

George Washington's GIS System

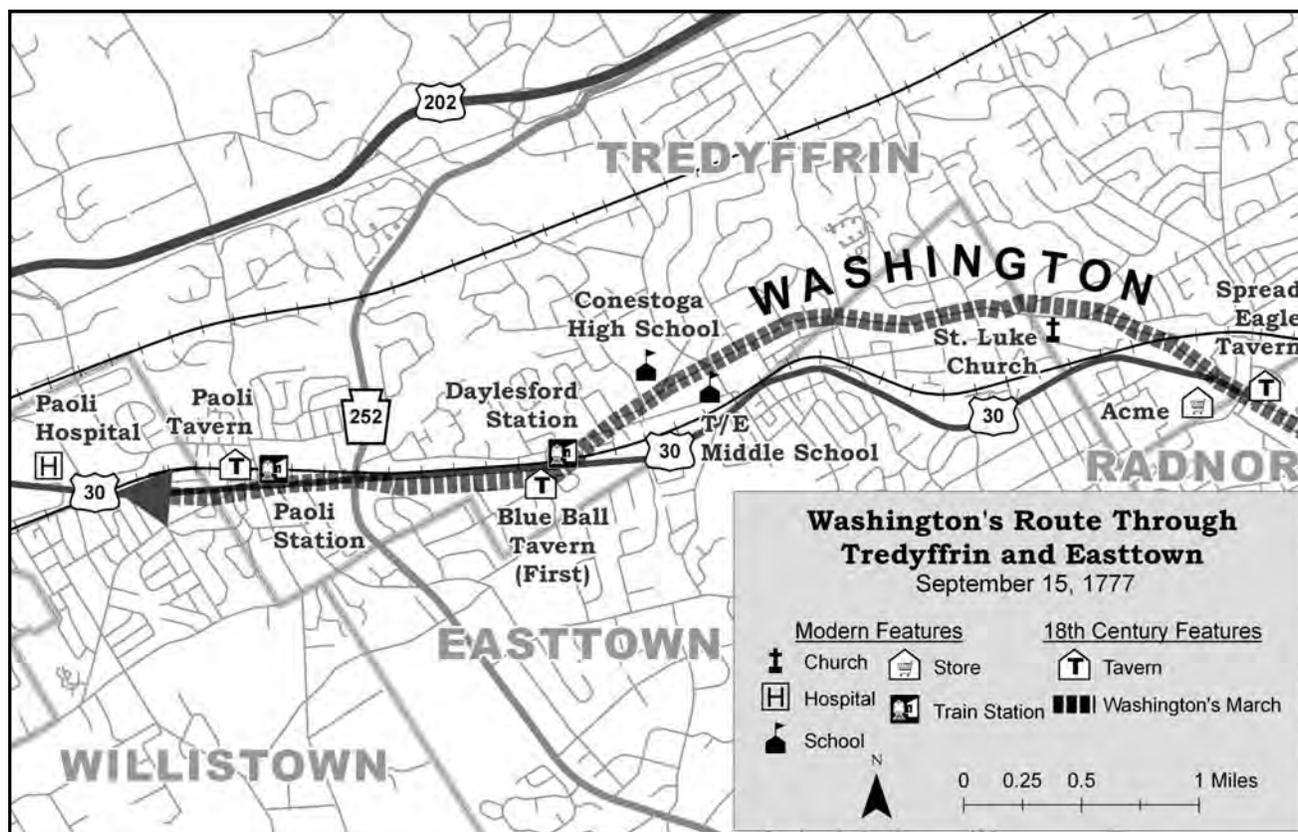
Sean Moir

The September 19, 2012 meeting of the Tredyffrin Easttown Historical Society featured a presentation by Sean Moir titled "A Fortnight in Chester County: The Philadelphia Campaign of 1777." This article provides some background on his use of computerized Geographic Information Systems to relate the troop movements of the Philadelphia Campaign in a context that present-day residents can easily comprehend.

As the mid-day September skies darkened, portending a coming hurricane, George Washington led his army of 10,000 soldiers through Tredyffrin and Easttown on their way from the relative safety of Philadelphia and into the Great Valley, where they planned to take a stand against the invading British army who had driven them out of the Brandywine Valley only four days earlier. Their route was primarily along today's Conestoga Road from the Devon K-Mart, past St. Luke Lutheran Church,

Conestoga High School, the Paoli Train Station, and beyond the Paoli Hospital to their evening's destination in the vicinity of the Chester Valley Golf Club in East Whiteland.

