
PEHR (PETER) KALM AND ENVIRONMENTAL CHANGE IN THE MID-EIGHTEENTH CENTURY

Tim Morgan

Morgan, Tim, Associate Professor of History (Ret.), Christopher Newport University
Newport News, VA, 23606
[8057 Tuckerman Lane, Potomac, MD 20854 (home)]

Abstract—This paper reviews the two-year visit of the Swedish botanist Pehr (Peter) Kalm to colonial North America, with general focus on his analyses and insights into deforestation in the Delaware River valley and particular attention to his comments on Atlantic white cedar (*Chamaecyparis thyoides*).

Keywords – Atlantic white cedar, *Chamaecyparis thyoides*, settlers, exploitation, deforestation, shingles, Delaware River valley, environment, Peter Kalm

INTRODUCTION

Environmental scientists wrestle with the problem of environmental restoration, one of the central questions being how to decipher what an environment might have looked like. A second, related issue concerns to what time do the restorers want to get the environment. Lack of historical sources is one key issue regarding such restoration. Few historical sources address the issue, except in passing perhaps. Historians interested in past environments must dig deep, although there is more evidence of what past environments looked like the closer one gets to the present. For environmental questions, however, an excellent source is the narrative of northeastern North America left by the Swedish scientist Pehr (Peter) Kalm. His work contains a wealth of material related to what the Delaware River valley looked like while he was in it, plus he reported much of what it had looked like decades before.

In fall 1748, Kalm arrived in Philadelphia after a long journey from his native Sweden, through England to North America. He spent the next two years in North America, traveling and collecting in the Delaware, Hudson, and St. Lawrence River valleys, and visiting Niagara Falls. He wrote notes and discourses on all aspects of his travels, publishing it in the 1750s, with an English translation appearing in 1770. In his publications about his travels, Kalm referred repeatedly to environmental changes Europeans had made since their arrival a little over a century before. His primary mission was to find trees and shrubs adaptable to his native Sweden, but his insights into the consequences of European intrusion and settlement into those regions form a substantive ethnographical and botanical record of northeastern regions of North America around 1750, a record much broader than his mission would indicate. He discussed what he thought were the reasons for the changes he saw in the analyses he included in *Travels*. He paid specific attention to those regions where Europeans had cleared major portions of the forests as they settled into the valley. His insights into deforestation's effects indicate a shrewd, observant, intelligent mind. He focused on Atlantic white cedar, devoting a number of pages to his analysis of the consequences of widespread clearing of the tree in the freshwater swamps in the Delaware valley.

NORTH AMERICAN FORESTS AND THEIR CULTURAL IMPACT

North American forests totaled about 1 billion acres when Europeans began their invasion of the continent about 1600 (Achenbach 2002; Floyd 2002). Since then, most of those forested acres have been cut over at least once (Achenbach 2002; Floyd 2002). In the United States today, few old growth forests remain, those uncut since European intrusion. Into the early 17th century forests, however, came an increasing number of Europeans who soon began repopulating themselves through natural means rather than immigration. The immigrants from the Chesapeake Bay to New England used the timber they found in a variety of ways. For them, the trees they found were a treat. European period narratives describe species, possible uses, and qualities of trees as the narrators hiked through the forests. While calling the forests wildernesses, they usually commented on the deer-park like quality of

the woods they traversed. Kalm mentions repeatedly in his *Travels* his concerns about what he thought were the wasteful abuses of forests in the Delaware valley (Kalm 1964). By 1600, a large percentage of Europe's forests had been leveled, and used for everything from firewood to building material to charcoal for smelting iron to shipbuilding. For example, with the exception of the King's forests in England, most English forests had been cut. Woodlots and small groves of trees remained, but the forested woodlands of early medieval England were gone by 1600. In colonial North America, the same wasteful practices (cutting without reforestation, etc.) began almost as soon as the English arrived. In Virginia, the very first cargoes sent to England by the first settlers at Jamestown were loads of wood from sassafras and cedar (perhaps Atlantic White) trees.

Eighteenth-century Europeans and Indians both regarded forests as dark and forbidding places. Indians of colonial Pennsylvania used a rite called "At the Woods' Edge" in which travelers, after passing through forests to visit Indian towns, were cleansed of evils they might have acquired on their journeys through the woods. As James H. Merrell reminds his readers in *Into the American Woods*, we still have regard for "the woods' ancient power." We still use words like "bewildered;" someone who is new to something is a "babe in the woods," and someone who is quite ill is "not out of the woods" (Merrell 1999: 23). Forests also had positive meanings for natives. They supplied Delaware River Native-Americans with game, fish, and wild fruits, nuts, vegetables, and roots to supplement the maize, beans, squashes, and pumpkins they cultivated. Forests gave the native peoples shelter and fresh land for planting when their old lands gave out. Delaware River valley natives used the river and its surrounding forests for food, medicines, and raw materials for shelter and warmth.

