Discovering the Chesapeake

The History of an Ecosystem

Edited by

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CHAPTER NINE

Reconstructing the Colonial Environment of the Upper Chesapeake Watershed

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Establishing an environmental baseline from which to measure landscape change in the Chesapeake since the arrival of Europeans is a crucial contribution to ecological history. This chapter provides insight into how this might be achieved using the land survey records of Frederick County, Virginia, between 1750 and 1800 to reconstruct the vegetation and land cover of the northern Shenandoah Valley during the early contact period. This information offers valuable clues to changing land use under colonial conditions of land ownership, resource use, and a developing economy.

European occupation of the Chesapeake region depended upon the transformation of what colonial settlers termed wilderness or wasteland into property. The condition of interior environments encountered by migrating European and Tidewater settlers during the early eighteenth century significantly influenced the locations and forms of colonial settlements. These environments were not pristine lands unaltered by previous native activities, although the nature and extent of the alterations remain problematic. Geographers and historians have long been interested in the first European penetrations of the mountainous upper reaches of the Chesapeake watershed in western Maryland and Virginia, but they have rarely been concerned with what is the focus of this chapter: what the process of appropriating property revealed about the relationships between society and environment.
Our treatment of Chesapeake history rests on three assumptions. We need, first, an interdisciplinary approach combining natural and social sciences because natural processes often operate independently of human action. Humans act to modify these processes, but nature responds to human activity in unexpected ways. Second, to understand this mutual interaction, we need to reach beyond the traditional documentary sources of the historian. Land-survey records in Virginia, for example, reveal important information on vegetation cover by identifying particular boundary markers, "witness trees," which are often described in some detail. When these surveys are organized geographically into continuous cadastral patterns, they provide the best data we are likely to acquire on the distribution of forested, open, and cultivated lands, as well as on the location of farmsteads, routeways, and other sites and paths of economic activity. Third, whether the intent is to test hypotheses about global processes or simply to reconstruct land cover from the bottom up, such research can take place only at local levels of inquiry and at the smallest spatial scales of individual settlement sites and land parcels.

We focus on the Shenandoah Valley of Virginia, with evidence derived particularly from Frederick County, the earliest and most effectively occupied county on colonial Virginia's far western frontiers. The Shenandoah River and the upper branches of the Potomac River form the bulk of the drainage basin of the western part of the Chesapeake watershed, the Shenandoah occupying the northern half of the Great Valley of Virginia between the Blue Ridge and the front range of the Allegheny Plateau. The Conococheague River occupies a similar position north of the Potomac in the Great Valley section of Maryland and adjacent Pennsylvania.

SETTLEMENT OF THE UPPER CHESAPEAKE

English authorities were unfamiliar with the area immediately west of the Blue Ridge until the second decade of the eighteenth century, when Virginia's lieutenant governor, Alexander Spotswood, and his entourage climbed the Blue Ridge in 1716 and looked over the Shenandoah Valley. Within three years, Virginia had begun to formulate a frontier policy designed to organize buffer settlements against potential French encroachments in the upper Ohio Valley and also against claims made by holders of the Northern Neck Proprietary grant to lands drained by the upper reaches of the Potomac. Maryland was slower to organize a western land policy, in part because of boundary disputes with Pennsylvania and in
part because of a general perception that much of western Maryland was devoid of trees (and was thus referred to as the "Barrens"). Colonial settlement of Maryland's Piedmont and Great Valley sections was delayed until the 1740s.

In Virginia, on the other hand, authorities had begun to develop a more elaborate settlement policy under Lt.-Gov. William Gooch during the early 1730s. His administration issued orders to individuals willing to settle families west of the Blue Ridge with the stipulation that within two years the grantors would settle one family per 1,000 acres granted. The goal was rapid settlement of the Appalachian frontier rather than profitable land speculation. Thus grantors were eager to sell off these lands as freeholds to prospective families. Despite this goal, settlers were left relatively free to define their own properties and to choose sites for farmsteads. By contrast, lands under the control of the Northern Neck Proprietary in the Virginia Piedmont and along the Shenandoah River carried no stipulation requiring settlement within a particular period of time.

Settlers from western Europe and the Middle Colonies, who began to occupy the Shenandoah Valley during the late 1720s and early 1730s, found themselves in an extremely isolated situation. Settlement in the Virginia and Maryland Piedmont had barely begun, and the Great Valley section of Maryland remained unoccupied. At the same time, colonial officials knew very little about the lands west of the Blue Ridge that they were trying to control on behalf of the British Empire. They imposed no particular spatial structure on settlement in the form of counties or townships, and towns were allowed to develop as a consequence of settlement rather than as a condition for it. The English survey system then in use, called metes and bounds, imposed no preconceived order on the shape of property holdings other than the rules that settlers generated themselves in the search for settlement sites and promising natural resources. Environmental considerations, therefore, were paramount in the decisions settlers made about sites for dwellings and farms. Encoded in the pattern of settlement, consequently, was very basic information about the physical environment and the way Europeans interpreted it.