By the time the Continental Army had lined up for battle the next day near Immaculata University, the hurricane had arrived in full force, compelling Washington to withdraw to Yellow Springs and Reading Furnace in search of dry supplies. What we know



today as the Battle of the Clouds never amounted to much, but had nature not intervened, both armies were prepared for a major battle that could have been more bloody than Brandywine, and due to Washington's poor choice of terrain could have ended the American dream of independence, in our backyard.

Discovering the Philadelphia Campaign

Anyone who has researched the Battle of the Clouds knows that good sources are few and details are vague. In fact, the entire Philadelphia Campaign was itself clouded in much mystery until recently. History books have always mentioned the Valley Forge encampment, but usually as an isolated incident. The battles of Brandywine and Germantown are relatively well known, but the details regarding why these battles were fought or how the armies approached the battlefields, and where they went afterwards, were mostly shrouded in fog until 2007, when Thomas McGuire published his two-volume set entitled *The Philadelphia Campaign*.

Mr. McGuire's books describe in detail the movements of both armies over the course of 1777. Using insightful narrative and abounding in first-person accounts, no detail of this campaign is left unexplored. For scholars and avid readers of history, these books reveal a vital, heretofore untold, chapter of American Revolutionary history, providing powerful insight into our struggle for independence. But for those who shy away from multi-volume history books, the story of the Philadelphia Campaign would remain fragmented at best, until 2009, when Chester County started using GIS technology to help tell the story to a wider audience.

What is GIS?

GIS, or Geographic Information Systems, is a field of study that combines geography and database technology to allow the creation of digital maps. Map features such as roads, creeks, houses, or parks are all stored in the database, and can all be graphically displayed on a map.

Whether we know it or not, most of us use GIS maps every day – when we're driving in our car with a GPS Navigation System, when we check the local weather radar map, or when we look anything up on Google Maps. GIS maps are used extensively in business and government too – whether a company is mapping

out its office or retail locations, or a local government is planning a new subdivision.

Historical GIS, or temporal GIS, takes this concept a step further. Most of the GIS maps mentioned so far only deal with the present day landscape, but there's a vast history of landscapes and events that are largely left unmapped in GIS.

