

The activity outlined in this article highlights an underutilized archaeological resource that presents one example of an easy to implement, low cost option to provide supplemental archaeological field experience to students. My focus is on developing additional field-based archaeological experiences for students to supplement the traditional summer field school. I am certainly not the first to suggest such an approach, as there are many published examples of similar exercises (e.g. Burke and Smith 2007; Gilsen 2013; Rice 1998; Riordan 2004). In this activity, students identify places where smoking occurred based on the distribution of smoking related artifacts (mainly cigarette butts but also cigarette packs, plastic mouthpieces, lighters, etc.). This activity utilizes an abundant modern resource to integrate students into the design and interpretation of fieldwork in order to provide further field experience for students.

A Review of the Archaeological Field School

In many ways, the summer field school is the pinnacle of archaeological education and has been described as a rite of passage (Walker and Saitta 2002), a transformative experience that creates memories to last a lifetime. In short, there is no substitute for a well-designed and well-implemented archaeological field school. As with any rite of passage, however, field schools are relatively fleeting moments in time. Many students and educators struggle to connect the experience to the classroom and ignite a comparable passion for learning in latter setting. Richard Wilk and Michael Schiffer (1981:16-17) present a critical review of the field school paradigm that is as relevant today as when it was written over 35 years ago. They raise three main points. One critique (Wilk and Schiffer 1981:17) is the ethical dilemma inherent in using the destructive excavation of a non-renewable cultural resource as a training ground for students. Second, there is often a theory and practice disconnect between the manual labor and the record keeping that students undertake in field schools and the hypothesis formation and testing that occurs outside of this setting (Wilk and Schiffer 1981:17). A final critique is that a single field season is unlikely to adequately prepare students for the rigors of professional fieldwork (Wilk and Schiffer 1981:16). These concerns feed into the continued critique that academic programs do not adequately train students for what represents the most likely career placement (Cultural Resource Management or CRM) of their graduates (i.e., Lerch 2012; Morrison 2012; Perry 2006; Schuldenrein and Altschul 2000). More recent analyses of the pedagogical and ethical implications of field schools, while certainly adding additional depth and new nuances, have essentially built upon these three themes (Baxter 2016; Connell 2012; Doelle and Huntley 2012; Mills 2005; Mytum 2012; Perry 2006; VanderVeen and Repczynski 2010). Again, my goal is not to criticize archaeological field schools. The goal here is to recognize other avenues to student field experience that address the three issues raised by Wilk and Schiffer.

Focusing on Cigarette Butts

Inspired by William Rathje's Garbology movement in the 1970s, many archaeologists recognized the potential of modern refuse to represent easily accessible, actively accumulating archaeological sites that are ideal for student-centered exercises (Camp 2010; Rice 1998; Stottman et al. 2007; Wilk and Schiffer 1981; Zimmerman 2007). Some of these examples represent careful attempts to recreate archaeological concepts, such as stratigraphy and relative dating (Zimmerman 2007). Others (Camp 2010; Stottman et al. 2007) are policy driven to inform the role of archaeology in campus waste management. In the following example, I focus on what has been described as "the most common form of litter worldwide" (Sawdey et al. 2016:i21): cigarette butts. As such, cigarette butt archaeology addresses the first concern of Wilk and Schiffer (1981) by focusing on modern resources that are not in danger of disappearing forever. In addition to their ubiquity, cigarette butts offer another key lesson for archaeology students. Thousands of campuses around the world are smoke- and tobacco-free, effectively writing the narrative that these spaces are free of smokers and cigarette butts. On the surface, this constraint suggests that cigarette butts are a poor medium for university educators, akin to having students search campuses for typewriters, slide rules, or patent medicine bottles. However, a growing body of evidence demonstrates that, while smoking bans may reduce smoking on campus, smoke-free campuses are still littered with cigarette butts (Jancey et al. 2014; Lee et al. 2013; Pires et al. 2016; Sawdey et al. 2016; Seitz et al. 2012). The archaeological evidence of smoking is an example of how archaeology can be used to investigate a potentially biased and hegemonic narrative—the archaeological record runs contrary to the historical record. This lesson is a significant one because most students, and many professionals, view the archaeological record as inherently biased and fragmentary. This situation is often seen in opposition to any historical setting where information that is less fragmentary is assumed to exist in the written sources.

A similar argument could be made for any form of refuse, as regulations prohibiting littering are omnipresent. But the difference between discarded cigarette butts on smoke-free campuses and other types of litter are the lack of formal receptacles for disposal of the former. Smoke-free campuses lack ashtrays, inviting smokers to discard all cigarette butts on the ground. While any public area will likely contain litter, unlike cigarette butts, other types of trash are always a biased sample of what people discard because much is discarded in garbage or recycling receptacles.

