Planning for Heritage Preservation in Western Turkey: a GIS Approach to Archaeotourism and Agricultural Policy

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In the Marmara Lake basin, western Turkey, the burial mounds of Bin Tepe are constantly threatened by looting, development, and agricultural expansion. This study outlines a Geographic Information Systems (GIS) methodology used to plan for a solution to preservation through archaeotourism development and agricultural policy compromise in the region. The components of this study include determining how to best take advantage of the scenic view of the mounds for tourism, projecting the potential future visual impact of growing olive trees, and developing a plan to mitigate this impact with unplanted zones. Fieldwork in 2011 both confirmed and furthered GIS analyses.*

Introduction

The Marmara Lake basin in western Turkey is an archaeological landscape that is populated by 116 monumental earthen mounds that constitute the famous Bin Tepe burial ground. The future of these mounds is currently unclear. A rapidly developing olive oil industry is quickly covering the Bin Tepe landscape with olive orchards, and beginning to obscure the mounds from view in the process. This study aims to aid in the development of a heritage management plan for preservation and sustainable development in the Marmara Lake basin through the use of GIS (Geographic Information Systems). In particular, it will detail research prior to and during the 2011 field season, which entails the use of GIS to plan for archaeotourism development and agricultural policy compromise in the region.

Central Lydia Archaeological Survey (CLAS)

The major goals of the Central Lydia Archaeological Survey (CLAS) are to discover the many past landscapes of Central Lydia, as well as to research preservation initiatives and policies aimed at land management.[1] The study area is approximately 350 km² surrounding the central Marmara Lake, and is located about 100 km inland from the Aegean coast within the Manisa Province. This region includes modern features such as towns, roads, canals, dams, and most importantly for this discussion, countless agricultural fields and orchards (Fig. 1).[2]

Prominent on the archaeological landscape are the 116 burial mounds, or tumuli, that make up the Bin Tepe burial ground. These date to the Iron Age, from the 7th-4th c. B.C.E., when the Lydian kingdom, and
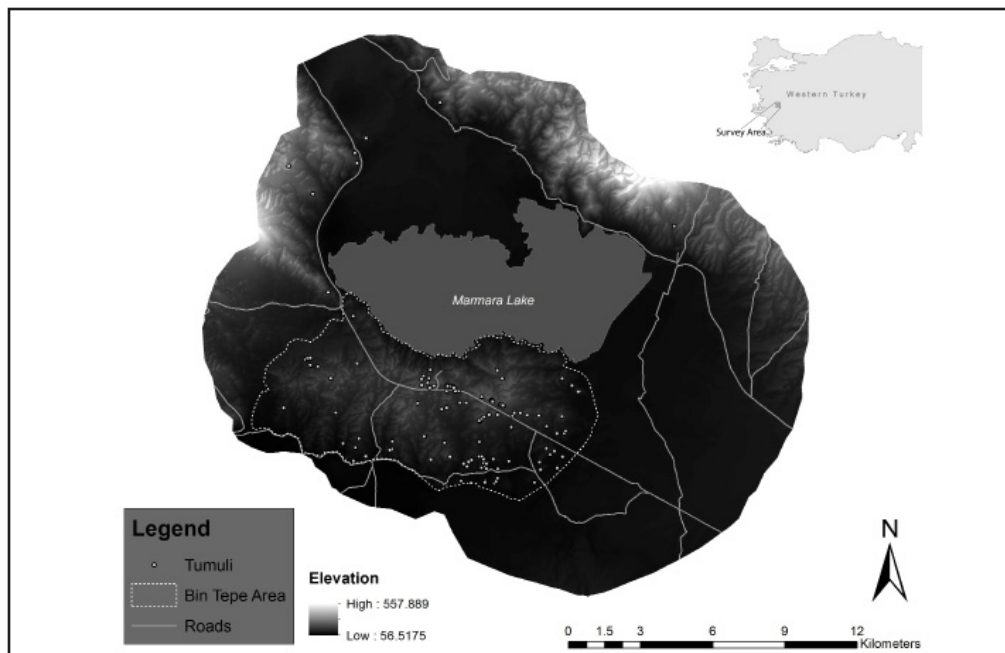

Figure 1: CLAS study area, including tumuli, the extent of Bin Tepe, and major roads; location in western Turkey shown in the inset (map created by C. L. Curtis, data courtesy of the Central Lydia Archaeological Survey).

subsequently the Persian satrapy, reigned over the area.[3] These ancient Lydians and Persians, centered at the famous Sardis site 10 km to the south, buried kings and other high status individuals in tomb chambers with rich grave goods and marked these burials with earthen mounds. The size of the mounds can range up to 70 m in height, with three very large mounds thought to represent the burials of the most important Lydian kings. But, most mounds are more modestly sized, ranging between 10 and 40 m in height.[4] The tumuli are still a dominant presence in the landscape today.