Local and regional historians have long proposed that the particular environmental conditions of the Shenandoah Valley at the time of European contact contributed greatly to rapid settlement of the area. This tradition fostered what has been termed "the prairie myth." The idea of an immense grassland prairie covering the floor of the valley became en-
shrined by Samuel Kercheval during the 1830s when he stated that “much of the greater part of the country between what is called the Little North Mountain and the Shenandoah River, at the first [European] settling of the valley was one vast prairie . . . with the exception of narrow fringes of timber immediately bordering on the water-courses” (1833: 52, 303). Although Kercheval’s contemporary Edmund Ruffin had argued as early as 1825 that the extent of prairie cover in the northeastern United States was exaggerated, most writers who broached the subject during the nineteenth and early twentieth centuries perpetuated the prairie idea. The record of fossil pollen from the Shenandoah Valley indicates the presence of both tree and plant species characteristic of more open land, but the data so far are too sparse to establish the abundance and distribution of open land.

The most extensive review of the literature on the western Chesapeake watershed suggested that although the Shenandoah Valley was probably the most burned-over region of the central Appalachians, the consequences for the landscape were not vast areas of prairie. William Robison in 1960 stated: “In all probability the traditional belief had a sound basis, but the extent of the precolonial prairies must have been exaggerated . . . the valley was not a continuous prairie where one site was much like the next but rather it included certain limited areas that had been cleared and were therefore desirable spots for settlement” (160–62). Robert Mitchell, after reviewing the witness-tree references in 455 surveys for the southern Shenandoah Valley made between 1735 and 1755, found that white oaks, hickories, and black oaks constituted 75% of the markers. He concluded that “the early settlers would have encountered a region covered with predominantly open to relatively dense woodlands of hardwoods and pines in various phases of succession interspersed with relatively open grassland areas of varying extents” (1977: 24). Yet there has been no systematic attempt until now to recreate land cover from a detailed reconstruction of witness-tree data from land surveys. If the Shenandoah Valley at the time of European settlement was indeed extensively covered with prairie, then the natural or cultural mechanisms maintaining such an ecosystem need to be explained.

**THE DOCUMENTARY RECORD**

Historians who have attempted to reconstruct colonial environments in North America have relied heavily on travel accounts, natural histories, and diary notations. Colonial accounts of the Shenandoah Valley’s
vegetation cover suggest a mosaic of forest and open land rather than an extensive prairie. Although John Lederer viewed the northern Shenandoah Valley from the Blue Ridge in 1670 and commented on the “sau
dahs” of the Piedmont, he made no mention of such landscapes to the west. Louis Michel, who envisioned the creation of a Protestant colony in the region, visited the northern part of the valley between 1704 and 1707. He commented that there was “land that is dry and barren and where it is difficult to pass through the wild brush-wood. On the contrary, there is good land, where are great forest trees of oak, and where much game abounds” (quoted in Kemper, 1921: 2). Alexander Spotswood’s expedition spent little more than a day west of the Blue Ridge. There was no report of a grassland or prairie, but one member, John Fontaine, remarked that members of the party ate “very good grapes, and saw a vine which bore a sort of wild cucumber, and a shrub which bore a fruit like unto a currant” (105–7). The presence of such plants suggests an environment more wooded than grass-covered.

Travel literature, however, must be used with caution. Travelers generally were not well versed in natural history and were often highly selective rather than comprehensive in their accounts. Some wrote from the perspective of the commercial potential of lands they traversed; others were more political in outlook and displayed their prejudices against colonial farm practices, frontier societies, and other social institutions; and still others indiscriminately incorporated accounts of regions unvisited into their descriptions. Given these caveats, landscape depictions were probably the least distorted elements in their travel experiences, and where travelers had some expertise in natural history their accounts become especially valuable.

Forest Patterns and Forest Transformation

Most travelers, and presumably settlers, judged land quality by its vegetation cover. Good soils were associated with hardwood forests, principally oak-hickory, and poor soils with pine woods. Lands that did not support forests and especially those covered with brush or scrub were considered infertile or barren. Open, grassy areas were noted particularly for their settlement possibilities, and comments on their appearance or extent are often extremely useful. If literate travelers had knowledge of Hugh Jones’s early eighteenth-century description of the Virginia back country, they would have expected that “the whole country is a perfect forest, except where the woods are cleared for plantations, and old fields,
and where have been formerly Indian towns, and poisoned fields and meadows, where the timber has been burnt down in fire-hunting or otherwise; and about the creeks and rivers are large rank morasses or marshes, and up the country are poor savannahs" (1956: 74).

The earliest travel notations made after pioneer settlers moved into the Shenandoah Valley during the early 1730s date from Moravian migrants passing through the region during the late 1740s and early 1750s. Traversing a shale zone just south of Frederick County in October 1753, one Moravian diarist noted that "the country was pretty barren, overgrown with pine trees" and, a few miles farther south, he and his companions camped and "put our horses in the woods." In the southern end of the valley a few days later he noted, "Although it is very hilly here, yet it is a fruitful country. It has few stones, but consists of the fattest, black soil. It is settled mostly by English and Irish people" (Hinke and Kemper, 1904: 144–48).

