



A Digital Historical Geography of Vienna, Maryland: The Digitization of John Smith's 1612 Map of the Chesapeake Bay and Thomas Ennalls' 1706 Map of "Vienna Towne"

Michael S. Scott, PhD
Eastern Shore Regional GIS Cooperative
Salisbury University
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This report describes the goal, the method, and the results of a digitizing project undertaken in the Summer of 2004 by the staff of the Eastern Shore Regional GIS Cooperative at Salisbury University. The desired result of this project, funded by the Town of Vienna, Maryland, was to scientifically compare the location of the town of Vienna with the mapped depiction of the Nanticoke River and its associated Native American villages as recorded by John Smith in 1612 and to compare Thomas Ennalls' 1706 plat map of "Vienna Towne" with the layout of the current Town of Vienna.

GOAL

One goal of this digitization project was to convert John Smith's 1612 Map of the Chesapeake Bay into a digital file suitable for use in a GIS (Geographic Information System). Once converted, this digital map would be able to be superimposed upon other data layers, such as the current location of coastlines or urban areas, to infer the current-day locations of places Smith observed in the summer of 1608 and 1609. While the focus of our inquiry was the Nanticoke River on the Eastern Shore of Maryland, we took the opportunity to digitize the entire map. Specifically, we digitized the coastlines, the location of Native American villages, and the location of key feature labels.

Similarly, the other goal was to convert Thomas Ennalls' 1706 map sketch of the potential lot and street locations of the newly-created "Vienna Towne." This map, along with the metes and bounds description of one of Maryland's first planned towns, is important to the

history of the town and there is a fair amount of disagreement as to its relationship with today's town layout.

METHOD

The method used for this project was straightforward and followed industry best-practices. A digital image of Smith's map was obtained from the Library of Congress web site (Smith, 1624; shown in Figure 1). The image was imported into ArcGIS 8.3, an industry-leading GIS software package. Once imported, GIS data layers for the coastline, villages, and label points were created and vector features were traced on top of the raster image. With the villages and the label points, a database file was created and attached to the spatial features. This database allows the storage of the name and the type of point.



Figure 1 Nanticoke River as recorded by Capt. John Smith in 1612

Once the vector representation of the spatial features was created, the challenging portion of the project began: the spatial rectification to a real-world coordinate system. While the digital image is a map, with a spatial reference and a scale, by default it is not tied to any particular coordinate system. In other words, the lower left corner of the map has a coordinate of 0,0 and is not tied to any actual real-world locations. Rectification is the process of assigning real-world coordinates to known map locations. This is accomplished by identifying features on the map (river confluences, points of land, etc.) that are the same today as they were in 1608. Then, the coordinates of those points from a georeferenced map of today's coastlines are related to the location from the 1612 map.

Once the points are identified and related, a mathematical formula is applied to the coordinates in order to transform the entire map (rectification). In the case of John Smith's map, the distortion from reality is so severe that a simple transformation would not cause the map to be aligned correctly. A more complex transformation, known as rubber sheeting, needed to be applied. Once the rectification process is finished, the GIS layer may be overlaid with accurate coastline data to compare John Smith's representations with today's reality.

With regard to the Ennalls' map, the process was very similar. However, the raster image of the map was rectified before vectorizing the features. The reason is that with the written discussion of the metes and bounds, we know how large the overall area should be (see Appendix A where 1 perch equals 16.5 feet; 160 perches by 100 perches equals 100 acres) and its general location (oriented in a northeast/southwest direction). Therefore once the raster image was rotated and scaled appropriately, the map was then positioned in relation to the current street network of Vienna. Specifically, the location of the street along the river (in 1706 called Thames Street) and the location of the Chapel of Ease were keys to the placement of the Ennalls' sketch map.