Preparation

With proper preparation, this activity can be implemented in any college class. It provides additional experience for students who have already participated in an archaeological field school while it can also serve as an introduction to archaeological

fieldwork for those students who have not yet done so. I implemented this activity once in a small course with 12 students. Most of these students (n=10) were upper-level undergraduates who had already completed an introduction to archaeology course. Only one of these undergraduates completed an archaeological field school. The other two students were master's-level graduate students with extensive archaeological experience.

Every archaeological field project requires field equipment, and this activity is no different. A strong effort was made to reduce the overall expense so that the project can be implemented in as many situations as possible. Each student needs items for collecting, bagging, and georeferencing the artifacts. We utilized trash pickers ([aka grabbers, pickers, pick-up tools, extension reachers] which can be obtained for as little as a few dollars each), nitrile gloves, and paper bags for collecting and bagging (Table 1). High precision portable GPS units would be ideal for each student or group. However, their high price tag means that the bulk purchase of these devices is not feasible in most cases. Luckily, nearly every student already owns a hand-held GPS device in the form of a cell phone. Different operating systems and GPS apps make data integration difficult, but planning and coordination at the beginning of the project can minimize these issues. One thing we noticed during the initial implementation of this project is that some GPS apps do not provide sufficient precision to produce maps at the scale necessary for fine-grained interpretation (Figure 1). When choosing an app, it is ideal to select one that will provide the requisite level of accuracy and precision (Cascalheira et al. 2014). We found the "Latitude Longitude Location" application most useful, but others certainly exist and new ones are created every day. It is also a good idea to ensure that students download the GPS app and practice utilizing its features before heading out into the field.

Table 1. Summary of the Cigarette Butt Exercise – A Breakdown of Activities, Time Allotted, and Preparation and Supplies Needed

Topic	Activities	Time	Preparation/ Supplies Needed
Preparation/ Research Design	Craft research questions, design surface collection strategy, download and test GPS app	1 class period (75 minutes)	Background on archaeological survey and research design (via reading or previous lecture)
Implementation	Students conduct surface collection, complete related questions/draw maps (homework), students email GPS data to instructor	At least one class period (75 minutes)	Supplies needed – personal protective equipment (trash pickers, gloves), paper bags, pens/markers for labeling bags, cell phones with GPS app
Analysis	Examine maps created with GPS data, evaluate research questions, conduct laboratory analysis, discuss future research possibilities	2 class periods (75 minutes each)	Computer and projector needed to present maps to a large group, trays and protective gloves needed for laboratory analysis

Figure 1: Example of data points that fall into in a grid-like pattern. This pattern is due to insufficient data accuracy and does not accurately reflect the archaeological record of cigarette butt disposal.



Research Design

Any research design should seek to address questions of who, what, when, where, and why. As with any archaeological survey, typically the first step is determining where archaeological remains exist, in the form of sites or scatters of artifacts. In the first iteration of this activity, our largest research objective was to identify such locations. Students are excellent collaborators in the research design process as collectively they may cover all parts of campus on a routine basis. If told about the project in advance, they can keep an eye out for smoking places and thus help guide the site survey process. Given the time and resources present, it is necessary to determine how much of campus can be covered in the course of the project. If the entire campus cannot feasibly be covered, a sampling strategy must be devised and employed. For our study, students first discussed types of areas (e.g., dorm exteriors, library, classroom buildings, parking lots, etc.) where they might expect to find the most evidence for smoking and we chose a sample that covered as many of these areas as possible. We selected four areas around a range of building types (an administrative and classroom building, library, a student dormitory, the student union) in order to have a representative sample of the central portion of campus. It is worth noting that we devoted relatively few days (four) to surface collection in order to illustrate that this activity can be implemented in during virtually any class period.

Another aspect of sampling that needs to be addressed is what material is to be collected. In our surface collections, the vast majority of items encountered were cigarette butts, but cigarette packaging, plastic cigar mouthpieces, and more ambiguous items such as lighters were encountered. It is also a good idea to discuss illicit items that may be discovered and what to do in such instances (Figure 2). It is also necessary for students to start planning for curation and data storage at this point of the activity. Thus, this stage of the process is critical to addressing Wilk and Schiffer's (1981) second point that students be more involved in generating questions/hypotheses as well as methods to test them.