Preservation Challenges

This important archaeological heritage is constantly under threat from looting, modern development, and agricultural expansion. Over 95% of tumuli in the survey area have already been looted, and new looting often yields frustration and further destruction rather than new treasures to sell.[5] Construction projects continually challenge the preservation of the mounds and the ecological landscape. Agricultural expansion, the focus of this study, is encroaching upon sites, damaging them both physically and aesthetically. In particular, a rapidly developing olive oil industry in the region is becoming a major means of income for many, and is quickly populating the landscape with olive orchards.[6] A lack of communication and collaboration between the various stakeholders in the region has thus often led to archaeological destruction.

Heritage Management Goals

A primary goal of the CLAS project is to manage these threats to preservation, especially through the development of a heritage management plan.[7] The major perspective of this plan is to seek collaborative solutions to heritage preservation by working together with local farmers, nearby village and urban communities, as well as regional and national governmental bodies.[8] One aspect of this plan is to encourage sustainable tourism based on the idyllic Bin Tepe landscape and its impressive mounds. Sustainable archaeotourism aims to have little to no negative impact on archaeological sites,[9] and a model such as this one could provide an influx of income into the region, as well as potential funding to support preservation initiatives. Therefore, it is hoped that all stakeholders will benefit by preserving the Bin Tepe mounds through sustainable tourism.[10]

Approaching Tourism and Agriculture with GIS

The expansion of olive orchards--as opposed to a previously diverse mosaic of much shorter field crops--will begin to block the view of the Bin Tepe mounds, and thus compromise a major touristic resource.[11] GIS can be extremely useful in mapping threats and creating a plan to manage sites in their spatial context. Thus, a GIS model was developed to determine how to best take advantage of the scenic view of the mounds for tourism, to project the potential future visual impact of growing olive trees, and to develop a plan to mitigate this impact with tree-free buffer zones. The quantitative and visual results of this model will be helpful in improving the dialogue between archaeologists, local communities, and regional authorities, and will hopefully foster progressive, forward-thinking policies that support preservation.

The spatial analysis presented in this paper had three major goals. The first was to find a potential location in Lydia to become a stopover for tourists along the highway that provided the best view of the mounds. The second was to project and quantify how the view of the mounds from this point would be obstructed as trees continued to grow. The last goal was to delineate buffer zones around mounds that allow for the
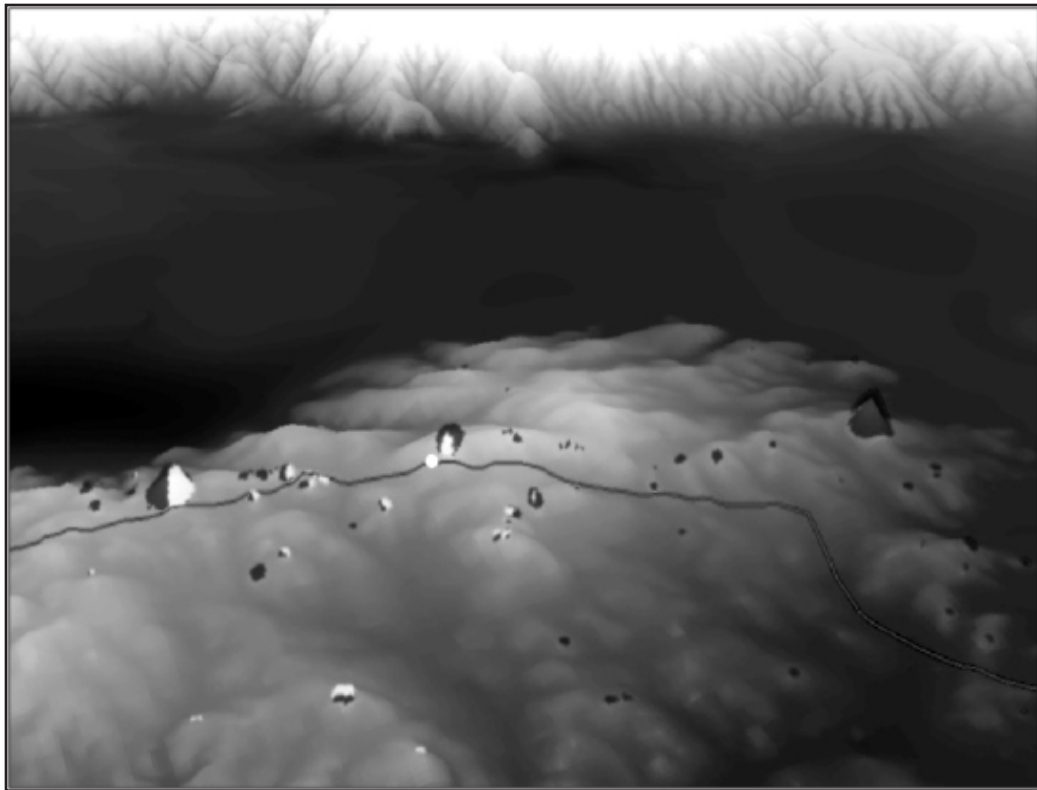
Figure 2: A 3-D visibility model of burial mounds along the highway (grey line) in the Bin Tepe region south of the lake. The white point is the chosen location for a viewing platform based on visibility analysis. The white areas of mounds represents the portions that can be seen from that point, while the black areas cannot be seen (model created by C. L. Curtis, data courtesy of the Central Lydia Archaeological Survey).