Oaks and hickories appeared most often in eighteenth-century accounts of forests in the valley. The naturalist John Bartram, traveling the short distance from Winchester to Stephensburg (Stephens City) in 1759 along a limestone-shale contact zone, "rode over very stoney ground producing great red Ceder pines . . . leaved 2 & 3 & 3 leaved broad leaved willow oak" (Bartram Papers). In the summer of the same year, Andrew Burnaby encountered "majestic woods; the whole interspersed with an infinite variety of flowering shrubs" (1798: 74, 157–59) and mentioned twenty-six species of trees including oak, hickory, maple, cedar, pine, sassafras, dogwood, locust, redbud, tulip tree, catalpa, chinkapin, persimmon, and chestnut. In Frederick County he observed that "the low grounds upon the banks of this river [Shenandoah] are very rich and fertile; . . . [the people] live in the most delightful climate, and richest soil imaginable; they are everywhere surrounded with beautiful prospects and sylvan scenes; lofty mountains, transparent streams, falls of water, rich valleys, and majestic woods; the whole interspersed with an infinite variety of flowering shrubs" (Burnaby, 1798: 73–74). The valley section of Frederick County contained the bulk of the region's more than 10,000 residents by this time, and Burnaby's landscape description is the best available after 30 years of settlement (Mitchell, 1977: 95–96).

The persistence of extensive forests and woodlands was a consistent observation in travel accounts throughout the remainder of the eighteenth century. Hardwood forests invariably covered limestone-floored valley bottom lands, while pines and scrubtier hardwoods were found on shale lands and bordering mountain slopes. Some travelers described for-
est openings in various stages of reversion to woodland. Philip Fithian, in 1774, saw “Glades, quite bare of Timber, and covered with Shrubs, Ground-Oak, Hazles, and c.” (1934: 107). Andrew Burnaby remarked that abandoned tobacco lands when left fallow became “beautifully covered with Virginian pines” (1798: 92), an observation also supported by Isaac Weld, who wrote that “lands left waste in this manner throw up, in a very short time, a spontaneous growth of pines and cedars” (1807: v. i, 152).

During succession, cleared land and old fields invariably produced messy areas of shrubs and thickets. John Fontaine had noted such areas on the eastern side of the Blue Ridge as early as 1716. Nicholas Cresswell and John Smyth remarked on several areas of “impenetrable thicket” on their journeys through the central Appalachians between 1774 and 1783. Other travelers, however, described the forest understory in some places as more open and devoid of heavy undergrowth. Ferdinand Bayard traveling through eastern Frederick County in 1791 passed through “forests whose hardy and tall trees did not permit bois-du-chien [dogwood] or bramble to overgrow the open spaces between the trees. A deep green turf covered those spaces and invited the tired traveler to rest” (1798: 68).

Earlier, in 1775, Philip Fithian rested near Winchester and “for the Sake of Meditation, took a Ramble into the long Bosom of a tall, dark Wood—We chose, at some distance from each other, a green shady Spot; threw ourselves carelessly on the cool Grass” (1934: 11-12). Fithian also commented on numerous flowering plants covering the valley floor, a phenomenon first noted by John Bartram in a letter to Peter Collinson describing his journey across the Blue Ridge in Frederick County and north along Opequon Creek: “Indeed beyond ye mountains in virginia & pensylvania, there is a great variety that I saw & ye inhabitants say ye ground is covered with dilicate beautiful flowers in ye spring which is not to be found after hot weather comes on” (Berkeley and Berkeley, 1992: 104). When Collinson germinated the seeds Bartram sent, he discovered “Curious Flowers” including “New Jacea with hoary rough Leaves—a very pretty Dwarf Gentian with a large Blew Flower, . . . Gratiola, . . . Draccocephalon, . . . Chrysantheamums or sun flowers, [and] Asters” (1992: 145). Several varieties of wild grape were also associated with disturbed land.

Settlers employed several methods of forest clearance, including burning, clear-cutting with ax and saw, and girdling. Only the last method is described in local accounts. Thomas Anburey wrote in 1779: “Their manner of clearing the land is, by cutting a circle round the tree through the
bark quite to the wood, before the sap rises, which kills it; they then clear
the small brushwood and cultivate the ground, leaving the trees to rot
standing, which happens in a very few years; and after receiving the cir-
cular wound, they never more bear leaves” (1789: v. 2, 188). Nicholas
Cresswell, in his 1777 account of setting up a farm in the northern
Shenandoah Valley, observed that the best land in large tracts was still
inexpensive “tho’ perhaps one third of it is cleared from woods” (1924:
197). If Cresswell’s estimate is reasonably accurate, then approximately
one-third of the prime agricultural land on the valley floor would have
been cleared by the time of the American Revolution, particularly in
the vicinity of Winchester, the region’s largest town. Twenty years later, Isaac
Weld was to observe:

In the neighborhood of Winchester it is so thickly settled, and consequently
so much cleared, that wood is now beginning to be thought valuable; the
farmers are obliged frequently to send ten or fifteen miles even for their fence
rails. It is only, however, in this particular neighborhood that the country is
so much improved; in other places there are immense tracts of woodlands still
remaining, and in general the hills are all left uncleared. (1807: v. 1, 231)

Patterns and Causes of Open Land

The outcome of settlement, land clearance, and farm building through-
out the eighteenth century was a variegated landscape with open bottom
lands, cleared farmland, small villages and towns, and surviving wood lots
between streams and on hill and mountain slopes. Part of this landscape
mosaic, however, had existed before colonial settlement in the form of
frequent variations in land cover that included not only hardwood forests
and more open woodlands but also various forms of open land largely de-
void of trees. Travelers made note of these patterns and provided several
explanations for their existence.

