount Neck and the south shore of the Annemessix River are basically unutilized. Erosion is classed as either slight or low for 83% of the shoreline, with shoreline aggredation affecting another 16%.

Monie Quadrangle- Category 1 land use occurs on just under 1% of the land area of this unit, with three small residential towns, Mt. Vernon, Venton and Oriole, accounting for nearly all of this total. In all 31% of the unit is subject to Category 2 use. Shoreline erosion is proceeding at slight or low rate along 89% of the coast, but rates are somewhat higher in the Victors Neck and Holland Point areas.

Nanticoke Quadrangle- Category 1 development here is concentrated along the east bank of the Nanticoke below Wetipquin Creek, where the towns of Tyaskin, Bivalve, Jesterville and Nanticoke form a narrow but almost continuous strip of residential and recreational development. In all 4% of the unit is assigned to Category 1 and another 10% is subject to Category 2 use. Marsh and swamp areas inhibit more extensive Category 2 land use. Erosion is slight to low (less than 4 feet a year), for 90% of the coastline.

Ninepin Quadrangle- Less than 0.5% of this unit is subject to Category 1 land use, but Category 2 use is fairly heavy, taking up 46% of the total unit area. Timbering has been going on in this area at a fairly high rate in recent years. The Pocomoke River has been artificially channelized over much of its length in this unit, having an unknown but undoubtedly deleterious effect on the cultural resources of the area.

Ocean City Quadrangle- This is the unit with the highest percentage of Category 1 development in the Lower Delmarva region. In all 34% of the unit receives Category 1 use and a further 14% receives Category 2 use. The portion of Fenwick Island within this unit is in essence.

totally developed, and Category 1 development has extended to the adjacent Upper Sinepuxent Neck area as well. The only part of the Ocean City unit that is not likely to go over to Category 1 use is northern Assateague Island which is protected by its state and federal park status. Northern Assateague is subject to very severe erosion, however, with 54% of the total coastline of this unit having an erosion rate classified as heavy (more than 8 feet a year). In the case of northern Assateague the construction of erosion barriers at the south end of Fenwick Island has intensified this problem, this whole part of Assateague has moved half a mile to the west, probably destroying any in situ cultural remains that pre-date 1900 A.D.

Pittsville Quadrangle- Category 1 lands account for 4% of the total area of this unit, and another 55% of the unit is subject to Category 2 use. The present and future patterns of land use in the Pittsville unit are dominated by the presence of the Rt. 50 corridor that runs along the southern edge of the unit. Growth along Rt. 50 between Salisbury and Ocean City has been increasing in recent years and this affects the growth of the towns of Pittsville and Parsonsburg within the unit. Future Category 1 development can be expected to occur between these towns and the Rt. 50 corridor. Coastline erosion is not a factor for this unit.

Pocomoke City Quadrangle- The Pocomoke City unit has the largest total area of land under use for any unit within the Lower Delmarva Region, with 4% Category 1 usage and 76% Category 2 usage. Pocomoke City is located at the junction of two major highways, Rt. 13 and Rt. 113, and a combination of through traffic travelling along Rt. 13 and local demand from the adjacent parts of Somerset and Worcester Counties has turned this town into the major retail trade center for the southern part of the Lower Delmarva region. The completion of the Bay Bridge-Tunnel which links the Delmarva Peninsula with Norfolk and the south caused a period of rapid growth for the Pocomoke City area. This unit can expect further growth. Coastline erosion is not a factor here.

Preston Quadrangle- Category 1 use is found on 2% of the land area of this unit, while another 76% of the unit receives Category 2 use. There are no important towns within this unit but it receives heavy agricultural usage, and the Beulah landfill is located here. This landfill will continue to be used until the year 2000 A.D. Erosion is classed as slight (less than 2 feet a year) for 76% of the shoreline of this unit.

Princess Anne Quadrangle- The Princess Anne unit presently exhibits 4% of Category 1 usage and 38% of Category 2 usage. The town of Princess Anne is the main administrative and retail sales center in Somerset County, and while the county population has declined over the past two decades, Princess Anne has expanded in total area. New residential areas have appeared on the north side of town both east and west of Rt. 13. The University of Maryland's Eastern Shore Campus at Princess Anne is also slated for growth in the future. Category 1 land use should increase,

therefore. Coastline erosion is not a factor for this unit.

Public Landing Quadrangle- A total of 1% of this unit can be assigned to the Category 1 land use classification, but there are no towns of any size here. Large scale commercial digging for sand has been carried out in the St. Lawrence Neck area of this unit, and in recent years there has been a considerable amount of timbering in the area south of Cedarton, but agriculture is still the main land use. In all 38% of this unit falls into the Category 2 land use classification. For 80% of the coastline erosion is classified as slight to low, but along the southern part of the coast are some areas of moderate (4 to 8 feet a year) erosion that make up 11% of the total coastline erosion pattern.

Richland Point Quadrangle- There is no appreciable impact on the Richland Point unit from either Category 1 or Category 2 land use. Coastline erosion is the principal destroyer of cultural resources within this unit. Erosion is slight to low for 84% of the total coastline. For 27% of the western or Chesapeake Bay fronting coastline, however, erosion is classed as heavy (more than eight feet per year).

Rhodesdale Quadrangle- (Data is only available for the portion of this unit that lies west of Marshyhope Creek) This unit contains no towns of any size, and Category 1 land use occurs on less than 1% of the total land area. Rhodesdale ranks quite high among the units in Category 2 land use, however, with 62% of its total area receiving such use. Rhodesdale is basically an agricultural area, but Category 1 land use could increase with the expansion of the town of Hurlock southward into the unit and the growth of the Eldorado/Brookview area. Coastline erosion is not a factor for this unit.

Salisbury Quadrangle- This unit is characterized by heavy Category 1 land use, with circa 6400 acres, or 17% of the total land area, being intensively utilized. Almost all of this Category 1 use is located in the Salisbury Metro Core area, which is contained within the loop of the Rt. 13 bypass. The Metro Core has been developing rapidly since the 1950's, and will continue to grow in the future. Salisbury is the largest city on Maryland's Eastern Shore, and the principal commercial and manufacturing center for the Lower Delmarva Region. Category 1 land use has increased at a rapid rate in the Salisbury area, particularly along Rt. 50 east of the city, and Rt. 13 south of the city. This trend should continue at least until the end of the century. Category 2 land use accounts for 38% of the land area of the unit. It is likely that considerable amounts of Category 2 land will continue to be converted to Category 1 use in this unit. Coastline erosion is not a factor for this unit.

Saxis Quadrangle- Less than 1% of this unit receives Category 1 use, and a total of 12% of the unit receives Category 2 use. Much of the land area of the Saxis unit is unutilize marsh. Coastline erosion provides the main threat to the cultural resources of the Saxis area. Erosion rates are classed as slight or low (less than 4 feet a year) for 81% of the total coastline. A further 20% of the coastline is subject to aggredation. A

large section of the coastline of the unit south of Marumsco Marsh has been severely impacted by the dredging of the Fair Island Canal.

Selbyville Quadrangle- Selbyville is one of the most heavily utilized units of the Lower Delmarva Region, with Category 1 use occuring on 14% of the total land area and Category 2 use taking in another 63% of the area. The great majority of the Category 1 development is concentrated in the southeastern part of the unit along both sides of the Ocean City Expressway. The very large Ocean Pines residential area takes in everything between the St. Martin's River and Manklin Creek. The growth of Ocean City has resulted in an increasing spread of Category 1 land use on to the mainland, especially around the two bridges that cross to Fenwick's Island. Land use away from the Ocean City area is still mainly agricultural, although the town of Bishopville, near the Delaware border, continues to expand. Erosion rates are classed as slight to low (less than 4 feet a year) for 74% of the coastline. There has also been a considerable amount of artificial filling along the shoreline of Jenkins Neck.

Sharps Island Quadrangle- A total of 4% of this unit receives Category 1 use, largely because in recent years the area has attracted large numbers of retirement and holiday home buyers and because of the concomitant development of recreational facilities along the shoreline. Category 2 use accounts for 28% of the unit. Erosion is heavy (more than 8 feet a year) for 18% of shoreline of the unit, while 57% of the total shore falls into the slight or low (less than 4 feet a year) categories. If the bay coastline is considered by itself however, erosion is classed as heavy for 43% of its total length. Sharps Island itself has lost over 80% of its total land area since 1848.

Sharptown Quadrangle- (data is not available for this unit)

Snow Hill Quadrangle- Although the town of Snow Hill is an important administrative and retailing center for Worcester county only 2% of the land in this unit can be classed as Category 1. The main land use in the unit is agricultural, with 37% of the total land area receiving Category 2 use. The unit has also been subject to considerable commercial timbering in recent years. Commercial gravel digging has been carried out in an area to the southwest of the town of Snow Hill in past years, but this is not apparently going on at the present time. A new project to revitalize the area along the Pocomoke River at Snow Hill has been proposed, but this will mainly affect areas already receiving Category 1 use. Coastline erosion is not a factor for this unit.

Taylors Island Quadrangle- There is no appreciable amount of Category 1 land use within this unit. A total of 21% of the land area of the unit is undergoing Category 2 use, with much of the rest of the land here being unutilized marsh. Erosion is a severe problem. Erosion rates are classed as heavy (more than 8 feet a year) for 41% of the total coastline of the unit and for 71% of the Chesapeake Bay coastline of the unit. The western coastline of Meekins Neck has retreated over half a mile since 1848.

Terrapin Sand Point Quadrangle- There is no land use of either Category 1 or Category 2 type within this unit. Erosion is classed as slight (less than 2 feet a year) for 51% of the coastline, but for a significant minority of the units coastal areas (28%) erosion is in the heavy range (more than 8 feet a year). This is especially true for Terrapin Sand Point itself.

Tingles Island Quadrangle- Less than 0.5% of this unit receives Category 1 use, and only 23% receives Category 2 use. Much of the total land area of the unit is unutilized because it is part of the Assateague Island National Seashore. Future development is most likely to occur on the Lower Sinepuxent Neck which is accessible from the Ocean City area via the Stephen Decatur Memorial Road. Erosion is classed as slight (less than 2 feet a year) for 51% of the shoreline, but aggredation is a problem for an additional 38% of shoreline areas. Aggredation is particularly severe on the Atlantic side of Assateague Island.

Wango Quadrangle- Less than 0.5% of this unit receives Category 1 use. The only town of any size is Powellville. Category 2 land use occurs on 34% of the unit. Large areas of forest are present within this unit, and intermittent commercial timbering is likely to affect significant percentages of the unutilized land here. Coastline erosion is not a factor for this unit.

Wetipquin Quadrangle- Category 1 land use affects 1% of this unit, mainly in the area that borders the lower Wicomico River. Although there are considerable regions of marsh and swamp contained within this unit, most of the total area is well enough drained for Category 2 land uses, and 33% of the total unit receives such use. Shoreline erosion is mainly a problem for the lower Nanticoke River, but rates are classed as slight to low (less than 4 feet a year) for 96% of the total shoreline of the unit.

Whaleysville Quadrangle- Category 1 land use takes place on 3% of the total land area of this unit. Category 1 use is confined almost exclusively to a strip of land running through the southern part of the unit that parallels Rt. 50 and the Conrail Line. The two major towns of the unit are Willards and Whaleysville. A further 55% of the unit receives Category 2 use. Most such use is agricultural, but a significant amount of commercial timbering has taken place in the unit during the 1970's. Coastline erosion is not a factor for this unit.

Whittington Point Quadrangle- No land use of either Category 1 or Category 2 type occurs within this unit. The total land area of the unit is contained within the limits of the Assateague Island National Seashore and the Chincoteague National Wildlife Refuge. Shoreline erosion is classed as slight (less than 2 feet a year) for 77% of this

unit, while a further 23% of the shoreline is subject to aggredation.

Wingate Quadrangle- A total of 2% of the Wingate unit is subject to Category 1 use, mainly owing to the presence of several small towns. Category 2 land use is confined to only 5% of the total land area. The majority of the unit consists of unutilized marsh and swamp which will tend to limit future Category 2 development. Erosion rates for 90% of the shoreline fall within the slight or low (less than 4 feet a year) classifications, but rates are somewhat higher in the Fishing Bay area than for the unit as a whole.

SUMMARY

An examination of the land use and erosion variables for the Lower Delmarva quadrangle units shows that the existing stresses on the cultural record of the region are distributed in a very uneven fashion. Land use stresses affect up to 80% of the total area of some units while having no effect at all on others. Similarly coastline erosion is destroying the cultural resources of some units at an extremely rapid rate. At the same time other coastline units are experiencing erosion rates that are smaller by a factor of ten than are those of the most severely impacted units. There are some larger patterns of stress, however, that appear when the Lower Delmarva Quadrangle units are compared. The individual units can be grouped together into zones having similar stress characteristics to assist in the development of a management plan for the Lower Delmarva region. Ten main groupings are recognizable within the fifty-one quadrangle units of the region. A list of these groupings and their defining characteristics is given below.

1. Outer Chesapeake Bay Group- (Barren Island, Bloodsworth Island, Ewell, Great Fox Island, Kedges Straights, Richland Point and Terrapin San Point units) Land use, whether of Category 1 or Category 2 type is highly localized and does not take in more than a total of 10% of the land area of a unit. More than 75% of the land area of the units is marsh. Erosion is classed as heavy for at least 20% of the Bay Shoreline of each unit.

2. Upper Tangier Sound Group- (Deal Island, Honga, Nanticoke and Wingate units) Category 1 land use is moderate (2-5%) and Category 2 land use is low (5-14%). Most of the total land area of the units is marsh. Coastline erosion is slight to low for over half of the total coastline of each unit and erosion classed as heavy occurs on less than 10% of the total coastline.