view of the mounds to be maintained by establishing a limit to orchard expansion. In order to accomplish these goals, spatial analysis was used to project the visibility of mounds in a landscape with no olive trees, trees at their current height, trees at their future height, and trees planted only at a certain distance from mounds.

Locating the View

The Salihli-Golmarmara highway is a major thoroughfare through the Bin Tepe region and is frequented by visitors coming from Istanbul and Pergamon on their way to destinations farther east.[12] It is also one of the main routes of people travelling to the famous Sardis site to the south, by way of the nearby city of Salihli to the east. It is hoped that Bin Tepe can tap into the existing Sardis tourist market.[13] A quick stop on the highway would be an ideal way to begin developing tourist appreciation for the Bin Tepe landscape.

In order to plan for this tourist stop, the ideal location for a viewing platform along the highway was determined using visibility analysis in GIS.[14] Viewshed or visibility analysis is a function of GIS that projects what can and cannot be seen from a location or set of locations while

Tree Height (m)	3	5	10	15
Visibility Reduction	24%	36%	56%	70%

Table 1: The visibility of mounds with various heights of olive tree populating the landscape. Percent indicates reduction in visibility of mounds as compared to visibility of mounds in a landscape with no trees (derived by C. L. Curtis from Central Lydia Archaeological Survey data).
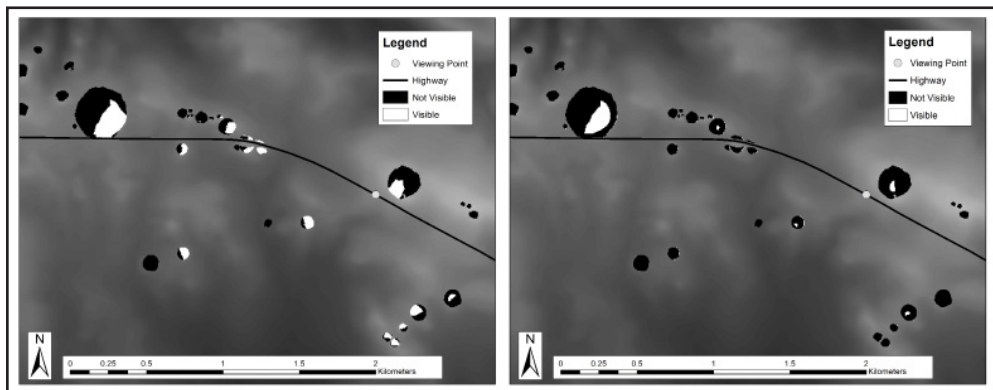