Prior to the settlement of the Shenandoah Valley, travelers crossing
the Piedmont had described various forms of landscape clearings. John
Lederer, in 1670, frequently referred to these clearings as savannae, a de-
scriptive term which he applied on his map to the entire eastern foothill
zone of the Blue Ridge. Thomas Batts and Robert Fallam, who followed
Lederer into Appalachian Virginia a year later, encountered rich mead-
ows along stream channels on the Piedmont, occasionally with grasses as
tall as a man (Alvord and Bidgood, 1912; Briceland, 1987). Yet Thomas
Anburey could write of the area in the vicinity of Charlottesville in 1779,
"The country is so much covered with woods, that you travel a long time without seeing an habitation" (1789: v. 2, 196).

Several eighteenth-century travelers commented on natural meadows along stream channels in the Shenandoah Valley. Philip Fithian found along Opequon Creek near Winchester "large and rich Meadows— Many have good Grass upon the Uplands" (1934: 19), and Ferdinand Bayard "was twelve miles from Winchester, when well-kept meadows foretold the proximity of a less cursed land, and of some intelligent planter . . . On the other side [of the planter's house] was a garden which overlooked a fairly large meadow, watered by a rather large stream" (1798: 58–59). According to the Duc de la Rochefoucauld-Liancourt at the end of the century, "the banks of [Shenandoah River] are, in some instances, covered with fine natural grass" (1800: v. 3, 195), a phenomenon that Fithian had earlier noted along the lower Susquehanna River in the form of "large Plains, or as the Inhabitants call them, Glades, quite bare of Timber" (1934: 107). Few travelers estimated the dimensions of such open areas and none suggested that they were so extensive as to constitute entire landscapes of grassland. Fithian comes closest when he claimed for nearby Pennsylvania "large open Plains, cleared either by the Indians, or by accidental Fire, hundreds of Acres covered with fine grass" (91).

Fithian's tentative explanations reflect the fact that most travelers who commented on open areas assumed that these areas would have been capable of producing forests. Although fire and clearance by Indians were mentioned as principal causes of open land, fires of the intensity necessary to produce a crown burn were probably not common enough to clear extensive areas—most fires served only to reduce the forest understory and ground cover and place it in a new cycle of succession (Day, 1953; Garren, 1943; Holland, 1979; Little, 1974; Prunty, 1965; Russell, 1983). Isaac Weld made this point in 1796: "In general there is but very little brushwood in the woods of America, so that these fires chiefly run along the ground; the trees, however, are often scorched, but it is very rare for any of them to be entirely consumed" (1807: v. 1, 62). There were, moreover, no resident Indian groups in the Shenandoah Valley at the time of European contact, and few travelers made direct references to clearings called "Indian old fields." On the first map of Virginia to show the upper Chesapeake watershed in any detail, the Joshua Fry and Peter Jefferson map of 1751, the only extensive area warranting an "old field" designation was the "Shawno Fields" of the South Branch of the upper Potomac River. Travelers themselves occasionally were blamed for creating slow-burning fires. The Marquis de Chastellux, while visiting Na-
ural Bridge at the southern end of the Shenandoah Valley in 1782, commented that “one is surprised to find everywhere in these unsettled forests the traces of several fires. These accidents are sometimes caused by the carelessness of travelers, who light a fire when they go to sleep and neglect afterwards to extinguish it” (1786: v. 2, 407–8).

Other travelers believed that periodic flooding produced most areas of open land associated with meadows and marshes along stream courses (Fontaine, 1972: 91), while a few pointed to stream damming as a result of beaver or buffalo activity (Cresswell, 1924; Fithian, 1934: 147). By far the most astute observation was made by naturalist John Bartram while visiting the Shenandoah Valley in 1759. He attributed natural meadows to stream damming from formations of calcareous (chalky) earth or marl. Marl forms as a calcium carbonate precipitate on rocks or wedged tree trunks, sticks, and twigs along streams in limestone areas. After crossing Opequon Creek on his way to Winchester, Bartram observed:

Ye effects of ye incrusting limestone waters which is of that nature that where it runs it incrusts round brush or leaves or stones or any thing in its course frequently stoping its course & overflowing ye adjacent low grounds amongst ye leaves brush or grass or weeds which it incrusts when ye winters frost is sharp it penetrates this crust which falls in scales & enricheth ye ground exceedingly. I observed a bank 8 foot deep at a mill race all of this encrusted limestone matter converted into firm soil & many times of such a firm consistency as to make numerous dams quite cross large creeks so that ye floods frequently overflowed large quantities of low grounds & enriched them much with its calcareous matter when dissolved by ye frost rain dews & sun. (Bartram Papers)

This is the first documented reference to travertine-marl deposits known in American scientific literature.