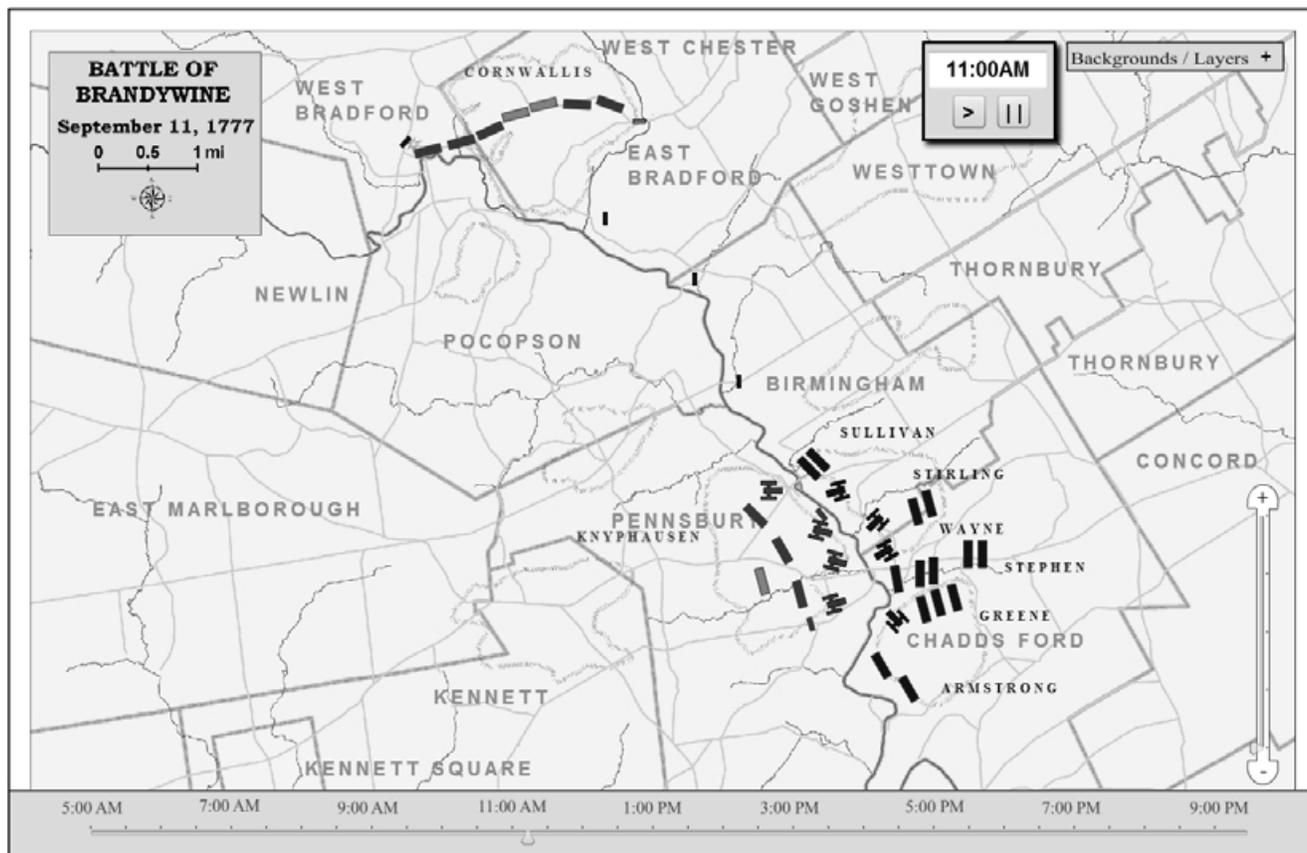
For example, your town might have a main street with a row of houses and shops that appear on modern day maps, but what if you wanted to know what that same street looked like 50 years ago, or 200 years ago? There may be some sketches or hand-drawn maps in the local library that could help, but say you wanted a map that transposed those historic features on a modern map? That's where Historic GIS can help, by providing additional layers that capture time as an attribute. There might be one house, say, that existed from 1720 to 1850, and another that existed from 1720 to present day, and a bunch more that were built in the 1950s. If the data was set up properly, you could create a snapshot map for every year since your town was founded.

As an added bonus, these historic GIS maps can be set against a background with a consistent scale and accurate natural features, such as contour lines and creeks. This is something that many historical maps are severely lacking.

Animated Maps

The animated map is a relatively new tool that builds upon the idea of historical GIS. Imagine taking the snapshot maps that were just mentioned and stringing them together in a time sequence. By doing this you could actually see the growth and development of a town, as features (in this case structures) come and go over the years.

In 2010, I developed such an animated map for the American Swedish Heritage Museum in Philadelphia, that depicts the evolution of the colony of New Sweden along the Delaware River in the 17th Century. This map shows Swedish settlement in relation to Dutch forts and eventually to Quaker meetinghouses, which quickly dominated the cultural landscape. The use of animated maps can also be used to depict historical events, such as a military battle. Once the movement of troops is recorded in GIS, as a sequence



Snapshot of the Brandywine Animated Map showing troop positions at 11 o'clock on the morning of September 11, 1777. All maps and other images are courtesy of the author.

of events or snapshots over several hours, they can be strung together or animated in a way that allows the map user to see the battle unfold.

Over the last few years, I have used this technique to develop a number of animated GIS battle maps for the Philadelphia Campaign of 1777. Not only are these maps animated, but they are also interactive. Users have the ability to turn on and off various layers such as structures, roads, fords, and labels, while also being allowed to switch backgrounds between the 18th century landscape and modern-day features. In some ways these animated maps act as a virtual time machine, allowing travelers a birds-eye view of past landscapes and events.

Illuminating the Philadelphia Campaign

Since 2009, I have been presenting a program throughout the western Philadelphia region – from Germantown to Elkton, MD – that describes the Philadelphia Campaign in detail. This program, which has now been seen by over 2,000 people, establishes the context of the Philadelphia Campaign within the

American Revolution, and uses animated maps and GIS to help graphically tie these events to local sites.

The animated maps used in this program include the Battle of Brandywine, the Battle of Paoli, the overall Philadelphia Campaign, and most recently, the Battle of Germantown (available to the public at the historic Cliveden House). By the end of 2013, this list will also include the Battle of the Clouds in East Goshen and West Whiteland.