Figure 3: Area of mounds visible from chosen viewing point in a landscape with no trees (left) versus 15-meter trees populating the whole landscape (right) (maps created by C. L. Curtis, data courtesy of the Central Lydia Archaeological Survey)

considering obstructions of the local terrain to an observer's line of sight.[15] The rolling topography of the Bin Tepe ridge prevents a very wide and clear view of all mounds from any spot on the highway. For example, the three largest and most prominent mounds--often associated with the major Lydian kings Alyattes, Gyges, and Ardys--cannot be seen at the same time from any one location on the highway. Though it would have been preferred to incorporate views of these three major monuments from the prospective viewing point, the rolling landscape made this impossible, though the fieldwork described below details how the chosen viewpoint mediates this difficulty. Subsequently, the best viewing point was chosen on the basis of the widest visible area that contained the most mounds in view, as determined by the overlap between the visible areas in the viewshed layer and tumulus points. This point was also chosen with consideration of the nearby bus stop and village, for ease of access and amenities for tourists, respectively. Viewshed analysis was completed again using this observer point, and a 3-D model illustrating the areas of the mounds visible from the chosen viewing spot can be seen in Figure 2.[16]

Projecting Olive Tree Growth

Next, a model was created in order to estimate how olive trees will block the view of the mounds as they grow. Though GIS scholars are working on the problem, there is currently no simple way to incorporate vegetation into viewshed models.17 One contribution of this project is in creating a simple methodology that other archaeologists and heritage managers with basic GIS experience could use in order to determine how the view of archaeological sites might be affected by growing vegetation.

Tree Height (m)	Buffer Extent (m)			
	5	10	20	50
3	18%	12%	2%	2%
5	31%	25%	16%	5%
10	55%	51%	41%	21%
15	69%	67%	62%	42%

Table 2: The visibility of mounds with various tree heights and extents of buffer zones around mounds. Percent indicates reduction in visibility of mounds as compared to visibility of mounds in a landscape with no olive trees (derived by C. L. Curtis, data courtesy of the Central Lydia Archaeological Survey).

In this analysis, trees are modeled as if they were a solid extension of the topography in all areas except on the mounds themselves.[18] Though olive trees are certainly not the only crop in the area,[19] this model predicts a worst-case scenario in which olives populate the whole landscape to demonstrate the effect that unabated olive expansion could have.

The trees in Bin Tepe are mostly very young, having been planted only recently with the upswing in olive oil production, and most orchards are thus currently at a height of approximately 1-3 m. The maximum height of olive trees was estimated at 15 m,[20] and the progression from current to future height was modeled with scenarios of 3, 5, 10, and 15 m trees rising above the ground surface. The results demonstrated that if trees populated the whole region with no buffer zones around mounds, the visibility of the mounds would decrease substantially as trees grow.[21] For example, a landscape of 15 m trees would reduce visibility of the mounds from the chosen viewing point by 70% as compared to a landscape with no trees (Fig. 3, Table 1).

Delineating Treeless Buffer Zones

For the purpose of directing future agricultural compromise, it was projected how not planting trees in certain areas around mounds—or creating treeless

buffer zones—would limit the blocking of the mound view. Treeless buffers were delineated arbitrarily at 5, 10, 20, and 50 m extents. These values were chosen to test which buffer distance allows for the most visibility of the mound with the various scenarios of tree heights populating the landscape. Results show that there is a clear relationship between wider buffer zones and greater visibility, with wider zones being necessary to afford mound visibility with higher trees (Table 2). Without knowing the exact maximum tree height in Bin Tepe, it was necessary to complete more work to determine which buffer might be ideal.

Approaching Tourism and Agriculture in the Field

It is clear that GIS was extremely useful in addressing the goals of determining an ideal viewing point, assessing the impact of tree growth on that view, and evaluating possible mitigation of the blockage by tree expansion with buffer zones. However, to check the accuracy of the GIS analysis and further address these three points, it was necessary to complete fieldwork on the ground. The goals of this work were firstly to ground truth the viewing point determined by GIS and observe the actual view to determine its value as a tourist attraction. A second goal was to assess the changes in olive trees on the ground since

Figure 4: A view from the ideal viewing platform location (photo by C. L. Curtis, courtesy of the Central Lydia Archaeological Survey).

the CLAS 2005 survey of Bin Tepe. A final hope was to try to determine the ideal and feasible buffer zone to allow for a full view of the mounds.