Taken together, contemporary observations concur sufficiently to lend credence to certain conclusions. The Shenandoah Valley undoubtedly was not covered by extensive prairies at contact time. Open areas certainly existed but only within a mosaic of forests, bottom lands, and clearings caused by a variety of cultural and natural processes. Periodic flooding caused by unusually heavy rains, or occasional snowmelts, or beaver or marl damming maintained meadows and marsh areas along watercourses. It is also possible that the periodic action of ice along riverbanks, soil compaction by herd animals such as buffalo at salt licks, and even intense burns emanating from lightning strikes and sulfur or saltpeter de-
Reconstructing the Colonial Environment

posit in soils could help to maintain open areas. Yet fire activity, whether of natural or human origins, rarely would have been capable of extensive forest destruction. Fire served to keep forest understory down rather than to clear the forest crown.

The region's forests themselves held little value for early settlers and were commonly viewed as a hindrance to farming. The first two generations of colonial settlers might have stripped one-third of the valley floor of its forests for agricultural purposes. Even as settlers drained marshes, reclaimed bottom lands, and cleared fields and pastures on adjoining uplands, the landscape of the Shenandoah Valley remained a mosaic of open and wooded land.

The Survey Record

The availability of an extensive and continuous survey record for Frederick County affords us another perspective on the contemporary travel literature and allows reconstruction of the colonial environment in greater detail. Surveys for grants and patents in the northern Shenandoah Valley consistently employed trees as witness markers. The Crown, through the Virginia Council—and through Lord Fairfax, as proprietor of the Northern Neck (the land lying between the Potomac and the Rappahannock Rivers)—provided individuals or groups with rights to specified amounts of land. The granting authority issued warrants authorizing the survey of claimed lands. The surveyors then went out, usually during the spring or fall months, and marked the metes and bounds of tracts with the aid of two chain carriers, who measured distances with a surveyor's chain. Surveyors sketched out tracts in their field notebooks and completed the final drawings and descriptions in their offices. The surveys were next entered into the record, and prospective landowners were expected to pay any required fees. The land office then issued land grants indicating the size, location, and delineation of tracts and the method of ownership (Hughes, 1979).

Clerks entered the grants in the Crown or the Northern Neck land books. Because the grants were not always transcribed accurately, however, historians have to use the tract descriptions outlined in the original surveys, an example of which is illustrated by Fig. 9.1. Not all of the original surveys have survived for Frederick County as designated by 1779, but we were able to retrieve information from 1,000 surveys representing 70% of the original surveys recorded between 1730 and 1780.

We compiled data on ownership, location, markers or witness trees,
Fig. 9.1. Survey of 1749 for John Snapp Sr., 400 acres
and other pertinent information in two databases. One was a coordinate file, consisting of the Universal Transverse Mercator coordinates for each marker in a grant. The second database, and the more important for present purposes, was the parcel information file, which contained the description of the land grant and the nature of the markers. Data about each marker included the object itself (tree, stake, or stone), the species of tree if marked by a tree, comments about the tree (young, old, sapling, forkeled, etc.), and any pertinent comments made by the surveyor with reference to each marker (such as “on a ridge,” “in a valley”) or to the area between markers (such as “into the woods,” “through a meadow”).

The Forest Community

We recovered information on 7,802 witness markers distributed over a 566-square-mile area on the floor of the Shenandoah Valley in Frederick County, a territory slightly more than half the land area of Rhode Island. Surveyors used terminology representing 51 different types of markers, 46 of which referred to different species and varieties of trees and the remaining five to stones, stakes, piles, posts, and poles. The proportion of marks represented by trees remained between 90% and 94% throughout the entire period from 1730 to 1780. There was no mention in any surveys of prairies or savannas, although there were numerous references to types of open land. The most commonly marked tree species was white oak (Quercus alba L.), followed by pine (probably Pinus virginiana L.), hickory (Carya sp.), northern red oak (Quercus rubra L.), black oak (Quercus velutina Lam.), and chestnut oak (Quercus prinus L.). The frequency of species identified changed noticeably during the century, however. The proportion of marked trees that were white oak declined from more than 45% during the early 1740s to 30% by 1780. A similar trend was evident for hickory, red oak, and black oak. Pine species, on the other hand, increased from less than 10% during the 1740s to almost 30% by 1780, with a distinct increase in frequency after the early 1760s. Similarly, chestnut oaks increased in frequency from less than 5% during the 1750s to more than 10% during the late 1770s. Four of every five trees marked received no further comment from surveyors. Most comments referred to the size or age of trees, with the most frequent reference being to a “sapling.” Saplings, somewhat unexpectedly, were marked more frequently during the 1730s and 1740s than during the 1760s and 1770s.

A potential problem in examining data on tree species derives from the use of vernacular names. The colloquial terms used by eighteenth-
century surveyors do not necessarily correspond to common names in use
today, much less to scientific names. A number of authorities have
worked on this problem, and the equivalents in Table 9.1 can be accepted
with a high level of confidence (Spurr, 1931; McAtee, 1938; Michaux, 1865;
Catesby, 1771; Ewan and Ewan, 1970).

