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Techniques for Locating Burials, with Emphasis on the Probe

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ABSTRACT: The search for buried remains frequently includes visual assessment of surface features, trained dogs, and sophisticated geophysical remote sensing techniques. Nonintrusive, electronic survey equipment, such as the proton magnetometer, ground penetrating radar, and electrical resistivity, have yielded good results. However, under certain field conditions a simple, less expensive, relatively noninvasive tool—the probe—is effective. The probe, when used by an experienced investigator, provides a variety of information in a short amount of time, facilitates excavation, and minimizes damage to a burial. This paper offers examples of the application of a probe in forensic cases in urban and rural settings and in the detection of historic burials. Examples include the location of four individuals killed during the raid on the Branch Davidian Compound in Mount Carmel, Texas, and the search for burials in cemeteries that had been desecrated.

KEYWORDS: physical anthropology, forensic archaeology, buried bodies, field techniques

Early in his career, William M. Bass worked extensively on locating and salvaging historic and prehistoric burials, particularly in connection with the Smithsonian River Basin Surveys program, which included excavation of archaeological sites along the Missouri River prior to the inundation that would follow dam construction. His initial work in salvage archaeology relied mainly on the digging of test units along a grid. Inevitably, a lot of holes were dug where burials were not located. Subsequently, Bass pioneered the use of heavy equipment (scraper, backhoe) to remove top soil and reveal the mottled, stained, fill that indicated the presence of a grave shaft. He became an expert on methods of locating and exhuming buried remains for both forensic and bioarchaeological research purposes. Because of his contributions in this field, it seems appropriate in a symposium in his honor to describe and illustrate the application of a technique that is employed in the location of burials. It is not one that he pioneered, though he did recommend the use of soil pH, temperature, and gas-sensing probes [*1*], as well as the use of an ice pick or screwdriver to detect areas of soft soil [*2*]. My application of the probe to the search for unmarked burials has been guided by the example of his early research and the principles he developed and taught.

Locating Burials

Field Survey Techniques

As Bass pointed out [*2*], "One can never dig in the ground and put dirt back exactly as nature had put it there originally." As a result, unmarked or deliberately concealed burials can generally be located through one or more of a variety of techniques ranging from simple, inexpensive visual inspection to more complex and costly geophysical remote sensing techniques and aerial photography. The means selected depend on the area to be searched, the type of terrain and soil, climate, logistics (amount of time, funds, and manpower available for the search), and other factors. Generally, a search should begin with the least intrusive—thus least potentially damaging—techniques so that minimum disturbance of the burial and associated artifacts occurs and maximum data on context are preserved. As France et al. [*3*] demonstrate, an effective search often requires the complementary use of several search methods and of many types of disciplinary expertise (for example, geophysics, botany, soil science). Killam [*4*] has reviewed the principal techniques used to locate human burials, ordering them from the least to the most intrusive and offering recommendations on their application. Here, I will mention these methods only briefly as background for discussion of one of them—the probe.

First, what are some of the clues to disturbance of the soil and the possible presence of a burial? An obvious one is vegetation, which can be absent or less dense over a recent grave site, or after an interval of more than a year, might be more lush over the grave than in the surrounding area as a result of the less compact, damper soil. Islands of bushes and trees in a plowed area sometimes indicate a cemetery, and plants different from the naturally occurring vegetation (for example, ornamental shrubs, flowering perennials, ground covers) also suggest a burial ground. Evidence of insect activity (eggs, larvae) on the surface of a grave site may be apparent if the burial is recent, and often the tracks, digging, or tunneling of mammals will be visible. As fill becomes more compact and subsidence occurs, a depressed area may be evident, or a mound of excess dirt not returned to the shaft may be found nearby. With removal of a top layer of soil, a difference in the color and texture of the earth in the grave shaft compared to the surrounding area is usually obvious. The fill in a grave shaft will display a mixing of strata or layers compared to the surrounding earth and may also show differences in temperature, pH, and electrical conductivity as well as magnetic anomalies.

Visual inspection of the presumed site by trained physical anthropologists, archaeologists, and others is not only the least intrusive technique but a logical first step. Scent-detection dogs (cadaver dogs) may be useful in this search if temperature is in the 40° to 80° range, atmospheric humidity is 20% or more, the ground is moist, and wind speed is at least 8 km/h [*3*]. The dog should be worked in a zig-zag pattern downwind of a likely site. Aerial photography—black and white, color, and infrared—from a helicopter or small plane can also greatly assist the visual search. Photographs should be taken from different directions, at different times of day, and under varied conditions of light. For example,

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when the sun is low and shadows are long, ground surface texture and topography are especially clear.