RESULTS

The results of this project can best be described as mixed. Related to the rectification of the Nanticoke River, the 1612 representation was rectified with reasonable success and

demonstrated that the Town of Vienna is very near the location of an important Native American village, Kuskarawaok (see Map 1 & 2). In the first map (Map 1), the case is laid out for the alignment of Smith's representation to the Nanticoke River of today. Note that the bends in the river do not match exactly. We have interpreted Smith's etchings as best we can and Map 1 shows our best educated guess. Then, using the rubber sheeting transformation process in the GIS, we manipulated the 1612 river to match today's coordinates (Map 2). This makes it likely given Smith's writings, that he observed the significant Native American village of Kuskarawaok with a population of somewhat less than 200 people near the present-day location of Vienna, Maryland (Smith, 2003).

We had wished to repeat this rubber sheeting process for the map as a whole. Unfortunately, the distortion is too great for that to be possible. After several tries with different sets of control points and increasing complexity of mathematical formulas (up to a 3rd-order polynomial), we concluded that Smith's map is simply too unlike the current-day coastline to be corrected as a whole. Therefore, we have applied a set of affine transformations (scaling, shifting, and rotating) to place it in the correct scale and in the same general area of the Chesapeake Bay. This will allow the audience to infer the locations of Smith's travels, as the human mind is much better at map interpolation than the computer will ever be.

With the Ennalls' 1706 map, the results seem reasonable but it will be hard to confirm our hypothesis without significantly more research than this project entailed (see Map 3). Given that the size of the area (100 acres) was not in doubt, nor was the general orientation of the map (northeast/southwest), the primary variable not known was the location along the river to begin or end the plat. The best clue, however, was the location of the Publick Lands of Vienna Towne (sic) in the northern-most block of the 1706 town layout. As the placement of churches on a town's public lands was a typical practice in the 1700's, we immediately looked at the location the Chapel of Ease site in north Vienna. Interestingly, if one places the corner of the Chapel of Ease property in the corner of the Publick Lands, the 1706-era Low Street matches up with the river perpendicular section of current-day Middle Street and the 1706-era High Street matches up with the river parallel section of current-day Middle Street. Once this best location was found, we then digitized the parcels in order to create the results (see Map 3). It is important to note

that this is one possible configuration of many possibilities. In order to find the answer conclusively, we would recommend examining the individual property descriptions for the 1700's. That should give a better indication of how the town developed and over what time period, particularly with regard to the eventual layout of the current streets.

CONCLUSIONS

In conclusion, the rectification of John Smith's 1612 map of the Chesapeake Bay proved more difficult than first anticipated. In retrospect, this is not surprising. Taking into account potential measurement error in 400-year old techniques, shoreline change since the 1600's (US Geological Survey, 1998), exaggeration of river courses by Smith to increase navigation clarity, translation errors between Smith and William Hole (the cartographer), and other random errors, it seems incredible that we can recognize our modern world in this map at all. Given that, we are very pleased that for at least the Nanticoke River, we were able to link the past with the present and place the Town of Vienna in its historical context. Similarly, given the lack of recognizable landmarks from Thomas Ennalls' original survey description, we were also pleased that upon rectifying his sketch map to its correct size and orientation, we could find a placement for it that made the most sense. We hope that as Vienna approaches its 300th anniversary, it can use this information to gather even more information about the historical geography of the Town of Vienna.

CONCLUSIONS – REVISITED

Since the publication of this report, a degree of controversy has appeared. It came to our attention that in separate research conducted by Wayne Clark, an archeologist for the Maryland Historical Trust, and others, the route that Smith took on his voyage up the Nanticoke was in dispute. According to Clark (2005), Smith traveled on the main stem of the Nanticoke River only until the confluence with Marshyhope Creek. At this point, Clark contends that Smith left the main branch and continued up the Marshyhope, putting the chief's village of Kuskarawaok halfway between the mouth of the creek and present-day Federalsburg. Part of Clark's logic regarding this deviation from the main branch of the Nanticoke is the passage in Smith's writings

that states “We became such friends [with the Indians] that they would contend who should fetch us water, stay with us for hostage, conduct our men any whither, and give us the best content. (Smith 2003)” From this and other similar passages throughout his journal, Clark and his collaborators deduce that Smith was actually being ferried about (“conduct any whither”) in dugout canoes, rather than in the expedition shallop. Therefore, Smith would not have had control of his route. Clark follows this supposition with research conducted by Helen Rountree which suggests that the Native Americans in this area would have sought out certain types of soils for the placement of their primary village. In the Nanticoke region, there is a predominance of these soils suitable for the location of a “chief’s village” south of Federalsburg, bolstering Clark’s opinion. Therefore, Clark lays out Smith’s geography as represented in Figure 2. He places the town of Vienna near that of the small Indian village of Nantaquack (A) and envisions the entire upper-half of Smith’s river as Marshyhope Creek (confluence at B).

