A large system of canals exists within the Vendee region of western France -- without these canals this area would contain more extensive marshland than currently exists. The flow of several rivers is controlled by this network, most particularly the Autise and the Sevre, that traverse the region as they exit into the Atlantic Ocean, and serves to drain the saltwater from the marshy plains between these rivers. The creation of this canal network in the Middle Ages is generally assigned to the monastic orders of the region during the 13th century. We argue, however, through fieldwork and the concept of relative aging that the canal system was begun in the tenth and eleventh centuries when Maillezais Abbey was first built and in conjunction with its subsequent relocation and rebuilding.

This supposition is supported by several aspects of the design and location of the Abbey, such as the care taken with the design of the western façade overlooking the marshlands, as well as the potential economic benefits of a drainage system in these marshlands. Given the location,
elevation, and historical timing of these factors in relation to other political and social events, it appears that it would have been unlikely that the monastic community at Maillezais would not have participated in the early design and construction of the canal system. In terms of financial gain, it is also unlikely that the monastery would have ceded the authority to build and manage the canals in their vicinity to other political or ecclesiastical powers. It is in this light that the field work undertaken in summer 2013 was designed to allow the research team to substantiate an earlier origination of the canal system, which previously had been presented as a hypothesis. Importantly, this fieldwork also served to validate the details and accuracy of a set of maps drawn between 1690 and 1715 by the French cartographer Claude Masse.4

The primary purpose of this paper is to delineate the research plan and the specific procedures used in its execution during the field season of Summer 2013. Secondarily, this paper will introduce a new layer of analysis that presented itself as part of the field experience: the visual awareness of the importance of elevation within a generally low-lying, marshy gulf.

In June of 2013 our research team, consisting of Dr. Mickey Abel, two art history graduate students and two geography graduate students, traveled to the Vendée region of western France, and Maillezais abbey in particular, to survey the marshy area surrounding the modern Golf d’Aguillion, known in the Middle Ages as the Golfe des Pictons, in order to gather data in support of a building chronology for the extensive hydraulic program still visible today. Our goal was to identify and record whatever medieval portions of the extant system remained visible. In this field program, a hand-held Garmin 78S GPS was used to gather location data for several

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categories including churches, canal ports, windmills, and other structures constructed of stone that had been shaped or cut in the Middle Ages. Documented medieval structures with previously established building phases, most particularly Maillezais abbey itself, were used to establish a template for a chronology of medieval stone. This system of “relative dating” facilitated the identification of those sections of the canal that were constructed during the early Middle Ages consistent with the building phases documented at the abbey.

The data was collected over a period of days, first identifying locations previously dated to the Middle Ages through earlier literature. These sites were each assigned a unique point with the GPS system. When collecting these points, we also noted the type of structure so that the data could be grouped and/or sorted by pre-determined categories. The data was then processed using ArcGIS Desktop 10.1 (ESRI, 2011) with the DNR Garmin application provided by the Department of Natural Resources. This processing transferred the collected data points from the GPS unit to a computer in a file format compatible with the ArcGIS Desktop software.\(^5\)

After processing the data, the points collected at churches and abbeys dating to the Middle Ages were used to geo-reference 17\(^{th}\)-century maps made by Claude Masse. (fig. 1) Geographic referencing uses points of known locations to map the image onto the earth. By geo-referencing the Claude Masse maps, we were able to bring them into the Geographic Information System (G.I.S.) and compare the locations of the features from the map against the point features we had collected as part of our field research. At specific sites within the Vendée, we collected GPS data as we physically traversed a portion of a canal system, such as

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when we followed the three-kilometer route of the aqueduct from the village of Maillé north and east towards Maillezais Abbey. Visual comparison showed that the points the team collected along this aqueduct aligned perfectly with these same features on Claude Masse’s maps, verifying the detail and accuracy of these earliest-known surveyed maps of the region. (fig. 2) This knowledge allowed us to reference other data points in relation to the features illustrated on the Claude Masse maps, filling out a more detailed picture of the canal system within the greater Vendée region.

While collecting data for this project, a question of interest was how the physical location of the various abbeys in the region affected their control over the canals and local communities. As confirmed by traditional topographic maps, the landscape in this area is predominantly flat.
Figure 2: This image shows the locations of the aqueduct and a portion of the canal system overlaying a portion of the geo-referenced Claude Masse map. Photo: authors.

low-lying marshland with scattered islands of limestone standing above the marshland. These limestone islands were the favored sites for two of the three early-medieval Benedictine monasteries: Saint-Pierre-de-Maillezais, Saint-Michel-en-Herm, while Saint-Maixent-de-Luçon was located on the northern coast of the ancient gulf at the medieval mouth of the Sevre Niortaise River. The visual experience of these particular locations, as well as the impressive monastic structures associated with them, suggests that, before the gulf was fully drained as we find it today, these sites would have been the dominant features of the pre-eleventh-century landscape. Based on this observation, we argue that this also would have allowed these sites to serve as “watch towers” over an extended area of the surrounding marshland and well out into the bay. When considered in conjunction with the idea of control, visibility becomes a significant factor--the premise being, if an area was visible from the monastery or if the monastery was
visible from a particular site, then this visibility would increase the likelihood of that site being influenced or controlled by the monastery. In this sense, the visibility factor allows us to imagine the visual relationship between the monastic communities and the general population. Quite literally, the population would look to the monastery as much as the monastery could watch over them.