An even more serious problem is surveyor bias. Different surveyors
were likely to have had varying abilities and inclinations to distinguish
and mark particular species. Species of hickory and northern red and
black oak, for example, are difficult to distinguish without fruits, which
appear mainly in the summer and fall. A surveyor was encouraged by law
to rely on the boundaries of previously surveyed lands and not to exceed
a three-to-one ratio for the length and width of the surveyed land,
though this was not always followed in practice. The precise boundary
was otherwise at the surveyor’s discretion, as was the selection of survey
points to be marked. A surveyor could thus choose to mark points using
a limited range of tree species, either because of a bias in favor of certain
long-lived species that showed the blazed marks of the ax well or because
of the way the surveyor had been trained.

We conducted one analysis to test the existence of bias. Forty-three
surveyors were involved in surveying Frederick County during the eigh-
teenth century, but only six accounted for 667 surveys, or two-thirds of
all extant surveys, covering almost 210,000 acres. There was a range
among the six from 197 surveys for Robert Rigg to 64 for William Baylis.
Baylis was part of two father-and-son practices, John and William Baylis
and Robert and Thomas Rutherford. While Rigg and a John Mauzy
demonstrated no clear biases, John and William Baylis seldom identified
black oak, pine, or, together with Robert Rutherford, chestnut oak.
Rutherford’s son John, however, did not exhibit such a bias. These con-
cclusions could simply indicate that the Baylis and Rutherford assign-
ments focused on parts of the county with forests of somewhat different
composition than areas covered by other surveyors. The similarities in
the frequencies with which different surveyors marked other tree species
might suggest either that no bias existed for those species or that the bias
was shared by all surveyors. Such a common bias would be difficult to
detect.

Although surveyor bias could cause certain tree species to be over- or
underestimated in terms of the overall forest community, it is unlikely to
distort our estimate of the abundance or extent of forested or unforested
land. The small size of many of the land grants (one-quarter were for less
than 200 acres), the surveyors’ descriptions of the vegetation, and the lack
Table 9.1 Common names used by surveyors for marked tree species and their modern scientific and common names

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<th>Twentieth-century common name</th>
<th>Scientific name</th>
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<td>Pinus sp.</td>
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<tr>
<td>White pine</td>
<td>White pine</td>
<td>Pinus strobus</td>
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<td>Cedar eastern</td>
<td>Red cedar</td>
<td>Juniperus virginianus</td>
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<td>Yew</td>
<td>Yew</td>
<td>Taxus canadensis</td>
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<td>Spruce pine</td>
<td>Hemlock</td>
<td>Tsuga canadensis</td>
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<td>Spanish oak</td>
<td>Southern red oak</td>
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<td>Chestnut oak</td>
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<td>Black oak</td>
<td>Quercus velutina</td>
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<td>Oak</td>
<td>Quercus sp.</td>
</tr>
<tr>
<td>Beech</td>
<td>Beech</td>
<td>Fagus grandifolia</td>
</tr>
<tr>
<td>Chestnut</td>
<td>Chestnut</td>
<td>Castanea dentata</td>
</tr>
<tr>
<td>White hickory</td>
<td>White hickory</td>
<td>Carya tomentosa</td>
</tr>
<tr>
<td>Shagbark hickory</td>
<td>Shagbark hickory</td>
<td>Carya ovata</td>
</tr>
<tr>
<td>Hickory</td>
<td>Hickory</td>
<td>Carya sp.</td>
</tr>
<tr>
<td>Walnut</td>
<td>Walnut</td>
<td>Juglans sp.</td>
</tr>
<tr>
<td>Black walnut</td>
<td>Black walnut</td>
<td>Juglans nigra</td>
</tr>
<tr>
<td>White walnut</td>
<td>White walnut</td>
<td>Juglans cinerea</td>
</tr>
<tr>
<td>Sugar maple</td>
<td>Sugar maple</td>
<td>Acer saccharum</td>
</tr>
<tr>
<td>Maple</td>
<td>Maple</td>
<td>Acer sp.</td>
</tr>
<tr>
<td>Box elder</td>
<td>Box elder</td>
<td>Acer negundo</td>
</tr>
<tr>
<td>Locust</td>
<td>Locust</td>
<td>Robinia pseudoacacia</td>
</tr>
<tr>
<td>Sycamore</td>
<td>Sycamore</td>
<td>Platanus occidentalis</td>
</tr>
</tbody>
</table>

(continued)
### Table 9.1 (continued)