Ground Truthing the View

The point determined by GIS was found to be a promising location for a tourist-viewing platform of the burial mound landscape (Fig. 4). It is located at the base of one of the three "royal" mounds. In addition to the magnificent view, there is already an earthen platform remaining from the Sardis Exploration excavations of the mound in the 1960s, as well as a dirt road leading up to it. These assets represent potential opportunities for touristic development. The existing earthen platform would require only modest adjustments for touristic viewing use, and information panels and maps could direct visitors to nearby villages and other attractions in the Bin Tepe area, such as Marmara Lake.

For the more adventurous tourist, the top of the mound provides panoramic views including the patchwork agricultural landscape, Marmara Lake, many tumuli, and the famous Alyattes tumulus to the east, obscured from view below due to a rise in elevation of the Bin Tepe ridge. Though one of the large "royal" mounds is visible to the west, the largest, famous Alyattes tumulus to the east is obscured from view at ground level due to a rise in elevation of the Bin Tepe ridge. However, it becomes visible about halfway up the side of the mound, and is a prominent feature of the viewscape from the top of the mound. This viewpoint location thus allows for the direct physical experience of one of the three major 'royal' mounds, as well as potential visual experiences of the other two, thus reconciling the problem of the view-obscuring terrain discussed above.

A stairway could be constructed up the side of the steep mound to allow for easier access, as well as to prevent erosion

Figure 5: Comparison of olive tree growth near--and on--a tumulus in 2005 (left; courtesy of the Central Lydia Archaeological Survey) and 2011 (right; C. L, Curtis, courtesy of the Central Lydia Archaeological Survey).

Figure 6: Comparison of olive tree growth and expansion near a tumulus in 2005 (left; courtesy of the Central Lydia Archaeological Survey) and 2011 (right; C. L. Curtis, courtesy of the Central Lydia Archaeological Survey).

due to tourist foot traffic. The northwest side of the mound, facing Alyattes, has already been deeply trenched, and the new construction could utilize this area of existing damage to avoid compromising the integrity of the mound profile. Another platform structure could be constructed part of the way up the mound, perhaps when Alyattes becomes visible, to allow for visitor traffic control, an information panel, and benches for a brief rest for those who need it. A specialist in sustainable construction and conservation would have to be enlisted to ensure that construction was exacted in a manner that did not damage the mound,[22] and also preserved its

visual impact as much as possible. Benches and another panel could also be placed at the top of the mound to provide further information to visitors.

Monitoring Tree Growth

Next, the second aspect of the project, monitoring the growth of olive trees over time, was appraised in the field. An archive of photos from the 2005 Bin Tepe survey was scoured for those that pictured olive trees near mounds. If olive trees were already apparent in 2005, their growth and expansion could be compared in 2011. Several pictures from 2005 clearly

documented olives, and a sample of these mounds were visited in 2011. Attempts to recreate the view of the initial photo allows for ease of comparison between 2005 and 2011, and it is clear that the olive orchards have grown drastically in only a few short years (Fig. 5 & 6).

Delineating Buffer Zones

Finally, the last aspect of the GIS analysis was buffer zone delineation. The 15 m maximum tree height determined prior to fieldwork was generic and not region specific, and so the buffer problem could begin to be truly assessed only by determining the expected maximum height for the olive trees in the region by finding the tallest tree currently standing there. The goal was to ascertain which projected buffer zone scenario determined by spatial analysis (Table 2) is appropriate

by finding the maximum tree height in the region. When villagers were asked about the oldest and tallest trees, they directed us to a small cluster of those from the Greek occupation, said to be 70-90 years old, which measured 6-7 m in height. However, they also said that most trees are pruned and kept to a height of 4-5 m for ease of access to the fruit. So, it seems that a 20 m buffer around mounds would be sufficient in maintaining their scenic value, as the GIS model projects only a 16% blockage with 5 m trees (Table 2).