3. Central Dorchester Group - (Blackwater River, Chicamacomico, and Golden Hill units) Category 1 land use is very low (less than 0.5%) and Category 2 land use ranges from 22 to 35%. Marsh conditions are present

over large portions of each unit, but at least a third of the total land area is suitable for either Category 1 or Category 2 use. Coastline erosion is not an important problem for any of the units.

4. Northern Dorchester Group- (East New Market, Federalsburg, Preston and Rhodesdale units) Category 1 land use is moderate to low (0.8%-5%) and Category 2 land use is very heavy (62%-76%). Most of the land of these units is subject to agricultural use. Coastline erosion is not a significant factor for these units.

5. The Western Inland Group- (Kingston, Mardela Springs, Marion, Monie and Wetipquin) Category 1 land use is low (0.5%-1%), and Category 2 use is moderate (28%-39%). Each of these units contains large areas of marsh or swamp, but these conditions are present over less than half of the total land area of each unit. Erosion rates are slight or low for the river shorelines of these units.

6. Middle Pocomoke Drainage Group- (Dividing Creek, Girdletree, Ninepin, Public Landing, Snow Hill and Wango units) Category 1 land use is low or very low (less than 0.5% to 2%) and Category 2 land use is moderate to high (28%-46%). Land use is mainly agricultural, but large tracts of forest remain and commercial timbering is important. Coastline erosion is not significant for any of these units except Public Landing.

7. Chincoteague Bay Group- (Boxiron and Tingles Island Units) Category 1 land use is very low (less than 0.5%) and Category 2 land use is low (23%-25%). Both units have large areas of coastline, but erosion rates tend to be low or slight.

8. Fenwick Island Group- (Assawoman Bay and Ocean City units) Category 1 land use is very high (25-34%) and Category 2 land use is very low to low (4%-14%). Both units have large areas of coastline, but erosion rates tend to be slight or low except for Assateague Island where erosion is heavy.

9. Salisbury-Berlin Corridor Group- (Berlin, Delmar, Eden, Hebron, Pittsville, Salisbury, Selbyville and Whaleysville units) Category 1 land use varies from low to high and Category 2 land use ranges from moderate to very high. All units within this group show either Category 1 land use in the heavy classification or Category 2 land use in the heavy classification. The two main urban centers of Salisbury and Berlin are linked by U.S. Rt. 50, and this whole corridor has in recent years been subject to rapid development. Coastline erosion affects only some units, and is classed as slight or low.

10. Lower Choptank Group- (Church Creek and Sharps Island units) Category 1 land use is moderate (3%-4%) and Category 2 land use is moderate to heavy (28%-57%). Both units have recently been affected by the increased development of recreational facilities and by the growth of second or retirement home ownership. Erosion is slight or low for the majority of

the coastline but it is heavy for much of the Bay coast.

Not all of the Lower Delmarva Units are contained within the ten groups described above. Four other units include large individual towns (Cambridge, Crisfield, Pocomoke City and Princess Anne) that give the units Category 1 land use percentages in the moderate or heavy range. These towns do not as yet seem to influence in a major way the pattern of development outside of their own units, so they have not been combined with surrounding units. In the case of Cambridge in particular, however, future land use changes may affect adjacent units in important respects. Apart from these four "town" units, three other units remain ungrouped. Two of these are Whittington Point, a unit not threatened by current land use and subject to only slight erosion rates, and Saxis, a unit with a Category 2 land use percentage equivalent to the neighboring Crisfield unit, but with a Category 1 land use percentage in the low range. The third unit is Taylor's Island, which has land use characteristics that match the Central Dorchester Group and coastline erosion characteristics that are similar to the Outer Chesapeake Bay Group.

The ten multi-unit groups of the Lower Delmarva region clearly are subject to radically different stress patterns. For Groups 1 and 2 natural erosion processes undoubtedly are the most important threats to the cultural record. For Groups 3,4,5 and 6 the main stresses on cultural resources result from Category 2 land use, but the nature and extent of these stresses vary markedly from group to group. For Group 7 a combination of Category 2 land use and erosion contributes to site destruction, while for Group 8 the main threat is from Category 1 land use. Group 9 is subject to major stress from both Category 1 and Category 2 land use. Finally Group 10's cultural record is threatened to a significant extent by both categories of land use and also by coastline erosion.

It is difficult to quantify the relative severity of these different stress patterns and to rank the groups according to the degree that their cultural resource bases are threatened. Cultural resources are not distributed uniformly in space, and in any case the nature of these resources will differ from one area to another. It seems likely however, that the four groups experiencing greatest stress as far as cultural resources are concerned are Fenwick Island, the Outer Chesapeake Bay, the Salisbury-Berlin Corridor and Upper Tangier Sound. The Northern Dorchester group and the Pocomoke City unit receive very heavy Category 2 use, but such stresses probably have a less immediate impact on the cultural record than do the stresses operative within Groups 1,2,8, and 9. Low stress groups would include the Chincoteague Bay, Central Dorchester and Western Inland Groups, as well as the Saxis and Whittington Point units. These are groups with very low Category 1 land use and slight or low coastline erosion problems.

LAND USE BY UNIT GROUPS

	very low	low	moderate	heavy	very heavy
Category 1	0.5	0.5-2.0	2.0-5.0	5.0-20.0	20.0-100.0
Category 2	5.0	5.0-25.0	25.0-40.0	40.0-60.0	60.0-100.0

	Category 1	Category 2	Shoreline Erosion
Group 1	very low to moderate (less than 10% total)	very low to low	heavy for 20% or more of Bay
Group 2	moderate	low	heavy for less than 10%
Group 3	very low	low to moderate	slight (only some units)
Group 4	low to moderate	very heavy	insignificant
Group 5	low	moderate	slight to low (for rivers)
Group 6	very low to low	moderate to high	slight to low (only some units)
Group 7	very low	low	slight to low
Group 8	very heavy	very low to low	slight to low (except Assateague)
Group 9	low to heavy	moderate to heavy	slight to low (only some units)
Group 10	moderate	moderate to heavy	slight to low generally, but heavy for the Bay

LAND USE BY QUADRANGLE UNIT

	Category 1	Category 2	
Assawoman	25%	4%	
Barren Is.	0%	9%	
Berlin	9%	50%	
Blackwater	0%	35%	
Bloodsworth	.7%	0%	
Boxiron	0%	25%	
Cambridge	16%	36%	
Chicamacomico	0%	26%	
Church Creek	3%	57%	
Crisfield	18%	12%	
Deal Is.	4%	8%	
Delmar	17%	51%	
Dividing Creek	0%	28%	
East New Market	2%	63%	
Eden	1%	51%	
Ewell	4%	0%	
Federalsburg	5%	73%	west of Marshyhope Creek only
Girdletree	2%	43%	
Golden Hill	.3%	22%	
Great Fox Is.	0%	0%	
Hebron	2%	56%	
Honga	5%	14%	

Kedges Straights	0%	0%
Kingston	.6%	39%
Mardela Springs	1%	37%
Marion	1%	28%
Monie	.8%	31%
Nanticoke	4%	10%
Ninepin	.3%	46%
Ocean City	34%	14%
Pittsville	4%	55%
Pocomoke City	4%	76%
Preston	2%	76%
Princess Anne	4%	38%
Public Landing	1%	38%
Richland Point	0%	0%
Rhodesdale	.8%	62% west of Marshyhope Creek only
Salisbury	17%	38%
Saxis	.7%	12%
Selbyville	14%	63%
Sharps Is.	4%	28%
Sharptown	data not available	
Snow Hill	2%	37%
Taylors Is.	0%	21%
Terrapin Sand	0%	0%
Tingles Is.	.2%	23%
Wango	.2%	34%
Wetipquin	1%	33%

Whaleysville	3%	55%
Whittington	0%	0%
Wingate	2%	5%

FUTURE DEVELOPMENT WITHIN THE LOWER DELMARVA REGION:

It seems unlikely that the Lower Delmarva will experience either rapid overall population growth or much new industrial development within the remaining two decades of this century. This statement must be qualified somewhat, since there is at least the possibility that the region could become a base for offshore oil exploration and exploitation, which would create a completely new set of cultural resource management problems. At the present time, though, there is no strong reason to believe that the region will be affected by oil industry related development, even though there are persistent rumors that the surrounding offshore areas may contain significant amounts of oil.

While industrial development will not be a significant threat except in a few restricted areas like the Salisbury Metro Core, residential and commercial development will be a severe problem. Although the Lower Eastern Shore's total population will not grow a great deal in the next twenty years, there will be a considerable degree of population redistribution. Rural farm population will probably continue to decline, but this loss will be made up by the construction of housing developments outside of the larger towns of the region. These housing developments create relatively high spot population densities that impose stresses on the environment that are not present in the case of a dispersed rural/farm residence pattern. Housing developments require elaborate water and sewer systems rather than individual wells and septic tanks. Already central Wicomico County is running out of land with the proper drainage characteristics to support even moderately dense residential housing.

A great deal of current residential and commercial development is related to the growth of the tourism and recreation industries in the Lower Delmarva region. The most obvious example of this is provided by Ocean City. On an average summer weekend in Ocean City the tourist population is considerably larger than the total resident population of the Lower Delmarva region. Since facilities have to be designed to accomodate peak demand rather than average annual demand, the Ocean City area is much more developed than would be necessary if only the area's permanent population needed to be served. Also there is a growing demand for summer or vacation homes in many areas of the Lower Delmarva region. This demand is increasingly affecting communities on the Bay as well as the Atlantic side of the Delmarva Peninsula. As in the case of the inland residential housing developments high spot population densities are created and facilities of all sorts must be upgraded even if peak demand is seasonal.

COMMERCIAL AND RESIDENTIAL GROWTH AREAS:

The areas likely to be most seriously affected by commercial and residential development over the next two decades are the Salisbury-Berlin Corridor, the Sinepuxent-St. Martin's Neck area of Worcester County and the Cambridge Crescent. The Salisbury-Berlin Corridor area has been defined earlier in the current land use section of this plan. The Sinepuxent-St. Martin's Neck area is essentially a westward extention of the Fenwick Island Unit. The westward spread of development from Ocean City that is now affecting the Upper Sinepuxent neck should continue over the next twenty years, and eventually take in all of Worcester County between Rt. 113 and Assawoman Bay. A similar extention of this developed area to the south should encompass the Lower Sinepuxent Neck as well.

On the Bay side the chief area for development should be the Cambridge Crescent. This is a crescent shaped region lieing along the south side of the Great Choptank River between Cambridge and Secretary. The Cambridge Crescent may develop into a small scale version of the Salisbury-Berlin Corridor, with development strung out along Rt. 50 as far east as Mt. Holly, and then turning northward up Rt. 16 to Secretary. The pace of development here should be somewhat slower than in the areas mentioned above, however, and the total land area that will be affected is smaller.

Apart from these three major development areas, i.e. the Salisbury-Berlin Corridor, the Sinepuxent-St. Martin's Neck area and the Cambridge Crescent, some other areas of the Lower Eastern Shore should experience considerable localized developmental pressure before the end of the century. In Dorchester County the towns of Vienna and Hurlock are the places outside of the Cambridge Crescent region that are likely to prove to be the largest recipients of residential and commercial development. In Somerset County the Crisfield area may continue to grow, especially if the proposed improvements to the harbor there are carried through. Pocomoke City, in southern Worcester County will almost certainly expand significantly over the next two decades. In each of these cases,however the total land area that is likely to be developed between now and the year 2000 is small relative to the three major development areas outlined above.

TRANSPORTATION:

One factor that will have a profound effect on development within the Lower Delmarva region is any growth or modification in the transportation network serving this part of the peninsula. The Lower Delmarva is primarily dependent on road transportation, with sea and rail transportation being mainly utilized for certain special categories of bulk cargo, like fuel for the Vienna power generating plant. For the most part produce and manufactured goods are carried into and out of the region by road. The key elements in the region's road transportation network are U.S. Rt. 50 and Rts. 13 and 113. These three highways link the major population centers of the region, and development tends to be channeled along them in strip fashion. The keys to the functioning of these major transportation arteries are the Chesapeake Bay Bridges, which provide access to the western shore. Within the region itself are two other important bridges, the Choptank River Bridge at Cambridge and the Nanticoke River Bridge at Vienna. Both at the present time can accomodate only a single lane of traffic traveling in each direction. Route 50, which crosses these bridges is dual highway over most of its length, but some sections of single lane highway still remain, especially in the vicinity of the Nanticoke River Bridge at Vienna.

The Maryland Department of Transportation has planned some important changes in the primary road network of the Lower Delmarva region that were to be completed before the end of the century. Within the four county region a total of 49.89 miles of highway construction that was classed as critical was proposed for the 1980's and 1990's. The main changes in the primary highway network of the region that were judged as critical concerned the dualing of the remaining single lane sections of Rt. 50 and Rt. 113 and the completion of the Salisbury Bypass. This would also mean the construction of new bridges across the Nanticoke and Choptank rivers. A further 186.86 miles of road construction of a non-critical nature was also proposed. These non-critical projects mainly concerned repairing and upgrading secondary roads in the region.

The proposed dualing of sections of Rt. 50 and Rt. 113 have already been postponed by the state for budgetary reasons. The replacement of the Choptank River Bridge has been delayed indefinitely as well. It is uncertain, therefore, how much change there will be in the Lower Delmarva road system in the next two decades. If these proposed highway and bridge construction projects do go through, however, even more rapid rates of growth along Rt. 50, Rt. 13 and Rt. 113 can be expected.