When Europeans (Swedish and Dutch traders and fur merchants) came into the Delaware valley, they pressured the local natives, the Lenni Lenape or Delaware Indians, to trade lands and furs for European manufactured goods like pots, pans, cloth, beads, bells, and weapons, especially guns, powder, and ammunition. Between 1630 and 1730, Delaware natives bartered extensively with the Swedish, Dutch, Finnish, and English newcomers. By 1730, the English, particularly, had displaced large numbers of the Lenni Lenape and cleared tens of thousands of forested acreage along the Delaware River shorelines. The complexities and demands of trade among the European and Indian peoples dwelling in the area put new pressures on the plants and animals native to that river valley.

PETER KALM, HIS *TRAVELS*, AND ENVIRONMENTAL CHANGE

When Pehr (Peter) Kalm arrived in North America, he was 32. Born March 6, 1716, he died November 16, 1779. He grew up in Ångermannland, Sweden. With his parents, Gabriel and Catherine Ross, a Scotswoman, Kalm had taken refuge there from the Great Northern War (1700-1721). Sweden and Finland were joined at that time. Kalm was well educated in sciences, especially biology. He traveled extensively as a young man, visiting Russia, Sweden, Ukraine, and North America. As a student of Linné's, he was chosen to go to North America to undertake the research into the flora of the continent. Although schooled in the sciences, he was also an ordained Lutheran minister like his father and, while in the Delaware valley, served as pastor in a Swedish-Finnish Lutheran church. In 1750, he married a widow while in North America. When he returned to Sweden, he taught at Åbo Academy until his death in 1779. He wrote numerous articles on his botanical research in North America, had many graduate students, and directed their research along lines he developed from his North American expedition.

When Kalm came to Philadelphia in fall 1748, he brought with him letters of introduction, most notably to Benjamin Franklin, who introduced him around the city. After a brief rest, he began exploring the Delaware River valley, collecting as he went. He noted there were few conifers, mostly deciduous hardwoods forming a canopy under which one could ride even in a carriage. He saw oaks, chestnuts, walnuts, locusts, apples, and hickories. He noted blackberry bushes as he traveled with Peter Cock, born in Karlskrona, Sweden, who had Anglicized his name. Kalm noted farms strung out along the roads and paths he traversed those early days of his visit. He mentioned a few red cedars he saw on a trip to Wilmington, Delaware, but made no mention of Atlantic white cedar (Kalm 1964).

Kalm's biological education had reached its fruition when Karl Linné took an interest in him in the 1730s. Born Carl von Linné in Stenbrohult, Sweden, on May 23, 1707, Linnaeus, as he is generally known, developed a love for plants under his father's tutelage. His father, a Lutheran minister who loved gardening, passed on his love of plants to his son. Called the Father of Taxonomy, he trained many botanists, Kalm included, and sent them on extensive collecting expeditions. He was responsible for the selection of Kalm for the mission to North America.

Kalm's ideas about the environment, and humans' manipulation and change of it, derived more from his biological than theological educations. Although an ordained Lutheran minister, he saw the hand of man more than the hand of God in environmental change. Enhancing his observations and studies of the flora and fauna of the valley was his ability to communicate directly with the older Swedes and Finns who had settled there. Several older Scandinavians had come in the last quarter of the 17th century, thus having lived in the valley for 60, 70, or 80 years. In the *Travels*, Kalm refers repeatedly to his conversations with older settlers, but, unfortunately, he seldom identifies them by name. He wrote down the conversations and used them as additional evidence to go with his own observations. Memories may not be as accurate as written documents, but written sources may be skewed for the purposes for which they were written. In a preliterate or semi-literate culture, however, memories are often much sharper and more accurate than those of a literate culture that relies on written sources.

In November 1748, Kalm noted for the first time the consequences of European assault on the forests of the Delaware valley. He discussed the collapse of the valley's wild game bird population. The disappearance of wild cranes and the near-extinction of turkeys he attributed to a number of factors:

1. clearing so much habitat land along major rivers and their tributaries
2. wholesale killing of hens and fledglings
3. taking eggs in enormous numbers
4. wholesale killing of birds (taking way more than necessary for food or feathers) (Kalm 1964).

Kalm said that a hunter could walk for more than eight hours looking for turkeys and never even spot one, let alone kill one. Eighty years before, he asserted, hunters could fill their larders in a few hours. Consequences for the settlers were dramatic, Kalm asserted. Loss of so many bird populations opened niches for many other species, among them jackdaws (grackles) and other inedible birds who feasted on the corn and other small grains European farmers planted in the newly-cleared fields. Squirrel populations also exploded in number, themselves also feasting on the grains and garden patches settlers created. He predicted that as Europeans continued clearing forest lands, populations of unwanted birds and animals would likewise continue to explode in numbers (*ibid*).