Figure 2. A marijuana smoker's cache, illustrating the importance of preparing for the unexpected. Photo courtesy of Emily Bartz.



Implementation

The implementation stage addresses Wilk and Schiffer's (1981:16) final point that questions whether a single field season will adequately prepare students for fieldwork. This activity will help students gain additional field experience without devoting an entire field season to their goal. Bethany Morrison (2012:23) notes that one significant outcome of field exercises is in teaching students "how to be outside." Beyond this basic goal, learning to think archaeologically while outside should be a major learning outcome of any archaeological field-based exercise. This cigarette butt activity addresses essential elements like basic orientation skills (i.e., determining the direction

north), identifying potentially important elements of the landscape/built environment, assessing surface visibility, how to effectively navigate physical obstacles within the survey area (i.e., what to do when the path narrows/widens significantly), and how to most effectively utilize the available time and resources. Advising students beforehand that their maps must contain a north arrow and significant features such as buildings, sidewalks, and benches is one way to ensure their focus is on such features (Figure 3). At the end of each survey session, students drew a map of the surveyed area, reflected upon the features that made particular areas more appealing to smokers, and identified the characteristics of places where smoking was least likely to occur (Figure 4).

Analysis

The analysis begins by combining numerous data points into maps of the distribution of cigarette butts on campus. In order to accomplish this step, we utilized Google Fusion Tables rather than proprietary GIS software. Google Fusion Tables are free, easy to implement, sharable through Google Drive, and have mapping features to display points, as well as heat maps, which essentially display artifact density (Figure 5). Making and sharing these maps allow different survey crews to compare results and they offer a way to test on-the-ground site assessments made by each student.

One of the main insights that students provided during fieldwork was the recognition of primary and secondary refuse deposits of cigarette butts (Schiffer 1972). This distinction has not been noted in the studies of cigarette butts conducted by individuals in the public health sector (Jancey et al. 2014; Lee et al. 2013; Pires et al. 2016; Sawdey et al. 2016; Seitz et al. 2012). However, the location of many butts in the cracks of sidewalks, near drainage features, and amongst piles of leaves and other debris made it clear that a variety of post-depositional formation processes were at work. Additional noteworthy taphonomic processes that were identified by many students were the actions of grounds maintenance staff at the university who often collected and disposed of cigarette butt piles while patrolling for litter. This example aptly illustrated that even very recent archaeological sites can be impacted by post-depositional processes.

Figure 3. Example of the worksheet that students completed after each surface collection.

Post Survey Question Sheet

Name: _____

1. Where did your group survey? On the back of this sheet, provide a sketch map of the area with a north arrow, survey boundaries, major landmarks (e.g., buildings, roads, sidewalks, etc.), and important features (i.e., things that seem to be associated with lots of cigarette butts. These may be trees, benches, bus stops, etc.) labeled. Mark the locations where you noted concentrations of cigarette butts.

2. What was the evidence for smoking in your survey area (provide a total count of items identified)? Was the debris concentrated or dispersed evenly throughout the area?