<table>
<thead>
<tr>
<th>Eighteenth-century common name</th>
<th>Twentieth-century common name</th>
<th>Scientific name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gum</td>
<td>Gum</td>
<td>Nyssa or Liquidambar</td>
</tr>
<tr>
<td>Black gum</td>
<td>Black gum</td>
<td>Nyssa sylvatica</td>
</tr>
<tr>
<td>Sweet gum</td>
<td>Sweet gum</td>
<td>Liquidambar styraciflua</td>
</tr>
<tr>
<td>Poplar</td>
<td>Poplar</td>
<td>Populus sp.</td>
</tr>
<tr>
<td>Ash</td>
<td>Ash</td>
<td>Fraxinus sp.</td>
</tr>
<tr>
<td>Lynn</td>
<td>Basswood</td>
<td>Tilia sp.</td>
</tr>
<tr>
<td>Dogwood</td>
<td>Flowering dogwood</td>
<td>Cornus florida</td>
</tr>
<tr>
<td>Elm</td>
<td>Elm</td>
<td>Ulmus sp.</td>
</tr>
<tr>
<td>Hackberry</td>
<td>Hackberry</td>
<td>Celtis occidentalis</td>
</tr>
<tr>
<td>Mulberry</td>
<td>Red Mulberry</td>
<td>Morus rubra</td>
</tr>
<tr>
<td>Sassafras</td>
<td>Sassafras</td>
<td>Sassafras albidum</td>
</tr>
<tr>
<td>Thorn</td>
<td>Hawthorn</td>
<td>Crataegus sp.</td>
</tr>
<tr>
<td>Cherry</td>
<td>Black cherry</td>
<td>Prunus sp.</td>
</tr>
<tr>
<td>Plum</td>
<td>Plum</td>
<td>Prunus americana</td>
</tr>
<tr>
<td>Birch</td>
<td>River birch</td>
<td>Betula nigra</td>
</tr>
<tr>
<td>Whitewood</td>
<td>Tulip poplar</td>
<td>Liriodendron tulipifera</td>
</tr>
<tr>
<td>Iron wood</td>
<td>Iron wood</td>
<td>Carpinus caroliniana</td>
</tr>
</tbody>
</table>

of stones and stakes as markers all argue that surveyors were not marking the few trees in a grassland area but rather they were surveying in mostly forested lands.

Thus, if the survey record is taken at face value, the data suggest that during the first generation of colonial settlement, between 1730 and 1755, the forests on the floor of the northern Shenandoah Valley were 71% oak, 14% hickory, 6% pine, 3% walnut, and 6% other species. These species were distributed widely throughout the valley floor and interspersed with more open grassland areas, particularly along stream courses, thus exhibiting a distribution pattern that was almost the reverse of Samuel Kercheval's conclusion in 1833.

These general observations are similar to what is found in modern-day forests, which remain dominated by oaks in particular. Yet the his-
toric picture is at odds with the anticipated frequencies of specific species. The limited references to hickories and chestnuts and the unusually high number of references to walnuts are particularly striking. Either these observations demonstrate a general surveyor bias or chestnuts and yellow poplars especially have been overestimated in reconstructions of the "potential natural vegetation" of the central Appalachians (Schantz and Zon, 1924; Kuchler, 1964). The decline in frequency of white oak, red oak, and hickory during the second half of the century and the increase in frequency of pine and chestnut oak may indicate a change in the composition of the forest as a consequence of intensified settlement. Alternatively, the data may simply reflect an increase in the occurrence of land grants on mountain slopes and in shale regions where chestnut oak and pine, respectively, would be more common. Similarly, the decline in the frequency of saplings mentioned in the surveys may indicate decreased timber "poaching" on ungranted or unoccupied land, which would be in the early stages of forest succession. The forests during the 1730s and 1740s, on the other hand, may have been in early stages of succession because they had been subjected to extensive burns or to the first wave of livestock grazing. If fire were suppressed or beaver or deer reduced in abundance over the course of the century, then saplings may have become less abundant than before European settlement. Finally, it is possible that surveyors developed a bias against saplings once they learned that saplings were often harder to mark and less likely to last than larger trees.

Patterns and Causes of Open Land

Another approach to the problem of open savannas in the Shenandoah Valley is to assess the possible explanations for the creation or maintenance of open land. If no reasonable mechanism can be proposed to account for extensive unforested areas, then a large-scale continuous prairie is unlikely. If, however, a plausible mechanism can be identified, it would support the idea of extensive grassy areas covering the Shenandoah early in the eighteenth century.

The most common native vegetation in the eastern United States is unquestionably forest. Only limited areas of the eastern United States inland from coastal wetlands do not support forest growth naturally. Low areas with high water tables along the Coastal Plain are covered by marsh grasses; areas with perched water tables on the Piedmont and in the Great Valley also support grassy marshes; and some mountain slopes are covered with boulders and rocks, having no vegetation at all. Fires,
storms, floods, wild-animal grazing, and aboriginal activities could remove forest cover temporarily, but the natural process of forest succes-
sion would lead to the reestablishment of mature forests within a few
decades. Without a recurring process to prevent forest regrowth, open
lands would not persist for extended periods of time.

Only two explanations—climate and soils—could account for both the
creation and maintenance of open grasslands. Although such grass-
lands occur naturally in parts of the western Middle West and on the
Great Plains, there is no evidence to suggest that climate in the Shenan-
doah Valley during the late seventeenth and early eighteenth centuries
resembled that of the Great Plains.

The soils of the Shenandoah Valley are well known. Extensive areas
are underlain by limestones, which generate well-drained soils and little
surface runoff. Although these conditions argue against soils as a causal
mechanism for creating prairies, scattered springs along limestone-shale
contact zones or in association with silts and clays commonly lead to the
formation of small marshy areas. And, as noted previously, localized
travertine-marl precipitates can cause or enhance floods, temporarily
rendering floodplains inhospitable to trees. Again, however, none of
these factors is likely to retard forest succession indefinitely.