Kalm's work in North America merited his recognition, as far as Linné was concerned. As the great biologist worked his way through the many examples Kalm sent him from North America, he began naming plants for his student. He named one plant genus for Kalm, a genus that contains mountain laurel species. The number of mountain laurel cultivars has grown dramatically since the colonial era. There are at least 42 separate cultivars of mountain laurel attributed to Richard Jaynes, a Connecticut plant breeder, alone (Brand 1997-2001)

For Kalm, the assaults on forests in the Americas led to the too-rapid depletion of wood stocks. The extensive trade network that had grown up between Pennsylvania and the English West Indies (supplemented by smuggling and other forms of illegal trade between Pennsylvanians and French, Dutch, and Spanish West Indian colonies) exploited West Indian woods as part of that trade, especially West Indian mahogany. Kalm affirmed that most West Indian mahogany had been used up by 1750. From the Delaware valley, large quantities of naval stores, especially tar taken from New Jersey pine forests, had left Philadelphia for English and colonial shipyards. Colonists had taken so much tar that "the forests of which [New Jersey] province are consequently more ruined than others" (Kalm 1964).

Another of Kalm's environmental insights related to gray wolves. He thought that laying out farms singly in the Delaware valley, rather than clustering the houses into hamlets and villages, had as much to do with the absence of wolves and other important predators as the deliberate killing of them. He wrote that wolves have migrated "since they encountered houses everywhere, and people fired at them" (Kalm 1964). The constant cutting of new roads further destroyed faunal habitat, Kalm argued. He said that colonial roads were free (few tolls, few brigands), but they were not well cared for. More to the point, however, he called attention to the fact that as more and more roads were built through forests, forests were cut into smaller and smaller segments, a road building consequence still argued today.

Kalm also interviewed prominent figures in Philadelphia. He was particularly interested in discussing with John Bartram, one of the great naturalists of the time, his views on environmental change since the beginnings of European settlement in the valley. In September 1748, Kalm asked Bartram if he thought substantial drying out of the climate had taken place, and Bartram said definitely. He pointed to many pieces of evidence to support his reply. He said water mills built sixty or seventy years before always had plenty of water when constructed. The last few years, he noted, required great rainfalls or heavy snow melts in order for there to be sufficient water for operation. Kalm concluded from Bartram's comments that forest clearing was a primary factor in climate desiccation. He wrote

“the diminution of water in part arises, from the great quantity of land which is now cultivated, and from the extirpation of great forests for that purpose” (Kalm 1964). Kalm did not, however, know about the dramatic change in climate known as the Little Ice Age, a period of cooling in the Northern Hemisphere that lasted from about 1300 until about 1850. That climate change may have played a potent role in the climatic changes occurring in the Delaware valley, but forest destruction was also an important factor (Fagan 2000).

For over 300 years European farmers had used water meadows as a means of getting hay for their winter fodder. Europeans coming to North America brought with them the techniques and methods of farming learned at home. Husbandmen created water meadows by running streams and brooks into fields on which they could grow water grasses suitable for winter fodder. Delaware River valley farmers diverting water sources from their natural stream and river beds into water meadows contributed further to desiccation going on in the valley, Kalm noted. He wrote “summer continues for seven months here. The inhabitants seldom fail to use a brook or stream in this manner (for water meadows), if it is not too far from the meadows” (Kalm 1964). Farmers usually mowed their meadows three times during the summer, Kalm commented, due to the constant supply of water to maintain rapid growth. Confirming his insight were his interviews with older Swedes and Finns who told him that they could remember times when there was much more water, and that there were many more lakes, ponds, brooks, and streams that had dried up in the last several decades. An old Swede, who had anglicized his name to King, reported that there were many ponds and lakes on which he had rowed as a young man, but were now dried up. He stated that many fish died as the bodies of water dried out (Kalm 1964). From all this evidence that he saw and discussed with colonists, Kalm evidently concluded that the forests, which Euro-Americans were so busily clearing, presented many advantages, including holding water in the soil and keeping air humidity up. The desiccation he saw around him, he believed, derived from misuse of the forests and woods. Although native populations made extensive use of woodlands—building their homes, firewood, burning to make “deer parks,” as examples—their impact was minimal on forested regions. They had adapted their lives to their environments, while Euro-Americans wrestled the environment to their specifications.