Moreover, another study determined that depth of archaeological evidence in relation to tree roots further supports this buffer delineation, as most tree roots extend to 1.0-1.5 m below the surface, where archaeological remains are commonly buried.[23] Therefore, Crow and Moffat assert that "on most known sites of archaeological
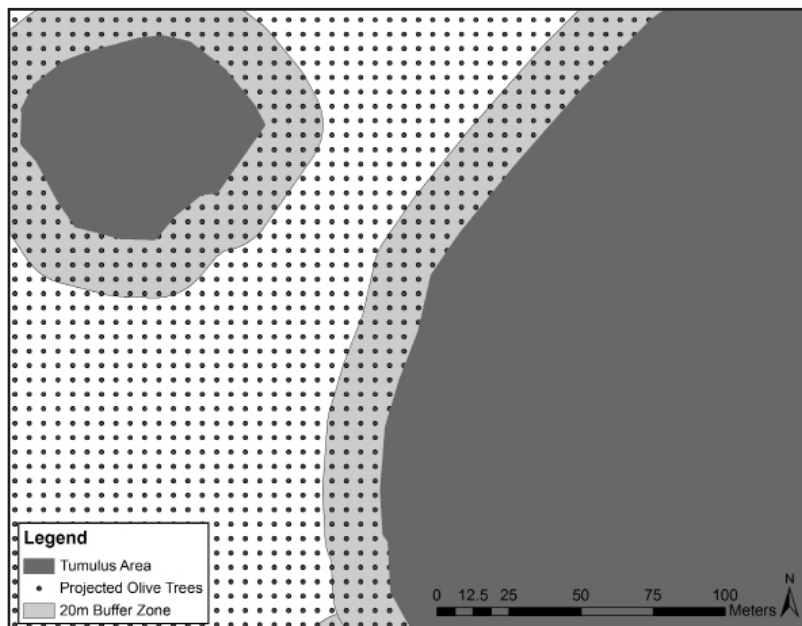

Figure 7: Zoomed in illustration of 5-meter-spaced olive trees across the whole landscape with the exception of tumulus areas. The number of olive tree points intersecting with the 20-meter buffer zones of all tumuli is 23,620 (map created by C. L. Curtis, data courtesy of the Central Lydia Archaeological Survey).

importance, new tree planting is not recommended and a buffer of at least 20 m should be allowed around the site before trees can be planted on adjacent land."[24] Thus, the buffer zone most appropriate for preserving mound visibility is also most appropriate for protecting potential buried remains.

Follow-up Spatial Analysis

These field findings motivated a follow-up spatial analysis based on the potential implementation of the newly determined 20 m buffer zone. What would the effect on local farmers be if this buffer zone policy were implemented around all tumuli in Bin Tepe? This new analysis modeled olive trees as points spaced at regular 5 m intervals across the entire landscape. This spacing interval was determined in the field and supported by an olive tree study of a neighboring region.[25] Moreover, this follow-up analysis is consistent with the initial spatial analyses, which modeled a landscape completely covered in olive trees. A new layer was created representing only the 20 m tree-free buffer zone "rings" around tumuli, and the intersection of these 20 m buffer zones and the 5 m spaced olive tree points was calculated (Fig. 7). The results of this analysis indicate that in a landscape totally covered by olive trees, some 23,620 trees might have to be removed if this policy were to be implemented.

The value per mature olive tree per year can be estimated at about $7,[26] which results in an estimated $163,340 reduction in local Marmara Lake basin profits per year.[27] This is likely an oversimplified estimation, as olive trees are not currently the only crops surrounding mounds, and thus not all buffer zones would require crop removal. It is clear, however, that considerations must be made for how to sustain the livelihood of local farmers while preserving heritage. One solution is to compromise by instituting the buffer

zone only near mounds that do not yet have olive trees nearby, thus preventing further expansion of view blockage while maintaining existing olive income. Another potential avenue to explore is a compromise between farmers and the government, with land grants provided to those who do not cultivate or cultivate less obtrusive plants in the buffer zones around mounds.[28]

In addition, potential tourism income can be considered. Though local figures are not currently available at the fine scale of the Marmara Lake basin, figures for the larger Manisa province in which it resides are instructive. In Manisa province in 2007, olive profit was $30.8 million, while profit from tourism in the same year was approximately $179.7 million.[29] Therefore, if tourism is as successful and profitable in the Marmara Lake basin as it has been in Manisa province overall, it could potentially make up for the profit reduction associated with olive tree exclusion in buffer zones, as well as increase local income exponentially.

Conclusions

The analyses presented here demonstrate how important it is to engage in heritage management planning within an explicitly spatial context. GIS was utilized to aid in planning both for tourism development and for agricultural policy aimed at heritage preservation in the Marmara Lake basin. The visual and analytical power of these results will be instrumental in striving for a collaborative solution with locals.