If we can judge from current environmental patterns, cyclonic storms
account for one-third of the annual precipitation of 36–40 inches received
in the valley, and floods are common throughout the entire western
Chesapeake drainage basin from January through April. Even extreme
flooding, however, is infrequent and, if extensive areas were to be defor-
ested by floods, they would be quickly recolonized. The death or fall of a
few canopy trees notwithstanding, severe weather conditions would be
insufficient to account for more than scattered, small, unforested locales.

Fire, as we have noted, can also be discounted as a force for the sus-
tained appearance of grassy areas. Fires contribute to more open forest
understories by killing seedlings and saplings, but lightning-induced fire
would have to occur during a prolonged drought period when a sufficient
quantity of flammable fuel would be present. There is no evidence of such
a drought period during the eighteenth century. Even if aboriginal fire
practices for land clearance or hunting took place in the Shenandoah Valley
immediately prior to European occupation, such fires would ignite
ground cover rather than tree crowns, and it would require an intensive
program of fire management to create extensive grassy areas. Because of
the absence of Native Americans at contact time, there was no human
impediment to normal forest succession.
Grazing animals, on the other hand, could create and maintain open land if they were present in sufficient numbers. Four species of indigenous mammals had the capacity to affect the distribution and regrowth of forests in the Shenandoah Valley: buffalo (*Bison bison*), elk (*Cervus canadensis*), white-tailed deer (*Odocoileus virginianus*), and beaver (*Castor canadensis*).

The abundance of bison in western Virginia during the eighteenth century is difficult to assess for lack of evidence. Despite an occasional placename reference to “buffalo,” there are only three documented references to bison in colonial Virginia and none in the Shenandoah Valley. The nearest reference is to the New River Valley in southwestern Virginia in the 1660s. Had bison been common in the region, it is likely that aboriginal populations would have taken up residence there.

Elk and deer, however, were relatively abundant in western Virginia. Deer in particular, with their substantial dependence on woody browse rather than on grass, could have affected the early stages of forest succession or the recolonization of meadows (Thomas and Toweill, 1982). Yet current evidence from the increasing deer herds of the western Chesapeake watershed suggests that they prefer herbaceous vegetation when grazing in meadows, on a scale which does not prevent the reestablishment of forest.

Beaver may have been common in the Shenandoah Valley during the early eighteenth century, although not as abundant apparently as on the northern Piedmont. Through food gathering and dam building, beaver can make a significant impact on the vegetation of riparian habitats (Barnes and Dibble, 1986; Naiman et al., 1988). Beaver activity can replace stream-side woodland with grassy meadows, marshes, shrub thickets, and bogs. Yet the valley’s predominantly limestone structure, with its limited surface drainage, restricted opportunities for the formation of the type of streams preferred by beavers. Our initial analysis, therefore, suggests that there were no outstanding natural mechanisms present in the Shenandoah Valley in such force or continuity as to sustain extensive grassy areas indefinitely.

**Unresolved Environmental Research Issues**

Although we are confident that our evaluation of the documentary and survey records for the northern Shenandoah Valley has provided supportable conclusions about landscape and environment in the western Chesapeake watershed, some research issues remain unresolved, and
our survey is to this extent a work in progress. One issue that needs further exploration concerns the modification of our data that would follow if we were to take account of the 200-odd subdivisions of the original grants which occurred between 1760 and 1800. It should also be possible to construct a composite cadastral map of Frederick County. When completed, a composite ground-cover map would provide the most precise and accurate geographic information we are ever likely to have about vegetation in colonial America during the pioneer contact period.

The resolution of two further issues depends upon constructing a land-cover map for the colonial period. Until we know the distribution of open, grassy areas in relation to stream courses, we will have neither an understanding of the frequency of grasslands in upland areas nor the means of differentiating among such terms as barren, bog, glade, marsh, and meadow. Colonists did not employ these terms as precisely as they tend to be understood today.

As Frederick County became more effectively occupied during the eighteenth century, the relationship between settlement site selection, demographic change, and land-use modification presents a further set of problems. We have initiated research on this relationship and have already begun to dismantle another set of “environmental truths.” The current state of our knowledge concerning settlement sites and soil types indicates that site choices were not compartmentalized along ethnic lines but that most pioneer settlers preferred limestone soils and consciously avoided shale soils. Although this hypothesis seems to be supported in Frederick County, the issue of soil selection is more complex. By mapping 31 original surveyed tracts along the limestone–shale contact zone that traverses the valley floor from north to south, we have discovered that 11 were primarily on limestone land and only 3 were mainly on shale, but 17 were located along the limestone–shale interface. This pattern strongly indicates that early settlers were conscious of the ecological advantages provided by edge habitats. While the limestone areas were first exploited for their agricultural potential, the shale lands proved to be superior for mill sites because of their greater surface drainage and steeper stream gradients. It is no coincidence, therefore, that by the end of the colonial era a high correlation existed between the distribution of mills and the presence of shale land. These findings constitute the basis of another research project.

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