AGRICULTURE AND FORESTRY:

Based on trends that are observable over the last two decades total farm acreage should continue to decline for the Lower Delmarva region as a whole for the rest of this century. However, the rate of this decline is slowing in Somerset and Worcester counties, and in Dorchester County the total number of farm acres has actually increased since 1970. Wicomico is the only county where the rate of decline is increasing. This is a result of the conversion of farmland in central Wicomico to other uses, as the Salisbury area continues to develop. Despite this decline in total acreage, production should actually increase in the future. This will be accomplished by more intensive use of the remaining agricultural land, which will increase stresses on cultural resources located on this land. Double croping, increased mechanization and the construction of irrigation and drainage systems will accelerate the rate of destruction for cultural resources.

The damaging effects of agriculture in the Lower Delmarva region are quite severe, especially for the relatively fragile prehistoric sites of the area. The light soils of the Lower Delmarva are especially susceptible to wind and water erosion when the plant cover has been removed from them. In the watershed of Marshyhope Creek soil loss from erosion has an average annual rate of 1.8 tons per acre, and considerably higher rates are found for some particularly vulnerable soils.

Commercial forestry in all probability will increase within the Lower Delmarva region mainly owing to an improved market for low quality hardwoods. The overall quality of the timber grown in the region's forests has been declining for some time because of poor management and logging practices. However, the demand for lower quality timber has been growing recently, and with wood increasingly being looked upon as an alternative fuel source this trend should continue. Commercial timbering imposes severe stresses on the land surface, and it should be regarded as a serious threat to the cultural record of the region. Worcester and eastern Wicomico Counties are the areas that will be most affected by timbering for the remainder of this century.

WATERSHED PROJECTS:

The U.S.D.A. has proposed certain water management projects for the Lower Delmarva region in the 1980's and 1990's that should affect cultural

projects are to reduce erosion, improve drainage and provide an increased water supply for irrigation and other uses. A large scale project in the Pocomoke River Drainage that would affect over 17,000 acres has already received initial approval, and is scheduled to begin in the mid-1980's. Such projects have both primary and secondary effects on cultural resources. The initial effect is in the actual modifications made to the drainage pattern of the river or stream in question. The secondary effect is a long term one that results from the changes in land use that such projects make possible. Watershed projects encourage the extension of agriculture and forestry into areas where these activities were previously limited by swamp or marsh conditions. In all over 50,000 acres within the lower Delmarva region will be modified to some extent by the watershed projects that are proposed for the remainder of the twentieth century.

CULTURAL RESOURCE MANAGEMENT

MANAGEMENT STRATEGY:

If correct management decisions are to be made, then knowledge about the nature and extent of the cultural resources of the Lower Delmarva region must be combined with knowledge about the nature and extent of the forces, both natural and man-made, that do damage to the cultural record of the region. A necessary first step in cultural resource management is the development of a set of procedures whereby information can be gathered in a systematic fashion. Complete preservation of the cultural record is not possible, even if funds and manpower for historic preservation were unlimited. Therefore preservation priorities must be established, and these priorities should be derived in an objective fashion, taking into account the whole of the cultural resource data base of the region and the stresses on that data base. Day to day preservation decisions will always contain some element of subjectivity, but these decisions should be made within a general framework that was created in a non-subjective fashion. Systematic data gathering is obviously the foundation for a rational cultural resource management plan.

The Lower Delmarva region presently lacks a systematically derived cultural resource data base. Through the use of remote sensing techniques, however, it has been possible to assess the present day stresses on the cultural record in a systematic fashion. This does not mean that all of the processes that contribute to the destruction of cultural resources have been identified or that the effects on the cultural record of these processes have been assessed in absolute terms. Nevertheless, a basis now exists for making generalizations about the relative rates of cultural resource destruction within the Lower Delmarva region. The goal of systematic, region-wide knowledge has been achieved, in an unrefined form, for one of the two major sets of factors that should form the basis for management decision making. The other major area of knowledge that is required for rational management decision making has not progressed to this level yet. Information about the nature and distribution of cultural resources is incomplete and uneven. The first and most important management need of the Lower Delmarva region is systematic knowlege of the cultural resources which survive there.

Systematic region-wide knowledge of cultural resources does not mean that every historic and prehistoric site must be located and assessed specifically. This would be desireable, but it is not really practical, at least in the forseeable future. What is needed is enough

systematic survey work to provide a basic knowledge of the nature of the data base. Information about site frequency and distribution from selected areas within the Lower Delmarva region would permit the development of predictive models, which could then be applied to other, unsurveyed areas. These predictive models to not necessarily have to explain past human behavior, nor do they have to be deductively derived. They are management, and not research, tools. These models would be based on the recognition that cultural resources co-vary in a predictable way with geomorphological features and also with other elements of the cultural record. The emphasis in this sort of modeling would be on association rather than on causality.

An example of this sort of "associational" predictive model for the historic period can be derived from data on house location and road location contained within the 1877 Atlas of the Eastern Shore. In Worcester county during the late 19th century over 60% of all dwellings were located within a quarter mile of a county road. The obvious implication of this observed distribution is that there is a strong association between the line of county roads and the location of dwelling houses in the 19th century. This "model" does not explain the observed phenomena, it merely notes the association. The "model" can be used, however, to predict site frequency and site location in other areas.

The development of "associational" models would represent only the first and most simplistic response to the problem of recognizing general patterns in the cultural resource data base. Knowledge of the wider cultural context from which cultural resources emerge is important to the management process, and research in this area should not be neglected. Cultural resource survey strategies should be developed with nomothetic goals in mind. However, there is also an immediate need for basic data gathering, especially in those areas now experiencing a high rate of environmental and developmental stress. Interim, management oriented survey programs should be gotten under way, therefore, as soon as possible in these areas.

The most pressing need for such surveys exists in the heavily stressed Outer Chesapeake Bay, Upper Tangier Sound, Fenwick's Island and Salisbury-Berlin Corridor areas defined in the preceding section. The whole length of the Chesapeake Bay coast from the mouth of the Little Choptank River to Cedar Island south of Crisfield should be examined for sites, and this survey should include the shorelines of the major islands as well. The rate of site destruction is extremely high here. A survey of this part of the Chesapeake Bay shore could be done relatively rapidly if only the shoreline proper were examined. The survey could be conducted from the Bay side using a shallow draft boat. This would elminate the problem of traveling through the salt marshes that border the Bay shore. By working from a boat and concentrating on only the immediate shoreline, several miles of shore could be examined per day. Once baseline data on coastal sites has been gathered, then a realistic monitoring strategy could be developed. A schedule for re-examining various parts of the coast in the future could be worked out

based on erosion rates and the nature and extent of the cultural resources present.

For the Salisbury-Berlin Corridor the main stresses placed on the cultural resources data base are land use stresses rather than environmental stresses. The parts of this area that are most likely to be affected by future development are the Salisbury Metro Core and a band of territory extending north of Rt. 50. High priority should be given to the identification of cultural resources within the Salisbury Metro Core, which will see continued rapid growth for the rest of the century. However, it is to be expected that the cultural resources of the Salisbury Metro Core have already been severely damaged by intensive land use. The other part of the Salisbury-Berlin Corridor area that will be receiving heavy developmental pressure within the near future is a band of territory about one mile wide that runs along the north side of Rt. 50 from the outskirts of Salisbury to Berlin. While a much wider corridor of land between Berlin and Salisbury is presently receiving higher than average use, it is this band immediately north of Rt. 50 that increasingly will be going over to the more intensive forms of land use. A systematic survey should be made of this band of territory in the near future.

The Fenwick Island area is subject to rapid growth and development which shows no signs of abating in the forseeable future. This development is not confined to the barrier island proper. It also occurs on the adjacent parts of the mainland. Fenwick Island has been so severely affected both by development and by natural erosion processes that pre-19th century cultural resources essentially do not exist there in primary context. The mainland regions bordering Assawoman and Isle of Wight Bay, which are now, or soon will be, affected by Ocean City related development should be surveyed as soon as this is possible, however. Both historic and prehistoric cultural resources are known to be present in these areas, and if the planning agencies that are directing development in this region do not take cognizance of these resources, they will be destroyed within a few decades. What is lacking is the specific site location knowledge that should come from a systematic survey. With such knowledge the most harmful effects of future development can be ameliorated.

In addition to the surveys mentioned above, which concentrate on areas of high stress with the aim of producing data to fulfill immediate management needs, a survey strategy that is not directly predicated on management concerns should also be developed. This survey strategy should attempt to answer questions about the general cultural context of the region in a diachronic fashion, and should also address questions of process. A stratified random sample approach based on geomorphological criteria should be adopted for this investigation. The initial geomorphological classification of the areas to be surveyed should be

derived from Landsat Satellite imagery and high level aerial photographic coverage rather than from more conventional data sources like soil survey maps. A classification and sampling strategy that is based on remote sensing data would offer two important advantages.

First, predictive models developed from such surveys could be applied directly to other areas within the region by using Landsat data. Landsat and high level aerial photography give overall uniform coverage for the Lower Delmarva region at several different points in time. Soil, vegetation and drainage information that has been derived from other sources for the Lower Delmarva region is the product of a number of individual investigations conducted over several decades. Coverage is uneven, with important categories of data missing for some of the counties. Also the data does not reflect the present condition of the region, but rather the condition of the region at some time in the past. Landsat and aerial photography have the facility to gather data from the whole region by a uniformly applied technique at a single point in time. Such uniform coverage is not available for just one date, it is available for several different dates within the last decade. The areas within the Lower Delmarva region as a consequence are much more strictly comparable through the use of remote sensing data than they are by any other means. This fact would enhance the applicability of predictive models by eliminating some sources of variation, while at the same time simplifying the mechanics of using such models on a practical day to day basis.

The second advantage that would come from the use of remote sensing data in the design of surveys is that this same data will be used to monitor present day stresses on the cultural record. By basing both cultural resource assessment and environmental and land use monitoring on the same set of data a fully integrated cultural resource management plan can be developed. The key issue in cultural resource management is the interaction between present day forces that affect the land surface and the surviving materials culture traces of man's past. Landsat imagery and high level aerial photography can examine both of these factors simultaneously and in a consistent fashion. By relying on remote sensing information, management decisions can be made on the basis of quantifiable data. A numerical expression of the likelihood of site occurance within an area can be determined and this can be integrated with a numerical expression of the rate of present day stress on the cultural resources of that area. The ability to quantify the variables that must be taken into account when decisions are made will strengthen the position of preservationists, since the charge that such decisions are either arbitrary or subjective can no longer be made.

The areas selected for survey should represent all of the major geomorphological divisions within the Lower Delmarva region. Preferably these survey areas should all be located within one of the four research units already established within the region. A concentration

of survey activities within a single unit will facilitate the recognition of macro-patterns in the cultural development of the Lower Delmarva. The most promising area for such survey activity is the Pocomoke River Drainage, research unit 2. Almost all of the major geomorphological zones of the Lower Delmarva region are represented within the Pocomoke drainage, from the salt estuarine bay marshes of the river's mouth to the freshwater cypress swamps near its head. Only certain specialized Atlantic coastal zones are not represented, and these could be dealt with in a supplemental survey project. The completion of a stratified sample of survey areas within the Pocomoke drainage would provide the necessary cultural resource data to implement an integrated cultural resource management plan for the Lower Delmarva region.

THE MONITORING PROCESS:

Once a cultural resource management strategy based on the procedures outlined in the previous section has been established and begins to function on a normal basis, the next requirement will be for a system that continuously monitors stresses to the cultural record. On a region wide scale this can be accomplished by regularly updating the information derived from remote sensing for the Lower Delmarva. Landsat imagery for any given part of the earth is available on an 18 day cycle. However, because of cloud cover and other factors not all of the Landsat scenes of a given area provide complete high quality coverage. Still, each year from 10 to 12 good scenes of the Lower Delmarva region should be available. Continuous updating on a monthly basis is theoretically possible, therefore, but this would probably be excessive. Updating on a six month cycle would be adequate to monitor changes in land use and it would also be realistic in terms of manpower and resources. Each Landsat scene costs approximately $250.00 and requires a considerable amount of both computer and operator time to get set up and running on a regular basis. In terms of the amount of information that a single scene can give these costs are very small, but resources for cultural resource management and planning are limited and a basic constraint will be the lack of personnel time to use all of the information generated.

Each year, therefore, two complete Landsat scenes should be acquired. One of these scenes should be an April scene, since April is the month when the initial land use classification was made. The other scene should be a late Fall scene, after crops have been harvested. High level aerial photographic coverage for the region is not available with the frequency and regularity of the Landsat data. However, depending on availability such photographic coverage should be acquired every two

years. Regular cross checks between the Landsat data and high level aerial photographs are desirable for the updating of the land use classification system. Also a certain amount of low level aerial photography should be done for some specific high stress areas. No attempt should be made to produce complete low level coverage for the region, however, since this would be prohibitively expensive and, in many cases, redundant, as Landsat and high level aerial photography would be providing the necessary management data.

Monitoring by remote sensing will provide the necessary data on large scale changes in land use and on coastline erosion. There still remains the problem of monitoring highly localized stresses caused by specific development projects. Regular contacts with county planning agencies are a necessary part of the monitoring process. In general these agencies are willing to supply information about construction projects upon request. The Salisbury-Wicomico County Planning and Zoning Commission goes further than this and invites comments from the Regional Preservation Office on the larger projects like housing developments that are proposed within the county. The county planning agencies cannot be expected to involve the Regional Preservation Office directly in every decision, large and small, that they make, however. This is desirable for the large scale projects, but it is impractical to do this on a day to day basis for all categories of activity taking place within the planning offices.