In addition to animated maps, this program uses paintings from Pamela Patrick White and Bryant White to help audiences visualize the human aspect of the campaign, as depicted on the opposite page.

The animated maps are also helping local students better understand our region's role in this nation's struggle for independence. Eighth graders from the Tower Hill School in Delaware attended an assembly in 2011 which featured my Philadelphia Campaign presentation. Faculty from the Unionville-Chadds Ford School District also saw the presentation and



Skirmish at Kennett Meeting House by Pamela Patrick White.

have had the Brandywine animated map installed at their site. And in 2012, the Tredyffrin/Easttown School District started using the Brandywine and Paoli animated maps as a supplement to the 7th grade Social Studies curriculum.

The GIS technology has helped these students to see how battles that took place over 200 years ago can be superimposed upon a modern landscape to reveal that their school campuses and their backyards were once part of important military engagements. This local connection, combined with eye-catching animation, has started to grab students' attention and imagination in a way that traditional text books and lectures have never been able to do.

The Robertson Map

In 2009, the Chester County GIS Department started working with the Brandywine Battlefield State Park to update their maps of the battle, based on some new information that was discovered by Malvern Prep professor and author, Thomas McGuire.

While traveling in London, McGuire came across a map of the battle created by a British officer in 1777.

Up until this point, maps of the Battle of Brandywine had been based on first- and second-hand textual accounts of the battle and a number of amateur sketch maps. This new map, in contrast, was drawn by Captain Archibald Robertson of the Royal Engineers, a professional cartographer who witnessed the battle and occupied the field with General Howe's army for the three days following the battle.

The details and accuracy of this map are like no other known map of Brandywine, but after losing the war the British had little need for it, and it was stored in the archives at Windsor Castle until McGuire discovered it. Upon studying the map, and the accompanying text, McGuire found that our understanding of important troop positions at Brandywine, especially in the vicinity of Birmingham Hill, had been wrong.

National Park Service Grants

In order to make this new information available to the public, Chester County and the Brandywine Battlefield applied for a National Park Service grant through the American Battlefield Protection Program (ABPP). In addition to creating a standard map of the battle, Chester County took on the ambitious project,

with the help of McGuire, of creating the first accurate animated and interactive GIS map of a Revolutionary War battle.

The County's GIS Department already had some experience with historical maps when I created a map of General Howe's encampment in Tredyffrin, which was included in my Winter 2008 *Quarterly* article about a British officer buried at St. Peters Church.

The Brandywine project received an award from the Pennsylvania Recreation and Park Society in 2010, and was also recognized by the Chester County Historic Preservation Network. On the heels of this success, in 2011, Chester County applied for a second ABPP grant to map out the Battle of Paoli in northern Chester County.

Another product of both the Brandywine and Paoli grants was a series of Historic Resource Atlases of the municipalities involved in the battles. Once again using GIS technology, these atlases display property boundary data that highlights which properties have obtained National Register status, or any other national, state, or locally historic distinction. Properties that contain structures that existed in 1777 are further highlighted, and troop movements are superimposed upon the entire map. The purpose of these atlases is to help local municipalities and their planners to understand their own historic landscape and see it within the context of the Philadelphia Campaign.

At the end of both grant projects, all the participating municipalities were awarded with their own copy of the atlas. In the summer of 2012, Chester County learned that they have been awarded a third grant from the ABPP, this time to research and map the Battle of the Clouds, which took place between the Brandywine and Paoli engagements.

This grant project will be similar to the previous two, but due to the sparseness of documentation on the battle, there will be a much larger historic research budget.

Interpreting the Philadelphia Campaign

If you've ever been to Boston, you know that that region is steeped in colonial and revolutionary history, much like Philadelphia. The difference is how they market themselves. If you walk into the main Visitors Center in downtown Boston, you are quickly



In November 2011, Chester County presents Tredyffrin Township with their Historic Resource Atlas. The author is at far left.