KALM AND ATLANTIC WHITE CEDAR

If Kalm understood generally what settlers did environmentally, one of his specific examples was Atlantic white cedar (*Chamaecyparis thyoides*). Called in colonial sources white cedar, cedar, juniper (Chesapeake Bay southward), or false cypress, the tree was used heavily. Since it grows best in freshwater swamps, it is not yet known how Euro-Americans found it, but presumably local natives, who made use of the tree for everything from canoes to shingling for their homes, showed the settlers where the tree was. By the time Kalm visited North America, colonists used the tree for the following: fence poles, roof shingles, cooperage (barrels, pails, butter churns, buckets, for example), siding, interior paneling, crates, fencing, boxes, and boat construction. Lightweight, rot-resistant, easily worked, and fragrant, the wood finished well.

There existed a debate between Swedish and English botanists when Kalm came to North America over the proper name of the tree. Swedes believed it was a juniper, calling it white juniper. The English called it white cedar. Kalm, following Swedish tradition, named the tree *Cupressus thyoides*, but later changed to its current name in the 19th century, *Chamaecyparis thyoides* [(L.) B. S. P.] (Kalm 1964). The name debate evidently was important to the intellectual circle that included Kalm when he stayed in Philadelphia.

The City, founded in 1681, was the capital of William Penn’s colony, Pennsylvania. His aggressive promotion of the city and colony in the German Rhineland, England, and Wales lured substantial numbers of European peoples to his colony by 1700. By 1700, the colony’s European population numbered 20,000 and Philadelphia had about 4,000. By 1750, the city was close to being the largest in population in the colonies.

Philadelphia and several other towns in the Delaware valley had used Atlantic white cedar as roofing shingles. Kalm reported that large numbers of public and private buildings had used the roofing since settlement began. So much cedar had been used for roofing and other purposes that “swamps and morasses formerly were full of them, but for the present these trees are for the greatest part cut down and no attempt as yet has been made to plant new ones “ (Kalm 1964). Colonial builders liked the shingles because they were lightweight, decayed less rapidly than any other shingle wood in the area, and were easily riven. They had a life expectancy of about 40-50 years. Use of them lightened roof weights and meant that expensive slates or tiles did not have to be imported from Europe. Kalm

measured bearing walls and found that using white cedar shingles meant builders could halve their thickness. Walls that in Europe would measure 18" thickness of brick were being built 9-10" in thickness due to the lighter roofs.

Although Kalm stated that many roofs in Philadelphia were built using Atlantic white cedar, research has so far found only two buildings that might have AWC shingles (Kalm 1964). One, Stenton, -James Logan's house, has definitely been identified as having AWC; another in the city seems to have them, judging by the appearance of the roof in illustrations. Stenton, built in the 1720s, was the home of Pennsylvania's Secretary, James Logan. Logan was a Welshman who came to the colony at Penn's request. He became one of the most powerful political leaders of the colony, often challenging Penn himself before Penn's death in 1718. Stenton was located just outside the City's original boundaries, but since then has been incorporated into the town limits. A two story brick house built in the Georgian fashion, the house was restored in the 1970s and early 1980s. When the restorers reached the third floor, they found a stash of Atlantic white cedar shingles stored under the floor boards, confirming the use of AWC as roof shingles in its construction. The shingles were still in good shape, though probably not useable for roofing.

One of Kalm's singular contributions to the study of Atlantic white cedar was his use of dendrochronology to obtain an idea of the tree's growth rates and years to maturity. He measured three AWC tree trunks (table 1). From his measurements, he concluded that AWCs needed about 80 years from sprouting to maturity. He wrote that colonials "are not only lessening the number of these trees, but are even extirpating them entirely. People are here (and in many other places) in regard to wood bent only upon their own present advantage, utterly regardless of posterity" (Kalm 1964). He evidently had some fondness for AWC because he devoted much less time to other trees. For no other tree did he do dendrochronology, and for no other tree did he provide such a complete catalogue of its uses.

CONCLUSION

Kalm's insights into Euro-American abuses of Atlantic white cedar echoed his dissension with what he regarded as colonists' generally wasteful uses of forests and wood. Colonials had used so much wood in the Delaware valley since the 17th century that they were scrambling to find new ways of building fences that did not require wood. Kalm's sensibilities reflect his scientific education and training. He wondered in his *Travels* about the effects Euro-Americans were having on the forests and environments of the Delaware valley. He thought that in pursuit of their own self-interest or happiness, they committed many follies. Rampant exploitation of natural resources, consequences of overuse of everything natural like trees, game birds, rivers, streams, and pools led, he thought, to the environmental changes he witnessed and reported.

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Table 1—Kalm's Atlantic white cedar dendrochronology.

Tree Number	Trunk Diameter	Number of Rings
1	18 inches	102
2	17 inches	116
3	24 inches	142