In other time and place, this controversy would have been set aside as a typical minor disagreement between academics and their methods. However, the context for this discussion has changed since we began our work. With the pending 400-year anniversary of the founding of Jamestown in 2007 and the subsequent tributes to his expedition of the Chesapeake Bay in 2008, many different interest groups suddenly have a stake in the outcome of this disagreement. From the National Park Service and its bid to have Smith’s route designated a National Historic Water Trail, to the work of the Sultana Group who seek to sail a replica of Smith’s shallop on the route that he took, to the state of Delaware who would like to claim a small part in early Chesapeake Bay history, to National Geographic who was making a map of the route (they ultimately chose our interpretation), many have a need to know of Smith’s actual travels.

So in an effort to settle the controversy, a group of historians, geographers, naturalists, journalists, and archeologists set out onto the Nanticoke River on June 23, 2005 to experience the river as Smith would have. The goal was to explain the competing theories of Smith’s route in the context of the river itself and see if could gain any further insight by examining the situation close-up. By the end of the day, most of the participants found our argument compelling. As reported by John Page Williams in his article entitled “A John Smith Puzzle on the Nanticoke” in the July 13, 2005 edition of the “Chesapeake Notebook,”

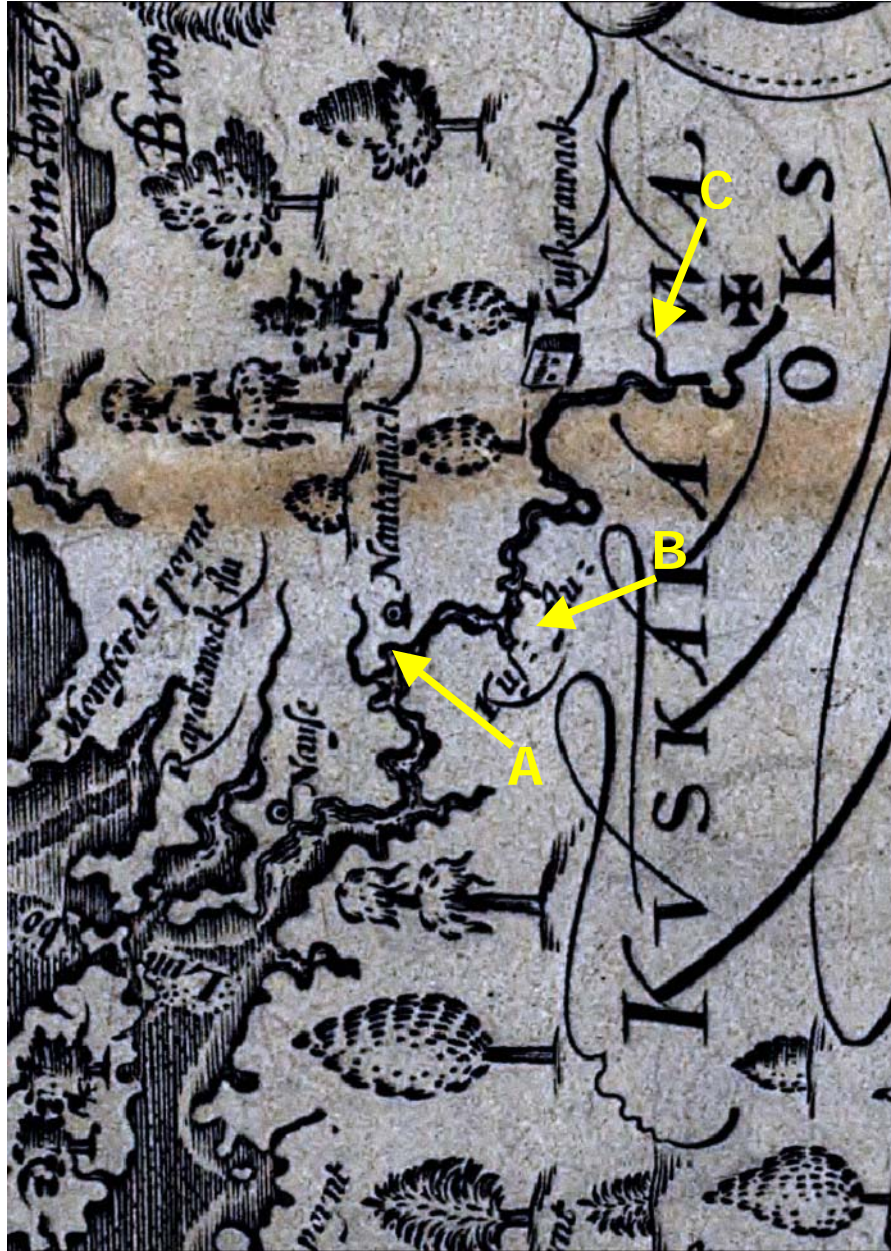


Figure 2. Smith's Nanticoke River interpreted by Clark (2005). (A) represents the location of present-day Vienna. (B) denotes Clark's interpretation of the confluence of the Nanticoke River and Marshyhope Creek, with the northward branch representing Marshyhope Creek. (C) points out a tributary that Clark identifies as a small creek off the Marshyhope.

“By day's end, we had covered well over fifty river miles. Most of us agreed with the GIS evidence, while acknowledging that a certain amount of mystery still surrounded the question because of the archaeological evidence — and lack of it. (Williams 2005)”

Indeed, even Mr. Clark agreed that his theory of Smith's route did not coincide with Smith's map in key areas. First, as one can see from Map 3, if we assume that the small tributary to the north on Smith's map is actually Marshyhope Creek (rather than considerably farther downstream as Clark contends), the straight-line distance between that confluence and the mouth of the river is close to the actual distance on a modern map (28.2 vs. 22.5 miles). If the confluence was actually at Figure 