Endnotes:

1 Roosevelt 2007; Roosevelt and Luke 2008a, 2009, 2010, forthcoming; Curtis and Sneeringer 2009; Luke 2010a, 2010b, 2011a, 2011b.
2 Kersel et al. 2008.
3 Roosevelt 2009.
4 Roosevelt and Luke 2006, 186.
5 Roosevelt and Luke 2006, 192; Roosevelt and Luke 2008, 181.
6 Luke 2010b, 395.
7 Central Lydia Archaeological Survey 2011; Luke 2011a, 2011b.
8 Luke 2010b, 401; Central Lydia Archaeological Survey 2011.
9 Boers and Cottrell 2007.
10 Luke 2010b, 401.
11 Though there are certainly buried archaeological sites between the tumuli that are being damaged by agriculture (Luke, personal communication, 2012), the visual presence of the tumuli provide a much more accessible resource for tourists, and are thus the focus of this analysis.
12 Luke, personal communication, 2012.
13 Currently, most tourists are interested in the early Christian and Jewish heritage at Sardis, and a new tourist facility focused on the Lydian-period burial mound landscape would bring new attention to this crucial chapter in the Marmara Lake basin's past (Luke, personal communication, 2012).
14 ArcGIS 9.3.1 was utilized for all analyses. Please contact the author with any questions or further details regarding exact GIS analysis procedures.
15 Shellito et al. 2004, 170.
16 Viewshed analysis was first exacted using all points of the highway shapefile as observer points, and subsequently executed again using the chosen viewing point as the observer point. The shapefile of the area of the mounds was used to clip the viewshed results to create the ArcScene 3-D image, in which only the areas of the tumuli are highlighted so that the proportion of the mound area that is visible and not visible is readily discernible.
 (Figure 2).
17 Dean 1997, Llobera 2007.
18 For each potential tree height, a raster was created with all cells given the value of that particular tree height. This raster was added to the base digital elevation model (DEM) raster to model the increase in elevation of the growing trees by creating an entirely new DEM. All mound areas were erased prior to conversion to raster format, and therefore, the model shows that trees are growing everywhere except the areas of the mounds themselves.
19 Common low-height crops are wheat, tomatoes, tobacco, and grapes. Aside from olives, other orchard crops include peaches, cherries, figs, and almonds, though these crops are not experiencing expansion

to the same extent as olives (Luke, personal communication, 2012).

20 California Rare Fruit Growers, Inc. 1997.

21 Visibility analysis was exacted on each of the vegetation-inclusive DEMs from the chosen viewing point. The resulting vegetation raster was clipped with a buffer polygon shapefile for each buffer scenario. The number of raster cells visible was then compared to the number of cells visible in the initial visibility analysis from the ideal viewing point (Fig. 2) to estimate the percent decrease in visibility from a landscape with no trees to a landscape populated by trees of various heights.

22 For comparison, see Brú 2002: 46.

23 Crow and Moffat 2005, 108.

24 Crow and Moffat 2005, 108.

25 Engindeniz et al 2010, 616.

26 Engindeniz et al 2010, 616.

27 $7 is the value is for a mature tree, after the establishment period of approximately ten years. An olive tree must grow for six years before becoming productive, and only reaches its full yield potential at ten years of age. It can be expected to provide this yield for about 86 subsequent years before declining (Engindeniz 2010: 618). Therefore, any trees less than six years old represent an investment by farmers that has not provided any of its potential yield as of yet, and this will require additional consideration in terms of compensation for profit loss (Luke, personal communication, 2012).

28 For example, see a similar model that has been successful in the Stone Henge landscape (Young et al. 2008, 58).

29 Engindeniz 2010, 616; Central Lydia Archaeological Survey 2011; Today's Zaman 2011. Detailed tourism figures are not yet available for Manisa province past 2007, but it is clear that agricultural income is rising rapidly. Updated figures may sway the balance between the value of olives versus tourism (Luke, personal communication, 2012).

Works Cited:

Boers, B., and S. Cottrell. 2007. "Sustainable Tourism Infrastructure Planning: A GIS Supported Approach." Tourism Geographies: An International Journal of Tourism   Space, Place and Environment 9 (1): 1-21.

Brú na Boinne World Heritage Site Management Plan. 2002. Dublin: Department of Community, Rural and Gaeltacht Affairs.

California Rare Fruit Growers, Inc. 1997. "Olive." http://www.crfg.org/pubs/ff/olive.html (23 March 2011).