An effort should be made, therefore, to provide these planning agencies with synopses of the data that has been gathered on the cultural resources of the Lower Delmarva region and to indicate to them areas where there are high probabilities that cultural resources will be found in the future. The information supplied to these agencies should consist of maps indicating likely areas within their respective counties for various categories of cultural resources and also a narrative explaining the significance of these categories of resources and placing them within an overall thematic context. The maps supplied to the agencies need not be so detailed that specific archaeological sites locations are shown. The aim should be to give planners, who typically do not have a specialist knowledge of the cultural resources to be found in the region, enough information to recognize how their decisions are likely to affect the cultural resource data base. A willingness on the part of the historic preservation community to provide information that aids in the planning process inevitably will encourage planning agencies to show greater concern for cultural resources.

PROTECTION AND PRESERVATION:

The ability to predict the nature and extent of the cultural resources within a region and to understand and monitor the natural and man-made stresses on those resources is not enough to insure the survival of the cultural resource data base of that region. Knowledge of the parameters that define the data base must be used as a tool to influence present day behavior that affects the cultural record. Historic preservation efforts should be channeled towards the most practical and cost efficient means of protecting resources. It should be recognized that every trace of man's past activities within the Lower Delmarva region cannot be preserved. The aim should be to protect a representative sample of the region's cultural record, and to gather as much information as is possible about those parts of the record that are certain to be destroyed.

The piecemeal survey and salvage approach that has characterized cultural resource management efforts in the Lower Delmarva region to date is not a practical and cost efficient way of dealing with historic preservation problems. Such localized evaluations lack sufficient context to have much meaning, and it is difficult to subsume them, after the fact, into any larger management or research framework. Once the goal of systematic, region-wide knowledge of the cultural resource data base has been achieved, each new project requiring a management decision need no longer be treated as a unique phenomenon. Mitigation efforts can be directed towards those parts of the cultural record in greatest need of preservation, with the option of salvage excavation being selected only under special circumstances.

Conservation of the data base should be the primary goal of cultural resource management. Every effort should be made to protect cultural resources from adverse development impacts rather than to try to salvage some knowledge from historic or prehistoric sites after their destruction becomes inevitable. On the other hand, when the destruction of cultural resources is occuring through some natural agency like coastline erosion that cannot be controlled, priority should be given to recording as much information as possible. Management decisions should take into account the fact that there are both controllable and uncontrollable forces that contribute to the depletion of the cultural record. Where impacts are even potentially controllable the emphasis should be on preservation; where impacts are uncontrollable the emphasis should be on recording. Both activities are legitimate parts of cultural resource management.

Since the conservatien ethic lies at the core of this cultural resource management strategy every effort should be made to restrict the uses of lands with known cultural resources of importance. This can be accomplished in a variety of ways. The highest levels of protection

are achieved when such lands are purchased or otherwise acquired by an organization or an agency specifically for preservation purposes. An example is the acquisition of the historic plantation site of Pemberton Hall by the Pemberton Hall Foundation. The Pemberton Hall Foundation is a non-profit organization whose sole purpose is the preservation of this significant historic property. Organizations of this sort should be encouraged to expand their activities to the maximum extent possible.

Another approach that is especially appropriate for prehistoric cultural resources is the incorporation of areas containing such resources into areas protected by natural area preservation programs. At the present time the Nature Conservancy in Worcester County is acquiring by purchase and by gift lands along Nassawango Creek. Worcester County members of the Archaeological Society of Maryland are encouraging the Conservancy to include the Nassawango Adena Site (WO-23) within the natural preservation area being established along Nassawango Creek. Active cooperation by individuals and groups interested in historic preservation and in the preservation of natural resources should aid both causes. State Wildlife Management Areas, although they were not created with cultural resources in mind, already serve to protect some important prehistoric sites in the Tangier Sound region. If an awareness of the compatability between cultural resource and natural resource preservation aims could be made a part of future natural area protection plans, Lower Delmarva's cultural resources would benefit greatly.

Individual private landowners can also be encouraged to protect cultural resources on their own properties. Very often landowners are not aware of the nature and significance of the cultural resources that are located on the lands that they possess. The owners of properties containing significant historic and prehistoric sites can be encouraged to take advantage of existing historic preservation laws and programs. A key first step is to get such properties listed on the National Register of Historic Places. Once this has been accomplished, property owners should be asked to set legal limits on the ways such properties can be utilized. The granting of preservation easements seems to be a particularly effective way to protect cultural resources while at the same time benefiting the property owner financially. Preservation easements in the past have been used almost exclusively to protect standing historic structures, but legally there does not seem to be any reason why this same approach could not be used in the protection of prehistoric sites of National Register quality.

Essential to all of the protection processes outlined above is the dissemination of knowledge about the importance of cultural resources and about the dangers threatening these resources. Education is the main ingredient in making historic preservation work, particularly in an area like the Lower Eastern shore. Maryland's Lower Eastern shore has a population with a high level of regional consciousness and a strong interest in the past. What is lacking is knowledge of the

processes by which cultural resources can be preserved and an awareness of just how severe the need for immediate action to protect these resources is. Higher levels of public awareness will have a very direct effect on historic preservation policies as implemented by state and local government within the region, as well as encouraging non-governmental historic preservation activities. The education process should begin through existing organizations that are concerned, on a regional basis, with archaeology and history. Several of these exist in the Lower Delmarva region, and include in their membership influential community leaders. Shaping the climate of opinion about historic preservation within the region is the only way that effective, region-wide preservation policies can be implemented. Cultural resource management within the Lower Delmarva region must be based on the cooperation of large numbers of individuals who are not professionally involved in historic preservation.

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APPENDIX I

Houses and People on the Lower Eastern Shore (1671-1850)

One major factor to be considered in historic preservation planning is the total number of historic sites representing any given period of time that are present within a particular region. If the significance of an historic site is to be assessed in an objective fashion, then that site must be viewed within a framework of the total universe of contemporary sites existing in the region in question. As a rule "significance" is a relative rather than absolute concept, and it is important to establish the total size of the available data base before judging the importance of some part of that data base in relation to the whole of it. This paper attempts to determine the size of the total historic site data base on the lower eastern shore for various points in time between 1671 and 1850. The aim will be to come up with theoretical maxima for the total number of sites that were in existence during certain time periods. Obviously we cannot say how many of these sites still survive, but a knowledge of how many sites there might be in an ultimate "best case" situation is still very useful. For one thing it will allow statistical techniques to be used in a more valid way for site assessment.

The data that is used here is gathered from several different census and tax lists and consequently it is somewhat variable in quality. Also, because of the nature of the available records, we can only deal with sites where dwellings were located. However, individual dwellings and their associated outbuildings account for the overwhelming number of structures that stood during any of the time periods in question on the lower eastern shore, and realistically it is mainly dwelling sites that will be recognizable as sites on the ground. The period under study extends from 1671, when the first figures for numbers of tythables on the eastern shore are recorded, to 1850, the date of the first really complete census that includes data about dwellings in the area.

The population schedules of the 1850 census provide three important categories of data for this study: the whole number of persons, the total number of families to which these persons belong, and the total number of dwellings that these families live in. We have these figures for the three counties then existing on the lower eastern shore, Dorchester, Somerset and Worcester. Two general conclusions can be drawn from this data. First, the number of families matches very closely the number of dwellings in the case of all three counties. This means that single family dwellings are the rule, as would be expected for a mid-nineteenth century agricultural region. Second, the average number of people making up a household is very similar for all three counties. The average number of persons per household for the whole region is 6.9, and the averages for each separate county are within 10% of this 6.9 figure.

These averages are based on the total number of persons within the counties including slaves. If the slaves are disregarded, the averages for the counties are even closer. For the purposes of this paper, however, it is more convenient to base calculations on the whole number of persons both free and slave, since in some of the earlier records slaves are not separately listed.

Prior to 1850 we do not have tallies of the numbers of dwellings being occupied at any single point in time on the lower eastern shore, but we can calculate numbers of dwellings by using census and tax data. We have figures for the total population of the region that extend back in time as far as 1701, although only since the beginning of the federal census in 1790 do we have data taken at regular intervals. Before 1701 and for some years in the early and middle parts of the 18th century we do not have figures for the total population of the region, but we do have records of the number of tythable or taxable persons living there. Total population can be estimated from the number of taxable persons. Once we have total population figures we can then calculate the total number of households, which should be almost the same as the total number of dwellings.

There are, of course, some problems in translating the numbers of tythables into total numbers of persons. As far as the problem of calculating total population in colonial Maryland is concerned, reference should be made to the work of A.E. Karinen. Karinen's Ph.D. dissertation was a study of changes in Maryland's population between 1631 and 1840. He proposed numerical ratios that could be used to calculate total population from numbers of tythables. These ratios, however, were based on figures for the whole state of Maryland and do not take into account any variation by county. It is apparent from the lower eastern shore data that Karinen's conversion factors are too low for all the counties there. Karinen gives a ration of 3 to 1 for total population as compared to number of taxables between the years 1712 and 1790. However, for the year 1755 the ratio between total population and taxables on the lower eastern shore is about 3.5 to 1, and for Dorchester county in the year 1712 it is 4.58 to 1. Before 1705 the ratio used by Karinen is 2.6 to 1, but for the only year within this time span for which we have data both on total population and on the number of taxables the ratios are 3.2 to 1 for Somerset County and 3.0 to 1 for Dorchester County.

Changes in the ratio between total population and numbers of taxables follow the same pattern on the lower eastern shore that they do in the state of Maryland as a whole. As time passes there tend to be fewer taxables in relation to the whole number of persons living in the lower eastern shore counties. However, from the data now available it seems that there always were fewer taxables relative to total population in these counties than in the state as a whole. Why this should be is somewhat puzzling. The same criteria for defining a taxable person should have been used throughout Maryland. For nearly all of the period under question taxable persons included all men aged sixteen or older except for a few exempted categories like clergymen and paupers.

However, slaves were also considered to be taxable, and there is some evidence that relatively fewer slaves were owned on the eastern shore than on the western shore. Difference in slave numbers was probably one factor, therefore, that accounted for some of the apparent variation in the ratios. Although we don't really know why these ratios are higher for the lower eastern shore, this fact should definitely be taken into account when calculating total population for the region. Consequently for the years 1676 to 1701 the ratios for calculating total population will be those given for the year 1701, that is to say, 3.2 to 1 for Somerset County and 3.0 to 1 for Dorchester County. Before 1676 taxables were more broadly defined than after that year, so instead of the 3 to 1 ratio a 2.8 to 1 ratio will be used for the years 1671 and 1675. Karinen suggests that the difference between the pre- and post-1676 ratio would be about .2, and we will accept the judgement for purposes of this paper. From 1701 on we generally have total population figures when we have any population figures at all, so the 18th century ratios are not needed in most cases. The one important exception is the year 1733, for which we have only numbers of taxables. Instead of Karinen's ratio of 3 to 1 we will use an average of two total-population-to-taxable ratios that we do have for the 18th century. These ratios are for the years 1710 and 1755, which bracket the year 1733 more equally in time than do any two other 18th century ratios that we have. The average ratios used for 1733 are 3.5 to 1 for Somerset County and 4.0 to 1 for Dorchester County.

It should be kept in mind that the data from which population totals for the lower eastern shore counties are drawn undoubtedly varies in accuracy, and that earlier figures are probably less reliable generally than are later figures. It is not really possible to assess the degrees of accuracy of the 17th and 18th century data, but since this information was gathered for tax purposes it probably gives a good approximation of the true state of affairs. The federal census data from 1800 on seems to be quite reliable, and raises no real interpretive problems. Another factor affecting county population totals on the lower eastern shore is changes in county boundaries. In the 17th century Somerset County took in all of the present counties of Somerset, Worcester and Wicomico plus part of what is now Sussex County, Delaware. In 1742 Worcester County was created out of Somerset County, and both Somerset and Worcester Counties included parts of Delaware until 1775. Dorchester County both lost and gained bits of territory during the 18th century, but these changes were relatively minor compared to Somerset County. Since this paper only deals with the 17th, 18th and early 19th centuries, no totals are given for Wicomico County, which was about equally divided between Somerset and Worcester Counties until 1867. As far as the data tables are concerned, entries dated before 1742 and labeled 'Somerset' refer to the whole region now occupied by Somerset, Wicomico and Worcester Counties plus part of Delaware. Entries labeled either 'Somerset' or 'Worcester' and dating after 1742 refer to Somerset and Worcester Counties as they existed before 1867, that is including the area that is now Wicomico County.

Once population totals have been determined for the counties, the next step is to calculate numbers of households from these totals. We have accurate figures for the numbers of dwellings and of families relative to the total population for 1850, as was mentioned above. The

first federal census, dating to 1791, records the total number of heads of families for individual Maryland counties, and this figure should be much the same as the total number of families at that time, but unfortunately these figures are defective for the lower eastern shore counties. Green and Harrington propose a figure of 7 for the number of persons per dwelling in 18th century America and a figure of 6 for the average number of persons in a family. These figures do not relate specifically to the lower eastern shore, but they agree very well with the 19th century population to dwelling ratio of 6.9 to 1 calculated from the 1850 census for the region. The ratios calculated by Green and Harrington also seem to be applicable during the 18th century on the eastern shore, insofar as we can tell. The total number of heads of families in Dorchester and Somerset Counties is recorded for the year 1704 and, when this number is compared to total population for the same year, we get an average family size of 6.1 persons. Clearly average family size in 1704 on the lower eastern shore is very close to the average of 6 proposed by Green and Harrington. Consequently we can probably also accept their figure of 7 for the number of persons per dwelling in the 18th century, which is, after all, practically the same as the 6.9 to 1 ratio obtained for the lower eastern shore counties in 1850. Since we have no totals for heads of families or numbers of dwellings on the lower eastern shore in the 17th century, the Green and Harrington figure will also be used for determining numbers of households before 1700. Therefore the same factor, 7, will be used in calculating numbers of dwellings in Somerset, Dorchester and Worcester Counties for all years dealt with in this paper. Table 2 gives the total numbers of dwellings likely to have been standing in selected years from 1671 to 1850 for the counties.