Probes, soil-sampling tubes, and augurs are inexpensive, relatively nonintrusive means of following up visual clues to a grave site and narrowing the search area. Probes include not only the metal rod to be described subsequently but sensors for detecting gases, soil pH, and subsurface soil temperature. Gases are released as a body decomposes, thus hydrogen phosphide, hydrogen sulfide, ammonia, carbon dioxide, and, especially, methane may be present. Soil gas probes give best results in unfrozen ground with low clay content. During early stages of decomposition soil around a body can show increased alkalinity [*1*], thus probes for measuring soil pH are useful in detecting possible burial sites. Further, as a body decomposes temperature increases relative to the surrounding soil. The increase is greater for shallow burials than for those at greater depths [*1*]. Thus thermal sensors provide yet another clue to an unmarked burial. These sensors are most effective when there is little wind [*3*].

If a probe has been used to outline the approximate location of a burial (based on the less compact soil in a grave shaft), some of the same holes can be used for the other probe sensors, reducing disturbance and possible damage to the site. In addition, a hollow tube with a tapered tip—a soil sampling tube—can be inserted at various locations in and adjacent to the grave shaft to obtain cores and compare the soil horizons of the surrounding earth and the typically scrambled layers of the grave fill. The differences in color when, for example, topsoil has been returned to lower portions of the burial shaft, and vice versa, or when other soils and materials such as brick fragments have been introduced, are obvious in coring samples.

Augur testing is somewhat more intrusive than the soil sampling probes but is another way to evaluate a site [*5*], though it must be used with extreme care and should be preceded by less potentially destructive probing and coring. An augur consists of a sediment bucket and cutting blades attached to a 2 m (or longer) shaft. When pushed into the ground and rotated (by hand or power), sediment accumulates in the bucket, providing a larger soil sample for visual inspection and geological, chemical, and other analyses. Chemical analysis, for example, can reveal higher concentrations of potassium, copper, and especially manganese in soils surrounding a decomposing body. In addition, the depth of geologic materials or artifacts can be recorded and compared with anomalies revealed in geophysical surveys.

Geophysical remote sensing techniques are nonintrusive and a number of them have proved effective in locating burials. These techniques measure physical, electrical, and chemical properties of earth, for example, magnetic susceptibility or natural electric currents. So-called "passive" techniques measure responses to natural conditions (for example, magnetism); "active" techniques measure responses to an induced signal and include electrical resistivity, ground penetrating radar, electromagnetics, and seismic reflection [*6*]. Electromagnetics, ground penetrating radar, and electrical resistivity—instrumentation developed for other purposes such as detecting subsurface pipes, foundations, faults, mineral deposits, ground water, and the like—have been especially effective in archaeological surveying and locating burials [*3,6–10*].

In electromagnetic surveying, a current inducing a primary field is transmitted into the earth and to a receiving instrument, which is also used to sense any secondary field resulting from subsurface properties and to compare it with the primary field [*6*]. Ellwood [*5*] recommends the use of a Williams Dual-bottle Proton Magnetometer [*11*], with measurements taken at 0.5 m intervals on a grid pattern over the area to be searched. Each data point represents the magnetic field difference in nanotesla between a reference bottle elevated on a pole at some distance from the grid and a search bottle placed about 0.3 m above ground at each grid point. A positive value indicates that the magnetic field at the search bottle is higher than that at the reference bottle. (The search area should be swept with a metal detector for near-surface metal prior to taking measurements.) The result is a map depicting the subsurface magnetic variations or anomalies occurring in the search area.

The rationale underlying electrical resistivity surveying is that earth materials behave like electrical resistors, impeding current flow through the ground. Conductivity of soils and rocks will be affected by moisture content, clay content, porosity, the presence of ionized water or salt, and other factors. Electrical current is applied through two electrodes inserted about 4 to 5 cm into the ground, and measurements are taken at a second set of two electrodes. The four electrodes can be arranged in a number of configurations, though even spacing between them has been common in archaeological work [*8,12*]. As the electrodes are moved along a straight line, measurements are taken at intervals equal to the spacing between the individual electrodes. A slightly higher current flow can occur at a burial site as a result of greater concentrations of ionized water in the disturbed soil.