2, Point B as Clark decided, the distance would for both the Nanticoke and the Marshyhope would have been significantly distorted. Second, while there is considerable archeological evidence of Native American activity all along Marshyhope Creek, Smith makes no note of additional village locations. Third, in the location that Clark assigns to the chief's village of Kuskarawaok (just south of Federalsburg), there is a lack of significant archeological evidence suggesting a major Native American presence. Of course, as the results of our research place Kuskarawaok near the current-day known location of the Chicone Creek archeological site, this lends credence to our argument.

The fifth and final set of major inconsistencies in Clark's interpretation are those we consider the most contradictory – what Smith included or omitted from his map. At Point B in Figure 2 where Clark maintains that Smith left the main channel of the Nanticoke and turned up the Marshyhope, one can see a small “nub” of water to the southeast. Clark suggests that this small indentation is Smith's representation of the main stem of the Nanticoke. However, for this to be true, John Smith's compass and navigating skill (that worked until this point in the river) would have to have malfunctioned. The Nanticoke River at the confluence of the Marshyhope runs **northeast** not southeast (see Map 1 or Map 3). Additionally, at this point in the river, one can see up the Nanticoke for about a mile or so. Based on his mapping everywhere else in the Chesapeake Bay, we can reasonably conclude that he would have mapped the extent and general width of that branch of the river that he could see, even if he did not traverse it. These errors in geography continue, if one believes that the upper part of Smith's river is the Marshyhope. Smith's river makes a decided turn to the east; the Marshyhope aims north-northwest. There is no significant tributary on the left side of the Marshyhope (Point C, Figure 2). There are several smaller streams that leads to the creek (Clark contends that the tributary at Point C is one of these) however there are many small streams that empty into the Marshyhope with none bigger than any other. Why would Smith not have mapped more than just one if there was no obvious hierarchy?

Suffice to say, by the end of the day on the water, the evidence presented by both sides tipped the argument considerably to the results of our scientific, mathematically- and geographically-based analysis. It is almost certain, however, that we will never know the truth. The physical evidence is simply too sketchy, Smith's writings were too vague, and his map is of limited (although amazing) precision.