These dwelling numbers are, of course, theoretical maxima and do not accurately reflect how many dwelling sites actually survive in an archaeologically recognizable form. Also the same dwelling sites and even the same structures undoubtedly are reused and modified through time and therefore appear in the totals for more than one year. It should be kept in mind that in the 17th and early 18th centuries the majority of dwellings in use were quite small timber structures without real foundations or durable structural features like stone or brick chimneys. Dwellings of this sort leave slight and easily destroyed physical remains, and undoubtedly most such sites are no longer recognizable on the ground. This means that while there may have been about a thousand 17th century dwelling sites in existence at some point in the past on the lower eastern shore, the number surviving today is very much smaller. Any 17th century site that can be recognized today represents a significant percentage of <u>all</u> 17th century sites, known and unknown, that still survive in the region. The situation is not much better for the early 18th century on the lower eastern shore, and it is not until after 1730 that the larger total number of sites and the generally better state of preservation of these sites begins to give us a fairly sizeable data base, at least in theory. Undoubtedly many fewer historical sites survive in recognizable form than are indicated by the theoretical totals calculated in this paper, and in general the farther back in time you go from the

present the smaller will be the percentage of sites surviving. The very small numbers of reported historic archaeological sites from this area do not give a sufficient basis for calculating the probable rate or percentage of loss for these sites, but at a guess I would say at least half of all late 19th century sites known to exist from documentary sources are no longer recognizable as sites on the ground. Presumably the percentage of loss for 17th and early 18th century sites is much higher, suggesting that the surviving data base for the early historic period in the lower Delmarva region is quite small at least in terms of absolute numbers of sites. I suspect that the western shore counties, although they undoubtedly had a larger number of early historic sites initially, have already lost an even larger percentage of these sites, since these counties generally have been under greater development pressures. Sites dating to the 17th and the first quarter of the 18th centuries make up one of the most fragile parts of the state of Maryland's total archaeological resource base, and the loss of any of them detracts in a very significant way from the total resource base of the state.

TABLE 1

TOTAL POPULATION ON THE LOWER EASTERN SHORE

	1671*	1675*	1694*	1695*	1696*	1701	1704
Dorchester	736	994	1983	1947	1884	2617	2312
Somerset	1158	1809	4604	4640	4442	5404	4435
Worcester	-	-	-	-	-	-	-

	1710	1712	1733*	1755	1791	1820	1850
Dorchester	2181	3475	7800	11753	15875	17759	18877
Somerset	6314	6352	12222	8582	15610	19579	22456
Worcester	-	-	-	10126	11640	17421	18859

N.B. * denotes total based on taxables

TABLE 2

TOTAL NUMBERS OF DWELLINGS THERE BASED ON 7 PERSONS PER DWELLING

	1671	1675	1694	1695	1696	1701	1704
Dorchester	105	142	283	278	269	374	330
Somerset	165	258	658	663	635	772	634

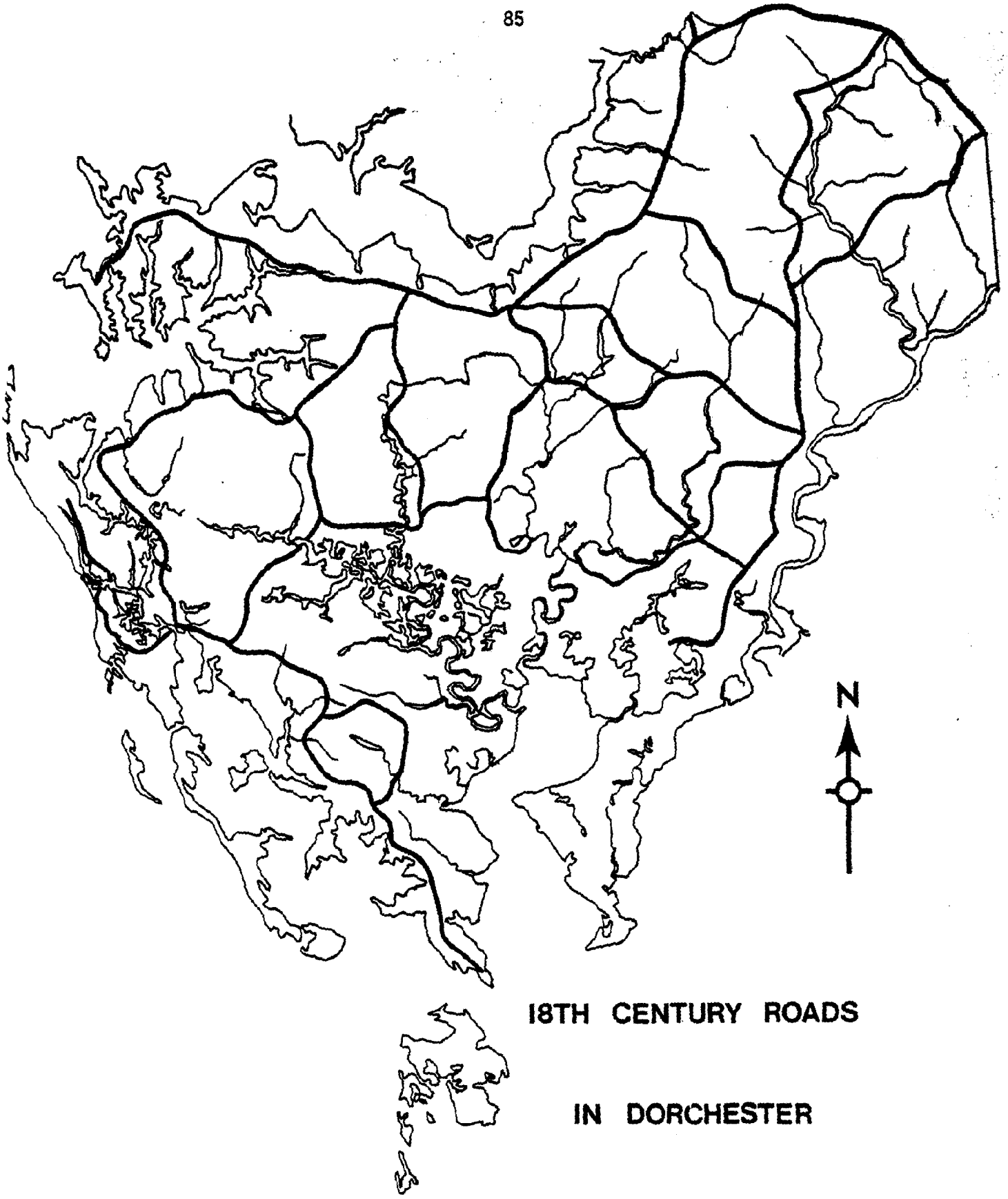
	1710	1712	1733	1755	1791	1820	1850
Dorchester	312	496	1114	1679	2268	2537	2705*
Somerset	902	907	1746	1226	2230	2797	3147*
Worcester	-	-	-	1447	1663	2489	2875*

N.B. * denotes actual figure taken from the 1850 census population schedules

APPENDIX II

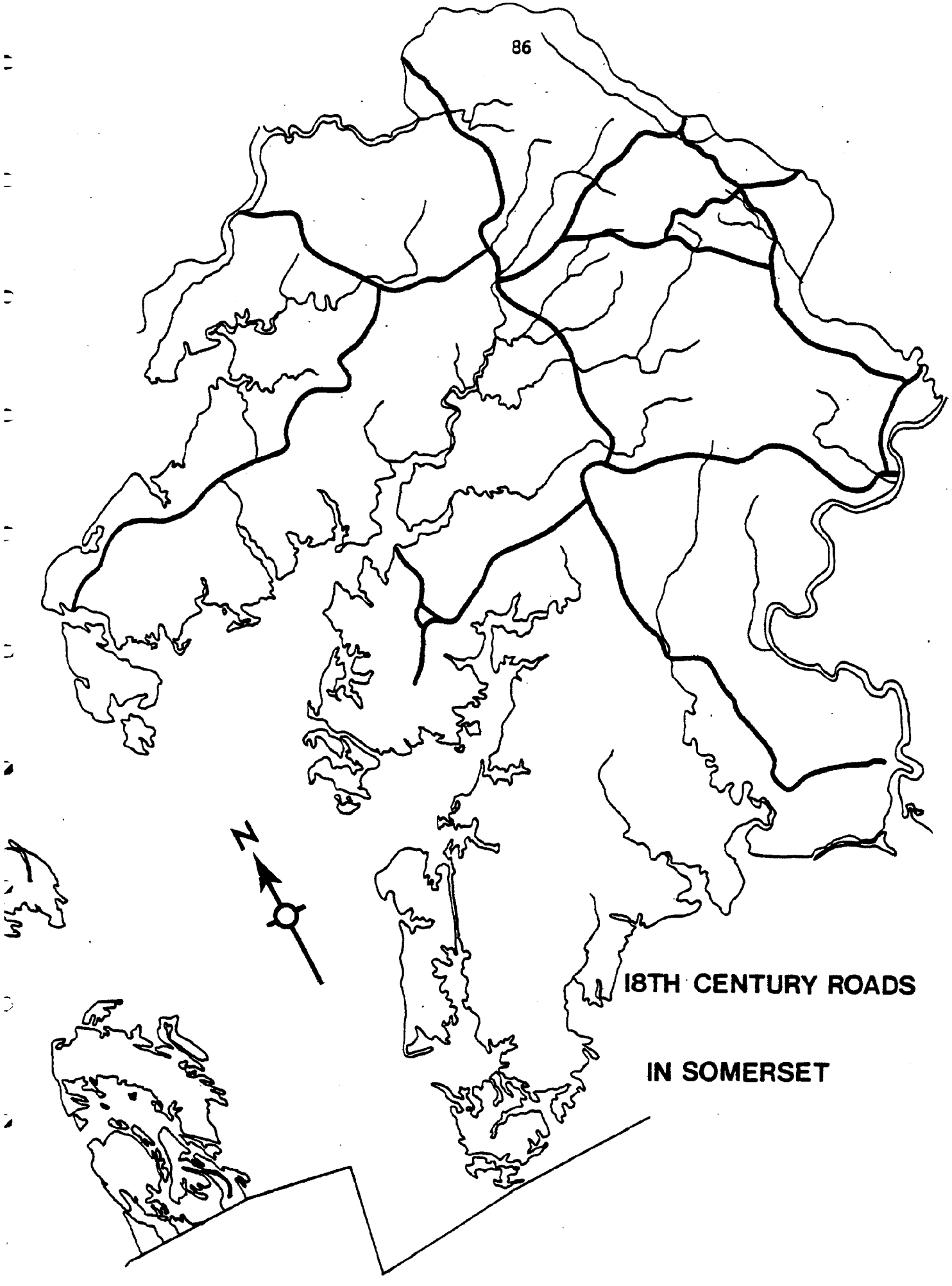
THE ROAD SYSTEMS OF DORCHESTER, SOMERSET, WICOMICO AND WORCESTER COUNTIES CIRCA 1800

This is a listing of modern roads in the four lower Eastern Shore Counties that duplicate the line of roads that were in existence at the end of the 18th century. The main source used was the Griffith Map of Maryland (1794). Most of the modern county roads listed here follow very closely the recorded courses of the circa 1800 roads. The major highways listed here tend to straighten out the actual line of the earlier roads, but still follow the same general course. The roads are listed by county and are further subdivided according to the U.S.G.S. Quad. Map on which they are shown. If the same road is on two quad. maps it is listed twice.