Ground penetrating radar, which involves the transmission of short wavelength, electromagnetic waves into earth and the recording of the energy reflected back from subsurface materials, has been especially useful in searching for burials [*3,6,7,10*]. Excavation patterns, changes in soil horizons, air voids, and metallic objects can be detected. The procedure calls for towing an antenna, by a vehicle or by hand, along the surface to be profiled. The apparatus must be kept at a constant elevation and works best in soil with high resistivity and few underground obstructions (that is, it does not work as well in clay, and results can be difficult to interpret in stony soil). The instrument provides a continuous data record, gives excellent resolution, and works over water or snow as well as earth. Bevan [*7*] indicates that for the sites he studied, ground penetrating radar was the most successful of the geophysical techniques he used to locate unmarked graves.

The most intrusive and potentially destructive means of search is heavy equipment such as a backhoe or grader. It is best used when the area to be searched is large, the terrain is flat, with minimal vegetation or a sterile topsoil cover, and there is no information about the location of the grave site(s). Killam [*4*] recommends it when other methods fail and warns that it should only be used to remove thin layers of topsoil and never for excavation of a body. Bass and Birkby [2] suggest the use of an elevated scraper pulled from the front by a tractor cab. The soil can be shaved a few inches at a time, the overburden collected, and the surface behind left smooth. If a backhoe is used, Bass [2] recommends a toothless bucket as least invasive and destructive. In my experience, a small backhoe, such as found on a Bobcat, can be useful and is easy to maneuver in areas with trees or other obstacles.

Advantages of the Probe

A probe is a metal rod, usually of stainless steel, with a T-bar handle on one end and on the other a slightly enlarged (relative to the shaft), rounded or slightly pointed tip. Probes are available in a variety of diameters (5/16 inch and 1/2 inch are frequently used), and length can be varied by attaching extensions (a length of four to five feet is usually suggested, for example [*13,14*]). The area to be probed is marked in a grid pattern with stakes and white string or tape anchored with small nails. The lanes that are formed should be about three to four feet in width. One entire search lane should be tested before beginning another, with the probe inserted about every ten inches as the investigator moves laterally across a lane and vertically down the length of a row. Killam [4] describes an optimal method of team search with probes.

As Boyd [13] points out: ". . . success in probing depends on an ability to detect the difference in the disturbed and undisturbed subsurface soil. Some practice is desirable in the immediate area . . . to get a 'feel' for the type of soil in that region." Depending on the nature of the soil, penetration becomes more difficult below about 1.0 to 1.5 feet in undisturbed soil. A probe inserted in disturbed soil will penetrate to a greater depth for the same amount of pressure. Often, the entire length of the probe can be easily inserted. As soil once disturbed is never the same as the other soil in an area, detection of a grave shaft by probing is possible long after a burial took place. I have used probes successfully to locate burials dating from as much as 150 years ago; however, the grave shafts of more recent burials offer substantially less resistance than those of older burials.

When a soft spot is detected, it is flagged. The resulting pattern of markers shows the approximate shape and dimensions of a grave shaft, if present, or indicates other types of subsurface anomalies (such as a decaying tree stump) that affect penetration of a probe. By probing at the corners or edges of the disturbed area, the depth of the shaft can be determined, and further careful probing can show the presence or absence of a coffin. Probe results can be tested and validated with a soil sampling (coring) tool. A typical coring tool has a diameter of about an inch and will extract approximately a foot of soil with each insertion. Both a probe and a coring tool produce best results when soil is relatively moist.

Although a probe is intrusive, when it is correctly used it will cause minimal damage and can, in fact, prevent damage. For example, a 19th century iron coffin burial recently examined at the Smithsonian had been damaged when a backhoe stuck one end of it. The coffin was removed because of impending development, with excavation conducted by an archaeologist and a local funeral home. Had the area been probed prior to excavation and the dimensions of the grave shaft and level of the top of the coffin determined, digging with such heavy equipment would not have continued to that depth. The damage would have been avoided, and valuable data on preservation of human remains in an intact cast iron coffin could have been obtained.

With practice and experience, it is possible to distinguish not only the area of disturbed soil that may denote a grave shaft but a variety of materials and objects, including, for example, rocks, bricks, cinder blocks, glass/bottles, heavy clothing, sleeping bag or tarpaulin, metal, wood, roots, and a body. In addition, probing a suspected grave site can enhance scent detection by a trained dog. Although Imaizumi [15] called attention to the usefulness of a probe as a "body finding machine," it has been suggested (for example, [4]) that probing in a disturbed area should not be continued to a depth at which the probe tip could damage a body. Such postmortem damage, though usually distinguishable from perimortem trauma, can complicate analysis of the remains. In forensic cases especially, such damage should be avoided. Therefore, when a disturbed or soft area is discovered, the use of other devices, such as gas detectors or subsurface temperature sensors, to supplement probing is suggested [14].