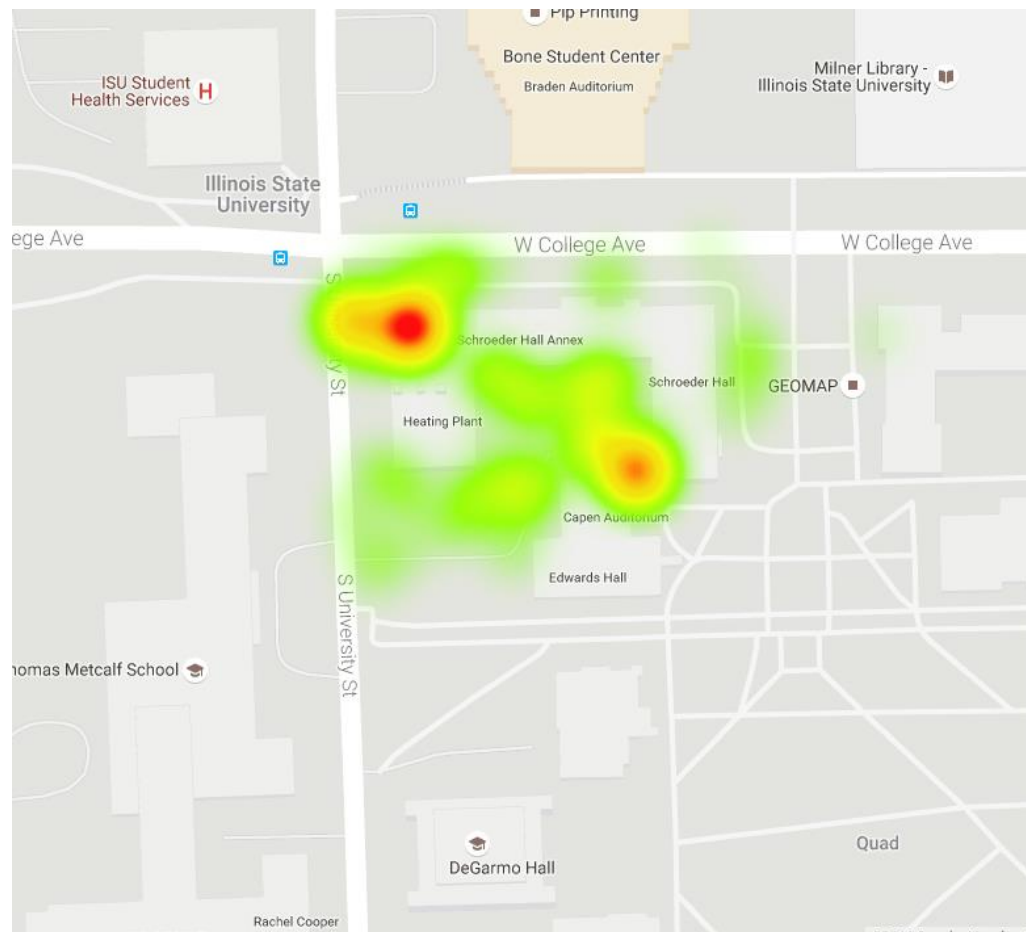
3. Where did you find the most evidence for smoking? What particularly important feature(s) does this area have?

4. Where did you find the least evidence for smoking? What particularly important feature(s) does this area have?

Figure 4. Example of a student map drawn while conducting his survey of cigarette butts on campus. Drawing courtesy of Sam Smedley.