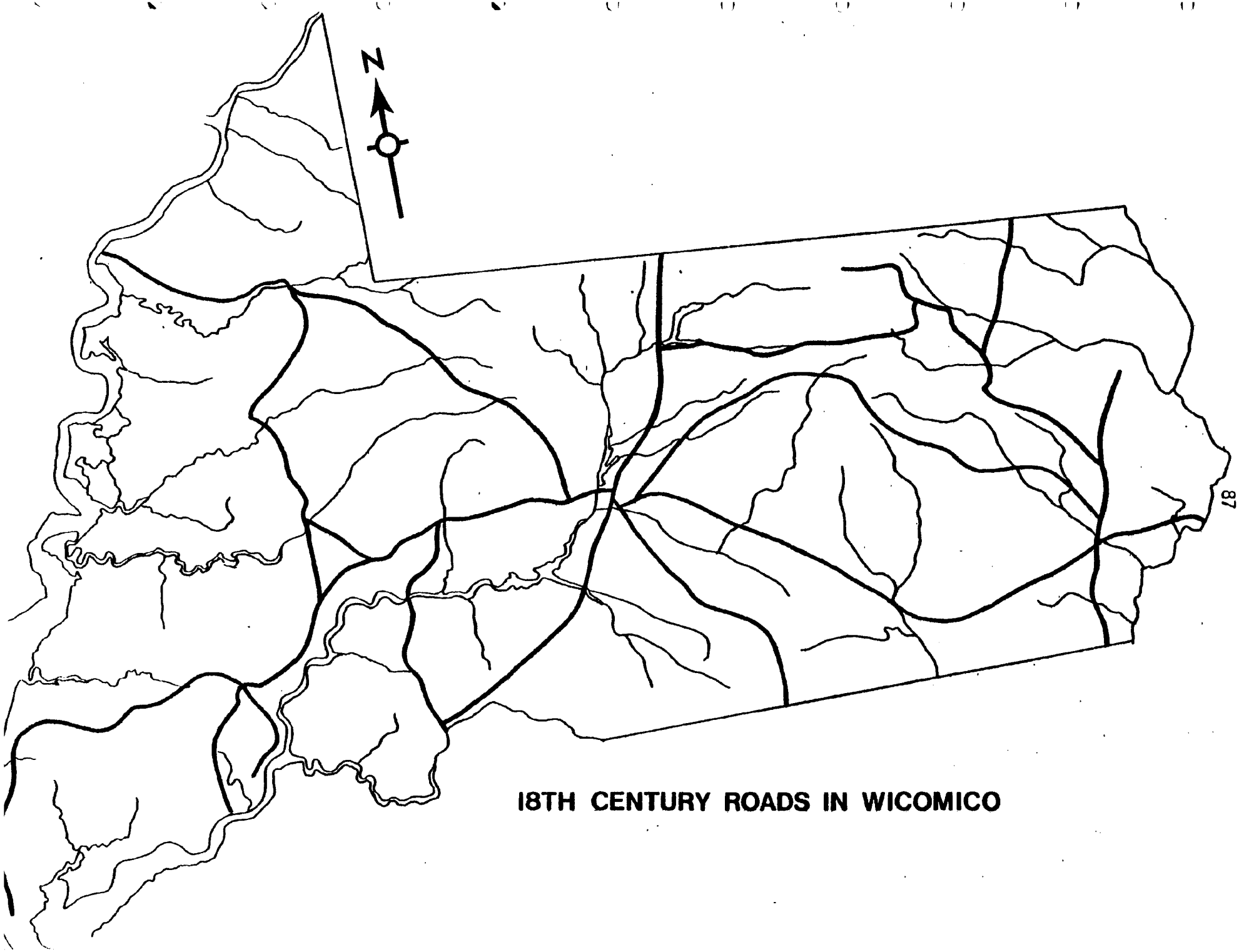
18TH CENTURY ROADS

IN DORCHESTER

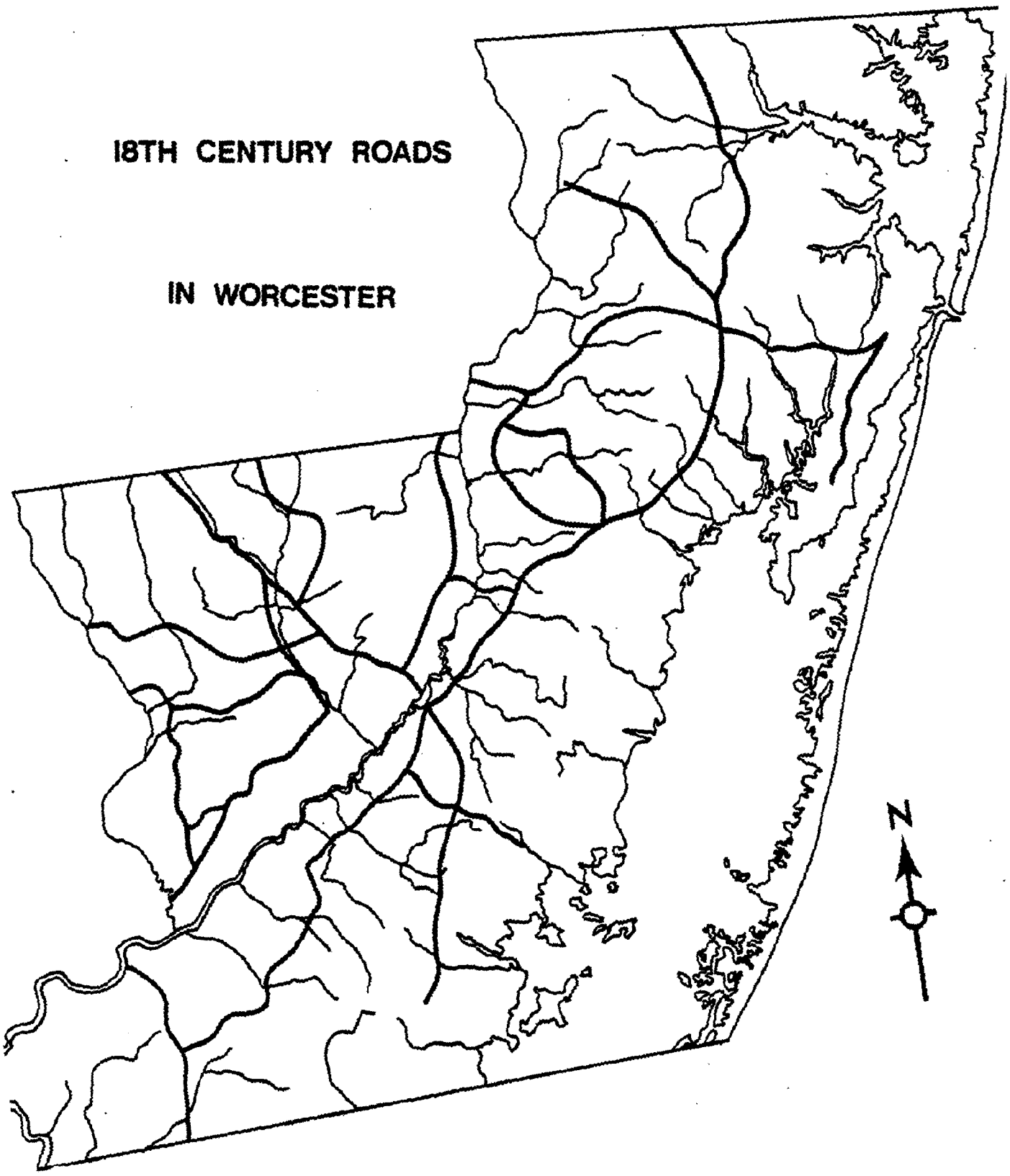


18TH CENTURY ROADS

IN SOMERSET



18TH CENTURY ROADS IN WICOMICO


18TH CENTURY ROADS
IN WORCESTER
N

DORCHESTER

Quad. Map	Road
Blackwater River	1. Bucktown Rd. from Indianbone Rd. to Bucktown 2. Bestpitch Ferry Rd. from Bucktown to 'T' junction and the north branch of the 'T' 3. Greenbriar Rd. from Bucktown to Key Wallace Drive 4. Maple Dam Rd. from Cambridge to Key Wallace Drive 5. Key Wallace Drive
Cambridge	1. Whitehall Rd. 2. Aireys Rd. from Airey to Austin Rd. 3. Austin Rd. to Rt. 50 (Mt. Holly) 4. Rt. 50 from Hicksburg to the Mt. Holly/East New Market Road 5. Mt. Holly/East New Market Rd. 6. Rt. 50 (Mt. Holly to Cambridge (considerably straightened) 7. Indianbone Rd. from Drawbridge Rd. to Bucktown Rd. 8. Bucktown Rd. from Indianbone Rd. to Bucktown 9. Maple Dam Rd. from Cambridge to Key Wallace Drive 10. Church Creek Rd. from Maple Dam Rd. to Church Creek 11. Cambridge/Hudson Rd. (Rt. 343)
Chicamacomico	1. Elliot Island Rd. from Henry's Crossroads to Savanna Lake 2. Drawbridge Rd. from Henry's Crossroads to Airey 3. Giffith Neck Rd. from Drawbridge to Cedar Lndg. 4. Steel Neck Rd. from Drawbridge to Newbridge Rd.
Church Creek	1. Golden Hill Rd. (Rt. 335) from Church Creek to Rt. 336 2. Church Creek Rd. from Maple Dam Rd. to Church Creek 3. Taylor's Island Rd. (Rt. 16) from Church Creek to Smithville Rd. 4. Cambridge/Hudson Rd. (Rt. 343)
East New Market	1. Drawbridge Rd. from Henry's Crossroads to Airey 2. Middletown Branch Rd. from Drawbridge Rd. to Big Millpond 3. Linkwood Rd. from Salem to Linkwood 4. the old road from Linkwood to Hicksburg 5. Airey's Rd. from Airey to Austin Rd. 6. Rt. 50 from Mt. Holly/East New Market Rd. to Hicksburg

DORCHESTER (continued)

East New Market (continued)	7. Mt. Holly/East New Market Rd. 8. Indianbone Rd. from Drawbridge Rd. to Bucktown Rd. 9. Rt. 50 from Big Millpond to Old Ocean Gateway Rd. 10. Centennial Rd. from Vienna/Rhodesdale Rd. to New Market/Rhodesdale Rd. 11. East New Market/ Elwood Rd. 12. Mt. Holly/East New Market Rd.
Federalsburg	1. Palmers Mill Rd. from Rhodesdale to Harrison's Ferry Road 2. Harrison's Ferry/Williamsburg Rd. 3. River Rd. from Williamsburg to Federalsburg 4. Allens Corner/Reliance Rd. from Federalsburg to Reliance 5. Federalsburg/Preston Rd.
Golden Hill	1. Key Wallace Drive 2. Golden Hill Rd. (Rt. 335) from Church Creek to Rt. 336 3. Crapo Rd. (Rt. 336) from Crossroads to Lakesville 4. Hooper Island Rd. to Fishing Creek 5. Smithville Rd. 6. Taylor's Island Rd. (Rt. 16) from Church Creek to Smithville Rd.
Honga	1. Crapo Rd. (Rt. 336) from Crossroads to Lakesville 2. Andrews Rd. 3. Lakesville/Crapo Rd. to Toddville Rd. 4. Hooper Island Rd. to Fishing Creek
Mardela Springs	1. Elliot Island Rd. from Henry's Crossroads to Savanna Lake 2. Drawbridge Rd. from Henry's Crossroads to Airey 3. Vienna/Henry's Crossroads Rd. 4. New Bridge Rd. from Steel Neck Rd. to Vienna/ Henry's Crossroads Rd. 5. Rt. 50 from Big Millpond to Old Ocean Gateway Rd. 6. Old Ocean Gateway Rd. to Vienna 7. Rhodesdale/Vienna Rd.
Preston	1. Federalsburg/Preston Rd. 2. Elwood Camp Rd. 3. East New Market/Elwood Rd.
Rhodesdale	1. Rt. 50 from Big Millpond to Old Ocean Gateway Rd. 2. Rhodesdale/Vienna Rd. 3. Kelly Rd. from Rhodesdale/Vienna Rd. to Rt. 14

DORCHESTER (continued)

Rhodesdale (continued)	4. Cokesbury Rd. from Eldorado to Rt. 392 5. Centennial Rd. from Vienna/Rhodesdale Rd. to New Market/ Rhodesdale Rd. 6. Palmers Mill Rd. from Rhodesdale to Harrison's Ferry Rd.
Seaford West	1. Cokesbury Rd. from Eldorado to Rt. 392 2. Rt. 392 from Cokesbury Rd. to Reliance 3. Allens Corner/Reliance Rd. from Federalsburg to Reliance
Sharps Island	1. Cambridge/Hudson Rd. (Rt. 343) 2. Hills Point Rd.
Sharptown	1. Cokesbury Rd. from Eldorado to Rt. 392
Taylors Island	1. Taylors Island Rd. (Rt. 16) from Church Creek to Smithville Rd. 2. Smithville Rd. 3. Robinson Neck Rd. 4. Meekins Neck Rd. 5. Hooper Island Rd. to Fishing Creek
Wingate	1. Andrews Rd. 2. Wesley Church Rd. 3. Lakesville/Crapo Rd. to Toddville Rd. 4. Wingate/Bishops Head Rd. 5. Crocheron Rd. 6. Toddville Rd. from Westley Church Rd. to Lakesville/Crapo Rd.