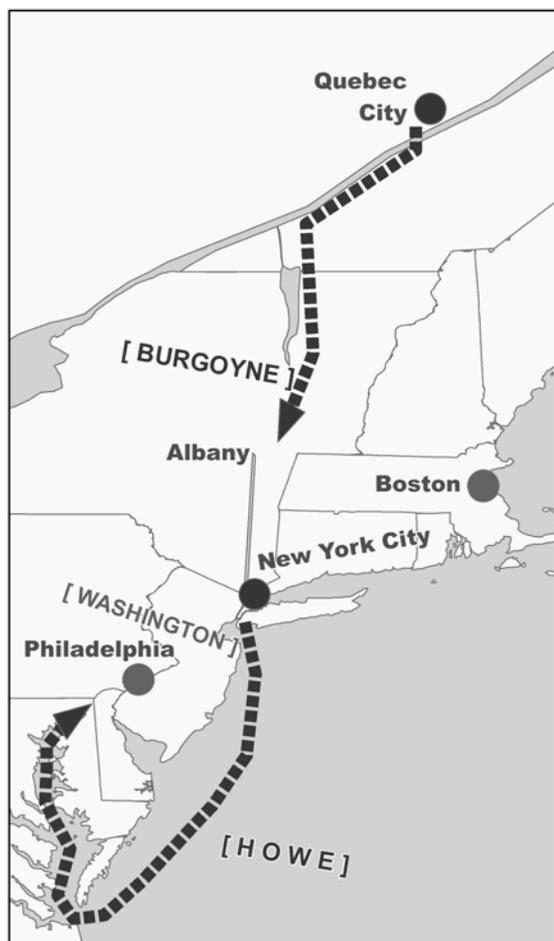
oriented to the myriad historic attractions that surround you: the Boston Tea Party, the Boston Massacre, the Old North Church, Lexington and Concord, Bunker Hill, and much more. Maps and brochures will help you locate these sites and understand how they all fit together.

Somebody touring the Philadelphia region, however, is not so lucky. Certainly there are places to see, such as Independence Hall, the Liberty Bell, Valley Forge, Brandywine Battlefield, and the Paoli Massacre Site. But the visitor does not get an adequate sense of how all these things fit together, or if they even do fit together. It's hard to say why the Philadelphia region has never fully told the story of the battles that occurred here as well as Boston does. Perhaps it's the difference between the Quakers' love of peace versus the Yankee fighting pride and prowess.

Regardless of the reason, one of the goals of all these GIS projects is to help tell the story of the Philadelphia Campaign and how it relates to the founding of our nation. At Valley Forge, General von Steuben may have instilled discipline into the Continental soldiers, but it was arguably the battles and the endless marching that occurred that fall from Elkton to Brandywine to Reading Furnace to Paoli and Germantown that built the army's courage, confidence, and unity. It is certainly not a stretch to say that the Philadelphia Campaign was the crucible where the Continental Army's identity was forged.

The Philadelphia Campaign also had major strategic implications. British officials in London had hoped that General Howe would take his army north to ren-

devious with General Burgoyne, seize control of the Hudson River Valley, and effectively cut New England off from Pennsylvania and the rest of the colonies. However, by focusing his energy on the more glorious and headline-grabbing venture of taking Philadelphia, the colonial capital, Howe left Burgoyne to be defeated at the Battle of Saratoga.



General Howe's glorious folly.

From his diplomatic desk in Paris, Benjamin Franklin immediately recognized the significance of Howe's folly. After receiving the news that Howe had taken Philadelphia, he remarked, "on the contrary, Philadelphia had taken Howe." Indeed, Philadelphia had taken Howe out of the game. Burgoyne's loss at Saratoga is widely recognized as the turning point of the war; it was the deciding factor in cementing America's alliance with the French, who were instrumental in securing Washington's victory four years later at Yorktown.

The Future of the Philadelphia Campaign

The lack of cohesion between the various revolutionary war sites and the shortage of national attention befitting its role in the founding of our nation, points to an opportunity for interpretive improvement in the Philadelphia region. With backing once again from the ABPP, the Chester County Planning Commission is currently working on an interpretive plan for the Brandywine Battlefield area, and there is some hope that further grants will be available for them to expand the scope to the entire County.

This is great news for Chester County, but to complete the picture the surrounding counties and states need to be included. The various interpretive sites including Valley Forge, Brandywine, Paoli, and the soon-to-be-built American Revolution Center, also need to work together to create a coherent story.

Indeed, GIS maps have the proven potential to transform historical interpretation. With much help from the ABPP, the material is out there for the Philadelphia Campaign – now it needs to be marketed to the public.

Sean Moir is a GIS Analyst with Chester County, and also does freelance GIS work. More information and sample work can be found at seanmoir.com.