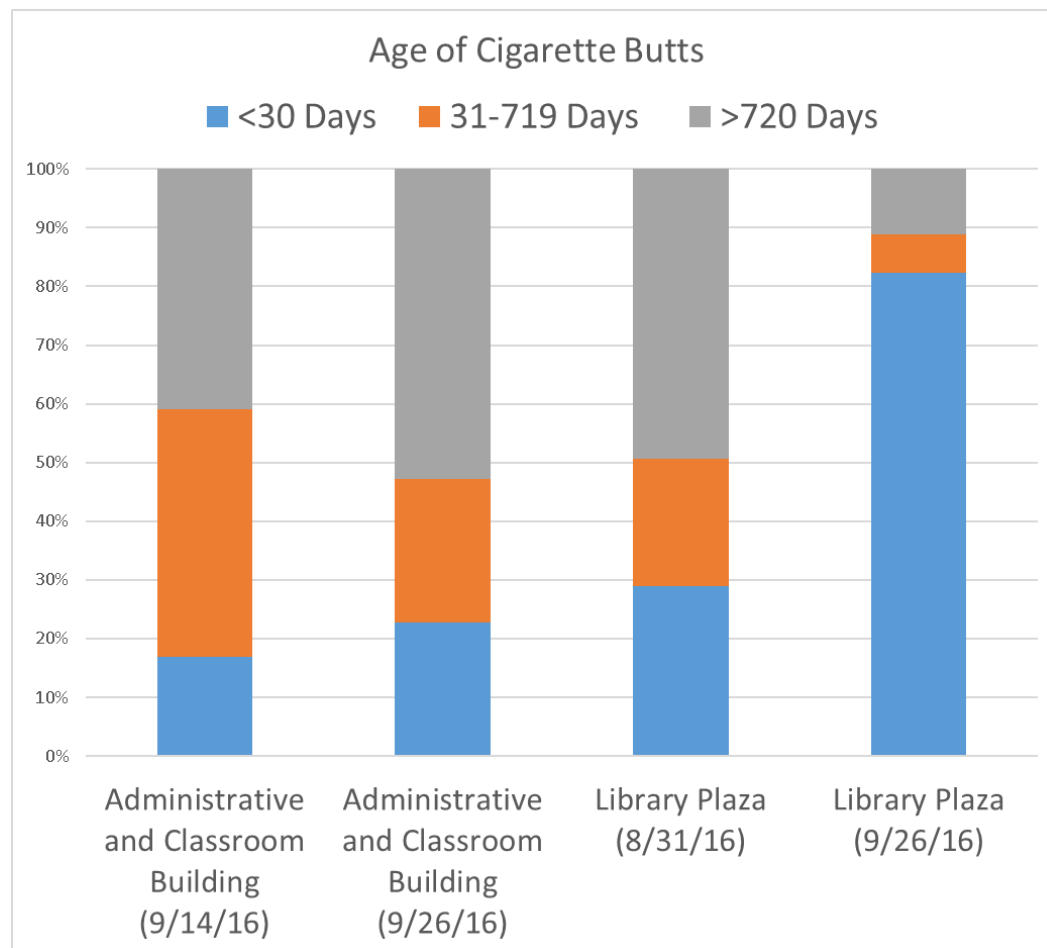


Figure 5. A heat map (shading matrix) of the distribution of cigarette butts noted on survey. Created through the use of Google Fusion Tables.



Every good field archaeologist knows that a disproportionate time must be dedicated to lab work for each hour spent in the field. Thus, a laboratory component is essential to this exercise. One lesson we learned is that cigarette butts retain a lot of water. Therefore, they should be allowed to thoroughly dry before being stored for any length of time. Ideally, this step should occur before any laboratory analysis of the artifacts. Few things make a laboratory exercise worse than moldy cigarette butts. Fewer materials are needed to effectively conduct the lab component than the fieldwork, namely nitrile gloves and good ventilation.

Figure 6. Estimates of the time since discard (i.e., “age”) of cigarette butts from the first and second surface collections of two areas on campus.



Given the richness of this database, many questions could be addressed with a detailed analysis of individual artifacts and assemblages of cigarette butts. We chose to focus on discard rates. As the archaeological record is a result of the intensity of site use in combination with the occupation span of a site, studying discard represents a basic lesson in the formation of the archaeological record (Schiffer 1975). In order to study discard rates, we conducted a total surface collection of two areas on two separate occasions, between two and four weeks apart (Figure 6). In a perfect world, a simple count of all the cigarette butts recovered in the second surface collection divided by the number of days since the previous surface collection should provide a general idea of the number of cigarettes discarded per day in each area. But this calculation assumes that all of the cigarette butts recovered during the second surface collection were discarded during the intervening days. In order to test this assumption, we estimated the “age” (i.e., time since discard) of each cigarette butt in the lab based on

deterioration experiments conducted by Giuliano Bonanomi et al. (2015), who essentially tracked the breakdown of the paper around the filter. We modified the categories from the work of Bonanomi and colleagues to <30 days, 30 days to 720 days, and >720 days. Since the day of our second collection of each area occurred within 30 days of the first, all of the cigarette butts should fall within the <30 day category. As shown in Figure 6, this distribution was largely the case for one area, in that 82% of cigarette butts fell into this category; however 18% were unaccounted for by that criterion. It was estimated that cigarette butts were discarded upwards of two years or more previously. This lesson is vital for students in that even a “complete” surface collection retrieves only a sample of the artifacts present; it is nearly impossible to recover all artifacts in the sampling universe. In our other surface collection, the proportion of cigarette butts in the >720 days category actually increased, largely due to the discovery of makeshift ashtrays in some raised flower beds that were passed over during the first surface collection.

Another aspect of the laboratory component was an examination of what I have termed the “smokable ratio.” This ratio is achieved by estimating the proportion of the artifacts recovered that were more than just cigarette butts but still contained a substantial portion of the tobacco tube. While the percentage of discarded but still smokable cigarettes was low in each assemblage examined (2.5% and 8.4%), the higher percentage occurred in an area with substantially higher pedestrian traffic. One testable hypothesis that students devised to explain this pattern is that more people would create more moments in which someone felt compelled to discard their cigarette due to the approach of campus security, law enforcement, or other authority figures.

Conclusion

The example presented here of an in-class archaeological activity offers some possible avenues to pursue for an archaeology of cigarette butts. The overall purpose of this exercise is to address some issues related to the reliance on field schools as the only means for students to obtain field experience. This essay is in no way meant as an attack on, or a substitute for, archaeological field schools. The exercise addresses the ethical dilemma raised when allowing students to learn through the destructive excavation of ancient archaeological remains, the method and theory disconnect associated with many field experiences, and the issue of a need for more, and more diverse, field experiences for students. The cigarette butt surface collection represents an easy to implement activity that allows students to gain additional field experience without the increased economic hardship experienced by many field school students (Boytner 2012). The activity also allows students to actively engage in research design, data collection, and hypothesis testing without risking unnecessary hardships to the archaeological record. Rather than serve as an exact blueprint to be followed, it is my

hope that this example inspires others to engage students with the archaeological record in innovative ways.

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