SOMERSET

Quad. Map	Road
Deal Island	1. Rt. 363 from Monie to Deal
Dividing Creek	1. Petes Hill Rd. from Perryhawkin Rd. to Rt. 388 2. Perryhawkin Rd. from Petes Hill Rd. to Rt. 388 3. Cokesbury Rd. 4. Meadowbridge Rd. from Friendship Church to Fruitland 5. New Rd. to Five Bridges Rd. 6. Rt. 388 Princess Anne to Friendship Church
Kingston	1. Old Westover/Marion Rd. from Westover to Hudsons Corner 2. Cornstack Rd. from Rt. 667 to Marumsco 3. Back Shelltown Rd. from Marumsco to Shelltown 4. Rt. 13 south from Westover to Westley Church/ Greenhill Rd. 5. Rt. 13 from Greenhill Rd. to Costen Rd. 6. Rt. 361 from Old Westover/Marion Rd. to Fairmount
Marion	1. Maddox Island Rd. 2. Miles Rd. 3. Rt. 361 from Old Westover/Marion Rd. to Fairmount
Monie	1. Rt. 363 from Monie to Deal 2. Fitzgerald Rd. to Rt. 363 at Monie 3. Ebby Rd. to Fitzgerald Rd. 4. Black Rd. from Rt. 362 to Ebby Rd. 5. Whitehaven Ferry Rd. to Whitehaven 6. Rt. 362 from Princess Anne to Whitehaven Ferry Road
Pocomoke City	1. Costen Rd. as far as Costen Branch 2. Rt. 364 from Rt. 13 to Dividing Creek Rd. 3. Courthouse Rd.
Princess Anne	1. Old Loretto Rd. (Rt. 529) from Princess Anne to Allen 2. Rt. 388 Princess Anne to Friendship Church 3. Perryhawkin Rd. from Petes Hill Rd. to Rt.388 4. Westover Rd. between Westover and Princess Anne 5. Rt. 362 from Princess Anne to Whitehaven Ferry Rd.
Saxis	1. Back Shelltown Rd. from Marumsco to Shelltown
Wetipquin	1. Whitehaven Ferry Rd. from Rt. 362 to Whitehaven

WICOMICO

Quad. Map	Road
Delmar	1. Rt. 105 (Morris-Leonard Rd.) Salisbury to Parsonsburg 2. Rt. 13 north from Salisbury into Delaware 3. Dagsborough Rd. from Rt. 13 to Pittsville Rd.
Eden	1. Allen Rd. from Allen to Fruitland 2. South Upper Ferry Rd. from Allen to Upper Ferry 3. Salisbury/Nanticoke Rd. from Salisbury to Catchpenny 4. Catchpenny Rd. to Quantico Rd. 5. Quantico Rd. from Nebo Rd. to Athol Rd. 6. Nebo Rd. to Whitehaven Rd. 7. Whitehaven Rd. from Salisbury/Nanticoke Rd. to Senkbeil Rd.
Hebron	1. Athol Rd. from Quantico Rd. to Porter Mill Rd. 2. Riggin Rd. from Porter Mill Rd. to Rt. 50 3. Barren Creek Rd.
Mardela Springs	1. Athol Rd. from Quantico Rd. to Porter Mill Rd. 2. Porter Mill Rd. from Athol Rd. to Riggin Rd. 3. Rt. 50 from Vienna to the second junction with Rt. 475 (straightened) 4. Rt. 54 from Mardela Springs Rd. to Barron Creek Rd.
Nanticoke	1. Salisbury/Nanticoke Rd. from Cox's Corner to Waterview
Ninepin	1. Purnell's Crossing Rd. from Libertytown to Powellville 2. Rt. 354 (Whiton Rd.) from Powellville to Willards
Pittsville	1. Rt. 262 (Warren Farm Rd.) west of Cambell Ditch 2. unnamed road joining segments of Ben Davis Rd. and Warren Farm Rd. 3. Friendship Rd. from Rt. 354 to Pittsville 4. Pittsville Rd. north of Pittsville to the Delaware line 5. Dagsborough Rd. from Rt. 13 to Pittsville Rd.
Salisbury	1. Johnson Rd.-Bear Swamp Rd.-Laws Rd. from Powellville to Salisbury 2. Rt. 12 Salisbury to Millville 3. South Division St. from Cambridge to Fruitland 4. Salisbury/Nanticoke Rd. from Salisbury to Catchpenny

WICOMICO (continued)

Wango	1. Johson Rd.-Bear Swamp Rd.-Laws Rd. from Powellville to Salisbury 2. Ben Davis Rd. west from Rt. 354 to junction with Rt. 266 3. unnamed road joining segments of Ben Davis Rd. and Warren Farm Rd. 4. Friendship Rd. from Rt. 354 to Pittsville
Wetipquin	1. Whitehaven Rd. from Salisbury/Nanticoke Rd. to Senkbeil Rd. 2. Whitehaven Rd. from Green Hill Lndg. to Whitehaven Ferry 3. Green Hill Church Rd. from Green Hill Lndg. to Rt. 317 4. Head of the Creek Rd. 5. Spry Larmore Rd. 6. Salisbury/Nanticoke Rd. from Cox's Corner to Waterview
Whaleysville	1. Rt. 354 (Whiton Rd.) from Powellville to Willards

WORCESTER

Quad. Map	Road
Berlin	1. Rt. 113 Snow Hill to Berlin 2. Berlin/Libertytown Rd. from Berlin to Ninepin Branch Rd. 3. Stephen Decatur High School Rd. 4. Sinepuxent Rd. 5. Rt. 346 Berlin to Whaleysville 6. Rt. 113 from Berlin to Peerless Rd.
Boxiron	1. Cherrix Rd.
Dividing Creek	1. Meadowbridge Rd. from Friendship Church to Old Furnace Rd. 2. Old Furnace Rd. to Rt. 12 3. Five Bridges Rd. to Sand Rd. 4. Sand Rd. to Creek Rd. 5. Whiteburg Rd. from Whiteburg to Dividing Creek Rd. 6. Oakhall Rd.
Girdletree	1. Rt. 113 Snow Hill to Bethenden Church Rd. 2. Bethenden Church Rd. to Johnson Neck Rd. 3. Johnson Neck Rd. from Bethenden Church Rd. to Pilchard Rd. 4. Pilchard Rd. from Johnson Neck Rd. to Rt. 366 5. Rt. 366 from Pilchard Rd. to Boston Rd. 6. Rt. 12 Stockton to Girdletree to Snow Hill
Ninepin	1. Rt. 113 Snow Hill to Berlin 2. Queponco Rd. 3. Ninepin Branch Rd. 4. Patey Woods Rd. 5. Berlin/Libertytown Rd., from Berlin to Ninepin Branch Rd. 6. Purnell's Crossing Rd. from Libertytown to Powellville
Pocomoke City	1. Boston Rd. from Rt. 366 to Sheephouse Rd. 2. Sheephouse Rd. from Boston Rd. to Buck Harbor Rd. 3. Buck Harbor Rd. from Sheephouse Rd. to Brantley Rd. 4. Brantley Rd. from Buck Harbor Rd. to Rt. 13 5. Old Pocomoke-Virginia Line Rd. (Much straightened) 6. Dividing Creek Rd. to Scotty Rd.
Public Landing	1. Ayres Lane to Pawpaw Creek Rd. 2. Taylor Rd. to Cedartown 3. Public Landing Rd.

WORCESTER (continued)

Public Landing (continued)	4. Porters Crossing Rd. 5. Rt. 113 Snow Hill to Berlin
Selbyville	1. Rt. 113 from Berlin to Peerless Rd.
Snow Hill	1. Rt. 113 from Snow Hill to Bethenden Church Rd. 2. Rt. 12 Stockton-Girdletree-Snow Hill 3. Castlehill Rd. 4. Cherrix Rd. 5. Rt. 12 from Snow Hill to Furnace Rd. 6. Mt. Olive Church Rd. as far north as Colbourn 7. Snow Hill/Whiton Rd. to Whiton 8. Porters Crossing Rd. 9. Rt. 113 Snow Hill to Berlin 10. Rt. 12 Salisbury to Millville 11. Millville Rd. from Rt. 12 to Furnace Rd. 12. Old Furnace Rd. to Rt. 12 13. Sand Rd. to Creek Rd. 14. Creek Rd. to Old Furnace Rd. 15. Dividing Creek Rd. to Scotty Rd. 16. Scotty Rd. to Oakhall Rd.
Wango	1. Snow Hill/Whiton Rd. to Whiton 2. Mt. Olive Church Rd. as far north as Colbourn
Whaleysville	1. Fooks Rd. east from Whaleysville to Campbelltown Rd. 2. Rt. 346 Berlin to Whaleysville

APPENDIX III

PREDICTIVE AND EXPLANATORY MODELS

One of the objectives of the Lower Delmarva Regional Center is to develop, over a period of time, a number of models that will serve as a theoretical basis for the organization of currently available data, data to be systematically collected in the future, and special needs defined by compliance legislation and research interests. Thus, in attempting to provide a stable base for effective future archaeological work in Lower Delmarva, two general categories of models need to be considered: predictive and explanatory. Each of these, in turn, would be expected to subsume a number of specific models that need to be generated to meet both management and research needs.

The literature on archaeological models is extensive. No attempt will be made here to either review that literature or to evaluate the efforts of others in pursuit of modelling. Rather, because the needs of Lower Delmarva can be specified in detail, suggestions will be made as to the type of modelling deemed appropriate and currently being explored. However, three articles that may serve as the beginning of a more thorough study might be briefly mentioned. "Social Archeology: The Future of the Past" by Redman, Curtin, Versaggi and Wanser may be found in "Social Archeology: Beyond Subsistence and Dating", edited by Redman, Berman, Curtin, Langhorne, Versaggi and Wanser (1978, Academic Press, New York). This article reviews much of the literature directed toward building social models. Ezra Zubrow's "Adequacy Criteria and Prediction in Archeological Models" makes a strong case for the insufficiency of using a measure of how successfully a particular model predicts a real data corpus. Zubrow's article has been included as a chapter in Redman's "Research and Theory in Current Archeology (1973, John Wiley & Sons, New York). Finally, a provocative model for examining changes in structural complexity in the transition between the Middle and Late Woodland in the Midwest is provided by Tainter ("Modeling Change in Prehistoric Social Systems") to be found in Binford's "For Theory Building in Archeology" (1977, Academic Press, New York).

A primary need that may be addressed through model construction is that of delineating those areas on Lower Delmarva that are likely to have preserved evidence of man's past activities. The prehistoric record for the region, as we know it, is heavily biased since it has been reconstructed from the artefactual evidence assembled by amateur collectors. Negligible work of a systematic nature has been done by professional archaeologists and it is not likely that this situation will improve markedly in the near future. We need to be able to have some device, therefore, by which we can predict where sites are likely to occur, to what period

they may belong, and to generate a model for site location that can be field tested and continuously refined. The proposed use of a combination of satellite acquired digital data of the earth's surface, high-altitude infrared imagery, low level oblique aerial photography and ground surveys, discussed elsewhere in this Plan, aims toward the development of a model that has a certain degree of mathematical rigor as well as intuitive flexibility for location and management purposes. There seems little doubt that areas of high sensitivity may be defined and that this data may then be used for predicting early historic and prehistoric settlement trends.

The situation described above for the prehistoric record applies to the historic record as well, except that because of the publication of maps, atlases, and tax records, among others, the data base is somewhat less biased. Nevertheless Lower Delmarva's early historic record is filled with gaps and documented inconsistencies. Attempts to reconstruct the record for even well known structures has involved countless hours of work and resulted more often than not in the discovery that the written record is by no means without inherent errors. Economic, rather than eco-logic, models may be more appropriately developed for the early historic period.

A second major need that may be addressed through model construction is to attempt to go beyond a description of artefact types and dates and to focus interpretive efforts on an attempt to reconstruct social systems. It is clear that the apparently continuous record of habitation on Lower Delmarva reflects a successful pattern of sociocultural adaptation that has involved both native and Euro-American peoples for many millennia. Socio-cultural interpretation of archaeological data is a recurring theme in archaeology. V. Gordon Childe advocated this approach in "Man Makes Himself" (1951), Grahame Clark called for interpreting archaeology in a social mode in "Archaeology and Society" (1957), Lewis Binford founded the "new archaeology" by insisting on treating archaeology as anthropology (1962), and in an exceptional example of a plea for interpreting the basis of human behavior through a careful examination of empirical evidence we may cite Osborn's "Strandloopers, Mermaids, and Other Fairy Tales (Binford 1977:157-205).

Lower Delmarva is ideally suited to explanatory model building based on several related lines of inference because the peninsula has, as we have noted, a rather long continuous record of habitation and because its geography is well suited to intensive investigation owing to the natural barriers presented by the Atlantic Ocean and the Chesapeake Bay. Work already completed by biologists, geographers, geologists, and economists can serve as an important basis for generating a multi-component model. The first ethnographic study of marine life exploitation should be published shortly, allowing ethnographic analogies to be made to the archaeological record. Studies of technology from St. Mary's City may be referenced for more detailed reconstruction of the early historic period on the Eastern Shore. The work of Kraft and others in Delaware may serve as an important

basis for environmental reconstruction. Thus even with a relatively weak data base which is strongly biased and varies considerably in quality, it is possible to look at Lower Delmarva in a formal way, construct models that tentatively explain or at least seek to explain the nature of culture change on the Eastern Shore, and develop the data base in a constructive fashion.

If the management of the archaeological resources of the Lower Eastern Shore is to include models, then, there needs to be an acceptance of the mundane as well as the esoteric. Predictive models applied to management goals may be largely oriented toward policy decision making by state and local agencies. Predictive models of this type would be deterministic, provide for quantized estimates of such factors as degree of potential damage to the cultural record in a given locale, and limit the number of variables to a small set for which reasonably accurate measures may be achieved. By contrast, explanatory models, whether predictive or causal, attempt to organize data and provide for multivariate explanations of cultural phenomena. Mathematical models that are explanatory in nature have continued to gain in popularity over the past two decades. For Lower Delmarva these have included a commitment toward the development of trend surface analyses and computer simulation studies. Finally, because they need not necessarily quantize variables, explanatory models need not be restricted to numerical data analysis. Ethnoarchaeological research should therefore be supported as another means of providing explanatory models that serve to go beyond the artefacts.

The degree to which the development of models succeeds in Lower Delmarva will, to a large extent, depend on the ability to continue the collection of data against which those models may be tested. Furthermore, the relationship of models to the type of data being investigated needs to be reviewed periodically. Two separate purposes may be served by modelling: the reduction of a large data set and the construction of a coherent framework around which uneven and fragmentary data may be organized. It is clear that the archaeological record of Lower Delmarva does not as yet suffer from being too voluminous. Therefore the purpose of modelling for the present must be to provide a coherent framework for what data there exists. For this reason we need not only seek more data, but the kind of data that will help to flesh out our ideas of what Delmarva's cultural past was like. In pursuing the collection of additional data it is also important to remember that the existing resources need to be protected to the greatest extent possible. Models will aid in making determinations as to what areas are most sensitive to data loss through either natural or man-induced destruction.