The technology appropriate for the exploration of this question of visibility is the ArcGIS Desktop Viewshed tool. It facilitates the determination of what portions of the landscape are visible from a particular point of the map. The viewshed tool requires two inputs—a point or set of points and a digital elevation model. Provided these two inputs, the tool will return a dataset called a viewshed, which is similar to a digital photograph where the image is stored as a grid of pixels. The viewshed’s pixels can be either a ‘1’ for ‘visible’ or ‘0’ for ‘not-visible.’ A pixel is assigned the value 1 when that area is visible from the input point(s). The SRTM 90m digital elevation model can be thought of as an image where each pixel’s value is the elevation above sea-level of the land in that pixel.

For this analysis, viewsheds were created for the three early medieval Benedictine monasteries individually, with a fourth viewshed created for the three monasteries together. This work used ArcGIS Desktop 10.0 (ESRI, 2010) and ArcGIS Desktop 10.1 (ESRI, 2011) software with SRTM 90m digital elevation model data and GPS data points for the three Benedictine monasteries collected using a Garmin 78S handheld GPS. To create the viewsheds for the three abbeys, Shuttle radar topographic missions digital elevation data was downloaded from the DEM Explorer (http://ws.csiss.gmu.edu/DEMEplorer/) hosted by the Center for Spatial Information...
Science and Systems at George Mason University (Han et al., 2012). This dataset has an approximately 90-meter resolution at the equator. For this project, it was downloaded in the Universal Transverse Mercator zone 30 projection. The unit for this projection is the meter. This projected coordinate system was selected over a geographic coordinate system so that the horizontal units were the same as the elevation unit provided in the dataset. (fig. 3) The elevation in this area ranges from sea level up to over 100 meters above sea level; the highest elevations are in the northeast as indicated by the darker shading.

The next step in the analysis used the Viewshed tool in the Spatial Analyst toolbox of ArcMap 10.0 to create viewsheds for Saint-Pierre-de-Maillezais, Saint-Michel-en-Herm, and

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Saint-Maixent-Lucon separately and then all together as one large viewshed. ArcMap creates the viewsheds as raster datasets. These rasters were then converted to polygon feature layers which allow finer control over their display. After creating these viewshed polygons, the different data were displayed in a variety of ways to enable a visual comparison of the viewsheds of the three Benedictine monasteries. The viewsheds were displayed separately and together using the SRTM DEM as a background, and again using the geo-referenced map by Claude Masse as a background.

Reviewing the digital elevation model of the area between Maillezais and the Atlantic Ocean shows that the three Benedictine monasteries are located in a generally low-lying area with very gentle relief. (fig. 3) This image also shows the large numbers of streams and rivers that pass through this area as they drain into the ocean. Before the building of some type of drainage system, the water in this low-relief area, especially during high tides, rather than remaining channelized, would spread out and create a large marshland. The drainage system not only drained the land, allowing for increased human occupation and use for pasture or agriculture, it dictated those who controlled the construction and maintenance of navigable water routes connecting the mainland to the ocean. These routes would not be dependent on the tide, nor would they have shifted over time, thus ensuring consistency in that control.

At an elevation of approximately 25 meters above sea level, Saint-Pierre-de-Maillezais was situated on the highest point on the western side of a limestone outcropping, measuring approximately 6 by 10 kilometers. It provided the Abbey with an unimpeded view in all directions and this elevated site made the abbey the dominant feature in the landscape. In earlier works, Mickey Abel, has discussed the importance of Maillezais’ narthex/tower and western
Figure 4: The yellow in the two images above indicate the areas visible from Maillezais Abbey. Photo: authors.
Figure 5: The yellow on the above two images indicates the areas visible from St. Michel En l'Herm. Photo: authors.
Figure 6: The yellow in the above two images shows the areas visible from Lucon. Photo: authors.

Figure 7: The yellow in the two above images shows the areas that are visible from at least one of the three Benedictine monasteries. Photo: authors.
façade in the geo-politics of the region. The evidence of what was, at least, a skeleton structure for the extensive canal system seen in Claude Masse’s map (fig. 1) lends credence to the importance and visual impact of the Abbey’s western façade. An examination of the viewshed for the abbey also suggests that there was a direct line of sight between it and the open ocean. (fig. 4) The viewshed overlaying the Claude Masse map shows that this line of sight followed water routes connecting Maillezais to the Atlantic.

While both Saint-Michel-en-Herm and Saint-Maixent-Lucon had sight lines to the Atlantic Ocean, also acting as guard outposts, it was the orientation of Saint-Pierre-de-Maillezais’s view out to the open gulf that would have facilitated its function as a gate and controlled passage between the ocean and the mainland. (fig. 4) Thus while Maillezais’ viewshed does not appear to have been as extensive as that of Saint-Michel-en-Herm, it was better situated to control access across the region.

The field program of data collection for early Middle Age landmarks and the geographic analysis of these landmarks not only validates the accuracy of Claude Masse’s late seventeenth-century map, it supports the assumption that, the while area of the drainage system provided water routes connecting the ocean to the internal river systems of mainland France and could be seen as acting specifically as water routes, these early canals were meant to drain the land so that it could be converted to farmland and pasture. The field work which facilitated the identification of an early chronology for this hydraulic system with the addition of the viewsheds allowed us to state more definitively that this canal network would have increased both the political and economic power of the people as well as the organizations that controlled its creation and use.

References