Central Lydia Archaeological Survey. 2011. Management Plan for the Gygaean Lake Basin, central Lydia western Turkey. Unpublished manuscript.

Crow, P., and A. J. Moffat. 2005. "The management of the archaeological resource in UK wooded landscapes: An environmental perspective." Conservation and Management of Archaeological Sites 7: 103-16.

Curtis, C., and M. N. Sneeringer. 2009. "Technology and Archaeology: Exploring Landscapes in Western Turkey." Poster presented for the 2009 Colloquium of Undergraduate Research Opportunities Program Projects, April 11, Boston.

Dean, D.J., 1997. "Improving the accuracy of forest viewsheds using triangulated networks and the visual permeability method." Canadian Journal of Forest Research, 27: 969–77.

Engindeniz, S., M. Yercan, and H. Adanacioglu. 2010. "The Valuation of Olive (Olea Europa L.) Orchards: A Case Study for Turkey." Bulgarian Journal of Agricultural Science 16 (5):615-21.

Kersel, M. M., C. Luke, and C. H. Roosevelt. 2008. "Valuing the Past: Perceptions of Archaeological Practice in Lydia and the Levant." Journal of Social Archaeology 8(3):298–319.

Llobera, M. 2007. "Modeling visibility through vegetation." International Journal of Geographical Information Science 21(7):799-810.

Luke, C. 2011a. "The Challenges of Going Green in western Turkey: Natural and Cultural Heritage Practices and Policies in the Gygaean (Marmara) Lake Basin of central Lydia." Paper read at the Cultural Heritage Center and the University Museum, 29 September, University of Pennsylvania.

----------. 2011b. "Partnering with the Community at Bin Tepe, western Turkey." Paper read at the Historic Preservation Conference: Saving Cultural Heritage in Crisis Areas, 4-5 November, American Academy in Rome.

----------. 2010a. "Archaeological Heritage and the Turkish War of Independence in central Lydia, Western Turkey" MUSEUM International (UNESCO) 62(1-2): 42-7.

----------. 2010b. "Heritage Preservation in Central Lydia," In The Lydians and Their World: Catalogue of an Exhibit at the Yapı Kredi Vedat Nedim Tör Museum, Istanbul, edited by N. D. Cahill, 389–403. Istanbul: Yapı Kredi Culture, Art, and Publishing.

Roosevelt, C. H. 2010. Lydia Before the Lydians. In The Lydians and Their World: Catalogue of an Exhibit at the Yapı Kredi Vedat Nedim Tör Museum, Istanbul, edited by N. D. Cahill, 37–74. Istanbul: Yapı Kredi Culture, Art, and Publishing.

----------. 2009. The Archaeology of Lydia, from Gyges to Alexander. Cambridge/New York: Cambridge University Press.

----------. 2007. "Central Lydia Archaeological Survey: 2005 Results." Arastırma Sonuçları Toplantısı 24 (2): 135–54.

Roosevelt, C. H., and C. Luke. Forthcoming. "Central Lydia Archaeological Survey: 2009 Results." Araştırma Sonuçları Toplantısı 28.

----------. 2010. "Central Lydia Archaeological Survey: 2008 Results." Arastırma Sonuçları Toplantısı 27 (2): 1–24.

----------. 2009. "Central Lydia Archaeological Survey: 2007 Results." Arastırma Sonuçları Toplantısı 26 (2): 433–50.

----------. 2008a. "Central Lydia Archaeological Survey: 2006 Results." Arastırma Sonuçları Toplantısı 25 (3): 305–26.

----------. 2008b. "Looting Lydia: the Destruction of an Archaeological Landscape in Western Turkey." In Archaeology, Cultural Heritage, and the Antiquities Trade, edited by N. Brodie, M. Kersel, C. Luke, and K.Walker Tubb, 173–87. Gainesville, FL: University Press of Florida.

---------. 2006. "Mysterious Shepherds and Hidden Treasures: the Culture of Looting in Lydia." JFA 31(2): 185–98.

Today's Zaman. 2011. "Tourists visiting Turkey hit 30 million this year, surpassing target."
27 December. http://www.todayszaman.com/news266948-.html.

Young, C., A. Chadburn, and I. Bedu. 2008. The Stonehenge World Heritage Site Management Plan: Consultation Draft July 2008. London: English Heritage.