APPENDIX IV

LANDSAT DATA APPLICATION TO ARCHAEOLOGY SURVEYING AND RESOURCE MANAGEMENT: A DISCUSSION OF TECHNIQUES

ABSTRACT

A new technique is suggested for the monitoring of management areas and archaeological surveying in the state of Maryland. Through the use of a publicly available set of algorithms (ASTEP II) it is possible to classify and analyze the spectral characteristics of digitized data from orbiting Landsat satellites. The following discussion gives a brief overview of the functions and capabilities of the multi-spectral scanner system of the landsat satellites and comments on specific archaeological applications of the digitized data generated by the satellite scanning system. Additional comments are made concerning the integration of other sources of remotely sensed data with the mss data and possible strategies that may be profitably employed by archaeologists to utilize this data in testing and evaluating specific locational models.

Satellite acquired data is only one of a variety of techniques for collecting data representing land form variations and their meaning. Collectively these techniques are referred to as remote sensing techniques. Although work with other sensors will be referred to briefly below, it is important to recognize that all current remote sensors measure some aspect of the electromagnetic spectrum. A review of techniques, equipment, and applications of remote sensing as they apply to the archaeologist may be obtained by referring to "Remote Sensing: A Handbook for Archeologists and Cultural Resource managers" (Lyons & Avery, 1977). In the discussion below I will focus primarily on data sensed from space, rather than attempting to review all possible sensors.

On July 23, 1972, the first in a series of satellites now designated Landsat was launched from Vandenburg Air Force Base in California. There are currently three satellites in orbit, although only two are actively transmitting data to Earth. Each landsat is wholly dedicated to acquiring Earth-resources data by means of two instruments. The first of these, and the one used most commonly, is a multispectral scanner (MSS) which measures reflected light from the Earth's surface in four separate bands of the electromagnetic spectrum. Two of these bands are in the visible portion of the spectrum, the remaining two in the infrared portion. The second instrument is a return beam vidicon (RBV) and is similar to a television camera. This device has not worked reliably in the past and little work has been done with rbv data to date.

Each Landsat satellite is in a circular, near-polar, sun-synchronous orbit so that any portion of the Earth's surface is scanned every eighteen days. Data is returned to one of several ground stations where it is recorded and interpreted. Soon thereafter, Landsat signals are further processed at Goddard Space Flight Center (GSFC) in Greenbelt , Maryland, and converted into imagery or digital forms. Imagery has the appearance of high-altitude aerial photography, and standard techniques of photo interpretation may be used to analyze the Landsat created scene. Digital data from Landsat are available on computer compatible tapes which permit the application of rigorous statistical techniques for more detailed analysis of the recorded light values.

Archaeologists have not used remotely sensed data as much as many other earth scientists. Most Landsat demonstration projects have been carried out by geographers and geologists (or specialists from allied fields) in conjunction with land cover mapping for forest and crop inventories, wildlife habitat mapping, flood damage assessment, geological mapping, and similar studies. The failure of archaeologists to take full advantage of remote sense technology in surveying and planning work is slowly being rectified. An excellent reference source is AERIAL REMOTE SENSING TECHNIQUES IN ARCHEOLOGY (Lyons and Hitchcock, 1977).

Among the compelling reasons for archaeologists to make better use of remotely sensed data, including landsat data, is that new methods for archaeological surveying and planning need to be developed in the face of rising costs and shrinking funds. There is also the need for more precise data than currently available in many areas of the mid-Atlantic to permit the formulation and testing of rigorous predictive and analytical archaeological models. One such new method, employing data provided by orbiting Earth satellites is described here.

The work being carried out at Salisbury derives its impetus

from studies at Chaco Canyon, in the San Juan Basin of New Mexico. In that pioneering effort, carried out in the mid-1970's, remote sensing techniques, including Landsat analysis, were intensively evaluated for their archaeological potential (Lyons, 1977). National Park Service archaeologists located and mapped approximately 400 miles of Anasazi roadways using both conventional and new remote sensing techniques (Lyons, Ebert, and Hitchcock, 1976). Half of the road network was identified on the basis of archaeologically demonstrated occurrences; the other half by reference to maps produced by low and high level aerial photography in planimetric and oblique form. A map with this data was then overlaid on a Landsat photo image which revealed that the major road branches lead to identifiable resource areas presumed to have also existed in the past.

Up to this point the Pueblo road system had been seen principally as a means by which interdependent communities were integrated. Now, however, through the use of Landsat and aerial photogrammetric evaluations, the road network can also be demonstrated to have been a necessary development providing reliable and easy access to vital resources located outside areas of primary occupation. For example, some branches of the network were shown to lead to timbered mountainous zones which may have provided wood and hunting, others lead to areas which may have served as possible sources of fish, and still others lead to locations which can be shown to be good sources of pottery clay.

In applying Landsat data analysis techniques developed for the Southwest to the investigation of archaeological sites in the mid-Atlantic region, new problems needed to be solved. Standing crops and forest canopies (such as are common in the Middle Atlantic region) prevent viewing the ground directly by satellite during much of the year. Urban and suburban development, man-induced alterations (such as strip-mining and reclamation), river dredging with associated spoil heaping, and effluent disposal mask or obliterate evidence of man's past cultural activities. Finally, even in ideal areas, sites are likely to be small and scattered, especially for the prehistoric period.

It is the purpose of this report to show how Landsat data may be used in the investigation of both large scale and small scale archaeological study units. Application of Landsat imagery to the definition of gross ecological zones has been described by Schalk and Lyons (1977) for the Southwest. It will be shown that similar work needs to be undertaken in the mid-Atlantic region. Recent work at Shenandoah National Park (Ebert and Gutierrez, in press) appears to be a major step in extending the Chaco experience to the Eastern Woodlands. Studies of this nature indicate that fixing the field of study well beyond the individual site effectively circumvents most of the problems associated with the inter-

pretation of satellite data as noted by Ebert (1977), Lyons (1977) and others. However, as will be seen shortly, this occurs not without a significant loss of data needed for potentially important research applications.

Utilizing this macro approach, it is possible to gain a synoptic overview of surface geology, topographic features, and soil differentiation. For example, non-linear patterns, including those of potential interest to archaeologists, may be detected. By using the derived reflectance characteristics of known geologic features it is possible to extract discernible patterns that have a high probability of being culturally significant from the total data set which would be expected to include naturally occurring arcuate and circular patterns. It is also possible to deduce paleo-sedimentation patterns from modern satellite derived analogs, to delineate large geologic lineament trends and smaller fault zones and to define larger rock alteration zones; all with reference to Landsat data. Such information has obvious importance to the study of prehistoric land form changes and the location of lithic sources used for tool manufacture. These data may also be tested against a model of resource exploitation and serve as a basis for an ecological approach toward the interpretation of past human activity.

The shortcomings inherent in this approach are, as suggested above, a product of scale. Site-specific information cannot be obtained and local variations within regional trends are easily lost. Nevertheless, the extensive experience of geographers and geologists may be drawn upon by the archaeologist in his attempt to incorporate land cover and geologic data in his work.

A second approach that would provide a solution to the problems posed by the dispersed nature of archaeological remains and the limitations of scale and resolution of satellite data is to focus on improved techniques of map registration and pixel analysis. This would necessitate acquiring computer software to reduce locational error to a five pixel field and to analyze the spectral characteristics of each pixel for each of the four spectral bands in considerable detail. Landsat data could then be used by the archaeological community for specific site location, critical area assessment, and temporal monitoring of selected areas of archaeological significance. Management of archaeological resources would also become practical on a regional or state-wide basis with the creation of detailed computer-directed site inventories developed with the aid of analyses derived from Landsat data. Furthermore, these data would be sufficiently refined to permit inclusion in a systems model of cultural interpretation.

A preliminary report on work completed at Salisbury State College has been recently reported by the author in a paper given at the

1981 Middle Archaeological Conference and will not be repeated here. However the general operational framework in which this work is being conducted needs to be referred to since an understanding of the procedures advocated elsewhere in this report depends on a familiarity with this framework. Preliminary work completed at Salisbury State College and the Lower Delmarva Regional Center for Archaeological Research. The present efforts are directed toward integrating the efforts of the Department of Sociology and Anthropology and the Department of Geography and Regional Planning in implementing the integrated set of computer programs (ASTEP II) used for the processing of satellite data. The final objective of the work is to provide the archaeological community in Maryland with the operational capability to use satellite data for both research and functional resource management. Toward that end our work is being staged to allow testing of the programs and analysis techniques to be described below during the development and implementation of the Landsat analysis capability.

Use of the ASTEP II programs at Salisbury in the pursuit of a research objective involves a standard sequence of steps. It is first necessary to select an appropriate scene (available from EROS on standard tape reels recorded at 1600 bits per inch). Using the programs' data extraction routines, a subfield of specific interest is defined, deskewed, geocorrected, and scaled. For archaeological purposes it is desireable to focus on river drainage systems because these provide not only excellent topographic references for map registration, but also conform to a standard study unit for archaeological research.

Acquisition of a black and white photo-like image showing the full Landsat scene is a useful method helpful in locating areas of interest. The full scene covers approximately 34,000 km with a ground resoluton of 80 meters. In order to develop computerized maps the data is corrected for lineprinter print characteristics and one or several channels are examined. A set of arbitrary symbols (usually no more than 15 different symbols are customarily used) is then chosen where each symbol represents a range, or slice, of reflected light values. Water and dry sandy ridges are easily distinguished in the infrared and a map generated from channel 4 data alone has proven useful in looking at the study area in a preliminary fashion. More information contained within the data may be extracted by employing a variety of statistical techfniques for pattern recognition.

Pattern recognition techniques may be divided into two broad classes: Unsupervised classifications and supervised classifications. The former, unsupervised classifications, allow the computer to generate clusters of pixels with similar properties in each of the four spectral bands. These clusters may then be evaluated statistically by examining interclass distances, sigmas, and a

table of Euclidean and angular distance relationships. Once refined the signatures for each of the clusters are stored. Each signature represents four means and associated covariance matrix of the reflectance values for each multispectral band. These signatures are then supplied to other subroutines which build an image that may be graphically displayed. The advantage to unsupervised classifications lies in the ability to proceed with an ? Analysis of a Landsat scene without any foreknowledge of the terrain features. Decisions concerning the placement of pixels into groups are made purely on mathematical grounds. The disadvantage lies in the possibility that the computer-generated clusters may be difficult to relate to ground features and may in fact not accurately reveal desired features. In the case of archaeological site location low site density may result in their elimination as a significant cluster.

The second class of techniques, supervised classification, requires that the researcher select "training areas" representing known ground features. These training areas are likely to include water, agricutlural land, urban areas, bare soil, forests, and, hopefully, archaeological sites. Each training area, once selected, is analyzed by the computer and signatures are developed for these areas. The evaluation of these signatures proceeds as above and on the basis of successive evaluation and refinement a final set of signatures is sought which when supplied to image building subroutines will reveal the extent to which the traning areas represent the entire field under study. The advantage to supervised classifications lies in the potential to identify many previously unidentified features, such as archaeological sites. The disadvantage lies in the fact that only known features are identified and in the case of small training areas, as are inevitable in archaeology, the signatures may be poorly defined statistically.

Usually a combination of supervised and unsupervised techniques yield the best results. The success of the enterprise is largely a function of experience in using the various techniques. Some expertise in data processing and inferential statistics is also desirable. However, success may be achieved by the novice especially in the production of base maps and simple classification. The more subtle research objectives, especially those involving the identification of small archaeological targets in temporal sequence, require greater familiarity with principles of remote sensing and the reflectance characteristics of ground objects as measured by Landsat's multispectral scanner.

The accuracy of maps generated from the satellite data must be evaluated by comparison to other sources of similar information that can be independently related to specific areas on the ground. This process of ground-truthing may be achieved in a variety of ways. The most obvious, but also the most time-consuming, of

these is to walk the area. A more efficient, but less accurate, way is to overfly the study area by plane. This is most commonly done from an approximate altitude of 1,000 feet. Photographs in color and color-infrared are taken at an oblique angle. It is, however, still difficult to relate a satellite map to the aerial photographs. A bridging platform is provided by NASA's high altitude aircraft. U-2 coverate is at 60,000 feet and ideally should be matched to the season of the Landsat overflight and the low-level overflight. Each frame of the U-2 coverage is a color infrared product which can be compared successfully at full scale to the Landsat maps and at enlarged scale to the low altitude aerial photographs.

Thus far discussion has largely been concerned with site identification and location. The development of strategies for resource management can also profit from the inclusion of Landsat data. Landsat analyses are among the most cost-effective for the production of thematic maps when applied to larger geographic areas. Landsat data may be used in several ways to facilitate the management of archaeological resources and are currently being incorporated into a management plan for lower Delmarva. The first of these ways of applying Landsat data to the management of archaeological resources is to provide uniform maps indicating the distribution and nature of archaeological and natural features. Monitoring the interaction between the two (the effect of erosion on sites, for example) and examining the relationship between site occurrence and topographic features is a primary goal. A second way is to allow for updating of the data base by acquiring data tapes from Landsat overflights at frequent intervals. A third way is to evaluate the effect of cultural stress (construction and land development) and natural stress (erosion and pollution) on archaeologically sensitive resources by computer analysis of Landsat digital imagery.

This report has tried to suggest a number of ways in which Landsat may provide data suitable for investigating specific research questions, management decisions, and site identification based on work being carried out at Salisbury, Maryland is in an ideal position to develop the Landsat program for archaeological application in the mid-Atlantic in that its academic institutions have a common computer capability. The landsat interpretative computer programs are accessible by all state colleges and universities as well as other state agencies such as the Dept of State Planning. Further, Maryland's varied landscape and archaeological record permit the testing of predictive models derived from satellite data. Future work in the Pocomoke drainage and elsewhere on the Eastern Shore by the Salisbury Regional Center will attempt to contribute to the more general evaluation of this new technique.

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