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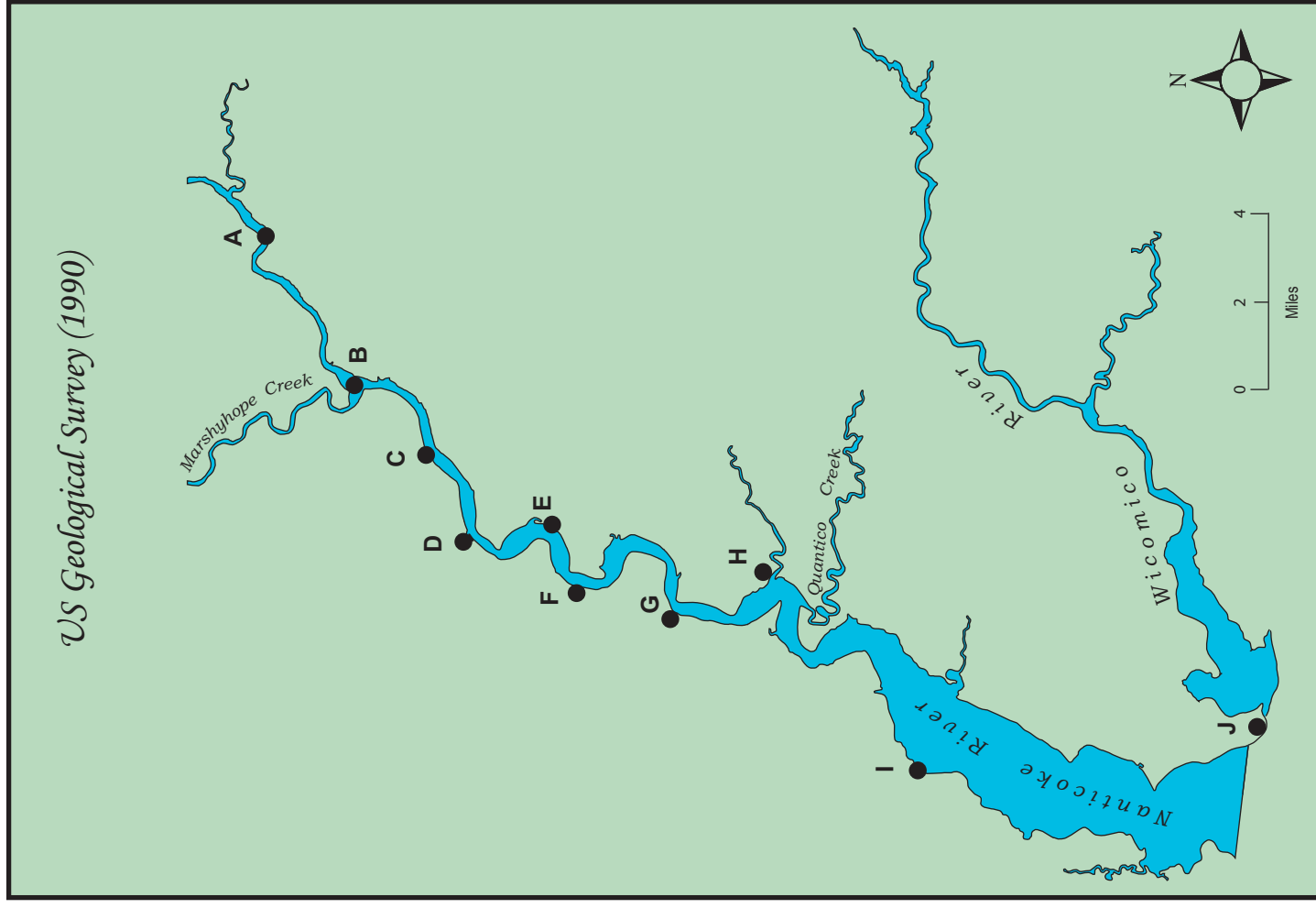
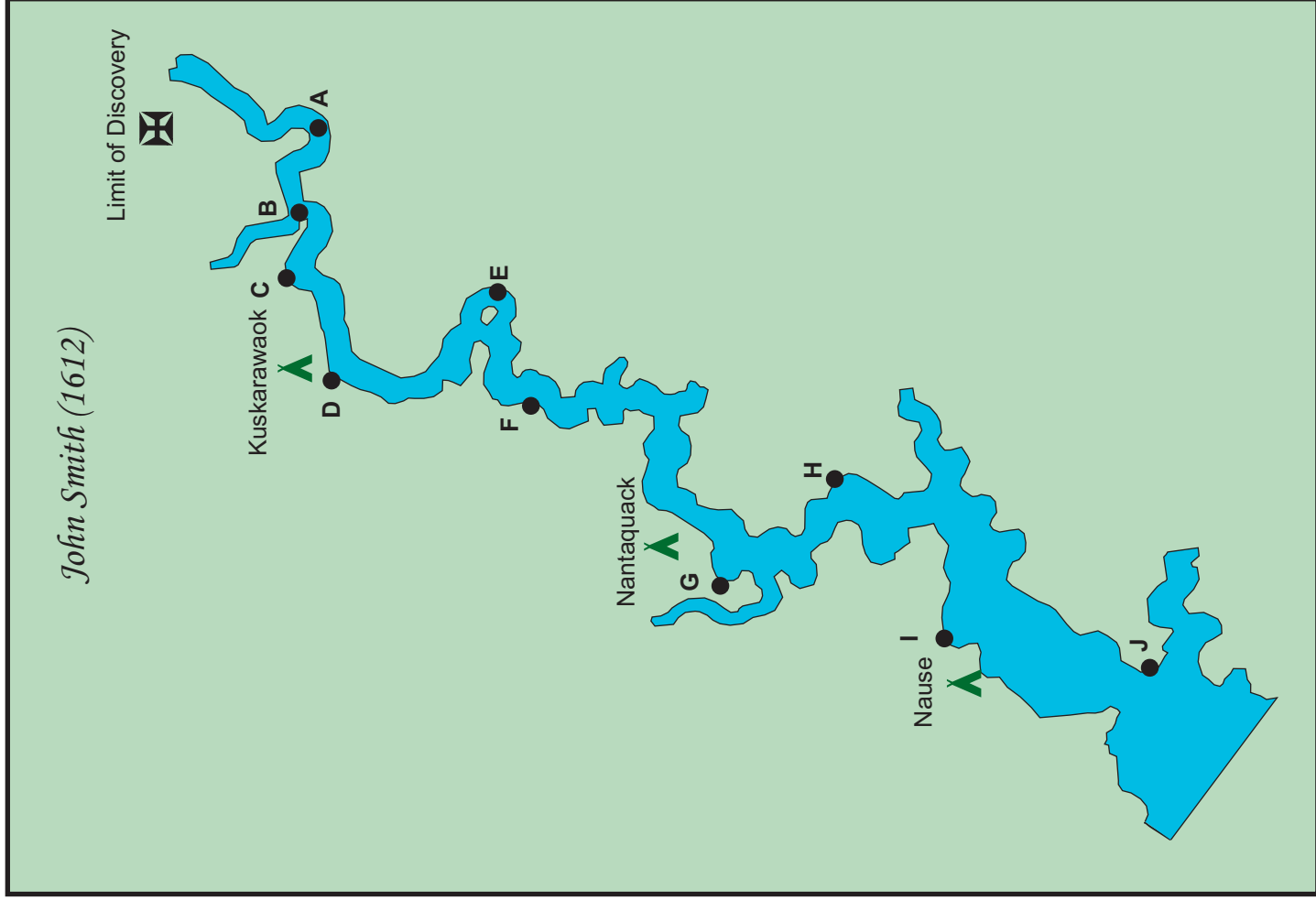
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The Nanticoke River: Historical Representation Vs. Present Day



Proximate Location of Native American Settlements in Relation to Vienna, Maryland

The representations of the river and Native American settlements are from John Smith's 1612 map of the Chesapeake Bay and have been rectified to the present day location. Because of the inaccuracies of John Smith's map, the location of the river is proximate.