The probe offers a number of advantages. Some listed by Killam [4] are that it permits a thorough search with minimal surface and subsurface damage, that it is inexpensive, that it is adaptable to any terrain, and that it can be done in combination with visual and other search techniques. In addition, probes are readily available in a variety of lengths and diameters and are easily made to order by a machine shop. They require virtually no maintenance, are easily transported, and their use, by an experienced individual, is rapid and effective. That the searchers must be trained—that is, they must have substantial practice and experience to use a probe successfully and minimize invasiveness—is perhaps the chief disadvantage. However, most techniques, even visual search, and especially geophysical remote sensing, require training and expertise for effective application. Other limitations on use of a probe are that the area to be searched must be relatively small, that good weather and unfrozen ground are necessary, and that rocky or extremely dry, solidified soil reduce effectiveness. In addition, probing is more physically demanding than it might appear and requires frequent rest or rotation of searchers.

Of course the probe, like other search techniques, is not foolproof. Verification of a burial, regardless of the means employed to detect it, depends on excavation. For example, in a recent search for a clandestine burial that had occurred about a decade earlier, I identified an oblong depression of appropriate size that contained denser and longer grass cover, and probed easily to a depth of nearly 5.5 feet. Ground penetrating radar suggested a burial, and an experienced scent dog also indicated the presence of a burial both before and during excavation. Soil in the pit was mottled and mixed, and a can was found at a depth of about 18 inches; however, at the bottom of the pit there was no burial but only a bottle.

Though the advantages of the probe are many and its drawbacks no more, and often less, than those of other search techniques, the probe is not used as extensively as it should be. Archaeologists have tended to avoid it because looters early recognized its utility and have employed it all too successfully. In addition, because probing appears to be so simple a procedure and probes are so easily and inexpensively acquired, many amateurs or persons new to archaeology and forensic science believe that they can become an "instant expert," often with unfortunate results. That the probe has been ineptly applied or its advantages misappropriated are hardly reasons to shun it. The following case studies provide some examples of its successful application in urban and rural settings and in forensic investigations and the location of historic burials. It is hoped that these examples will stimulate a new appreciation of the effectiveness of the probe and foster its increased application in combination with other search techniques.

Selected Cases Illustrating Effective Use of a Probe

Forensic Investigations

A forensic case in which a probe proved particularly useful was the search for the body of a young adult, black female, allegedly murdered and buried in the backyard of an apartment building some six months earlier. The burial was supposedly on the north side of the building in an area covered with debris and overgrowth. Construction materials were scattered about the yard, which was partially paved. Probing revealed much brick-like material in the soil within and around the designated area, but there was no evidence of a burial. The search area was then expanded and all unpaved sections of the yard along the west, north, and east sides of the building were systematically probed. No disturbed soil was evident, and a few exploratory excavations (small holes) confirmed the results of probing.

After further police questioning of an informant, the search was transferred to the basement of the building. A six-foot high cinder block retaining wall in the basement enclosed an area filled with sand around a fuel oil tank behind a furnace. The sand-filled area was 18.75 × 8.5 feet, and the sand reached nearly to the top of the wall, which was 3.25 feet below the basement ceiling. Initial probing revealed only compact, undisturbed sand. However, a depression and a low mound of sand were present near the east wall of the building, and probing of the depression showed loose, disturbed sand. The toes of a left foot were uncovered beneath the low mound. With the arrival of the Medical Examiner and Crime Lab staff bringing protective clothing, ventilating fans, lanterns, and video and photographic equipment, excavation continued until the entire body and a variety of associated items (beer cans, match book, lady's shoe, etc.) were recovered, listed, and photographed.

In this urban setting, amid construction materials, concrete, and backyard debris, ground penetrating radar, electrical resistivity, or magnetometer surveys would not have assisted the search. Using a probe, in less than two hours we were able to establish that the backyard did not contain a burial as initially alleged, and approximately 20 minutes after the search was transferred to the basement, the body was located.

Another forensic case provides an example of the use of a probe to confirm the results of a visual search over a relatively large area of difficult terrain. A police department requested assistance in locating the body of a man believed to have been murdered and buried in a wooded ravine. The victim was a white, male derelict who had lived in a make-shift shelter in the ravine. Two attempts to locate the body with cadaver dogs had not been successful, and the terrain was too irregular, swampy, and full of metallic and other debris for geophysical techniques to be effective.

An informer had indicated that the man was murdered near an isolated residence (allegedly occupied by drug users), then moved into the ravine on a child's sled, and buried somewhere there. The area to be searched covered several acres and was shaped like an elongated isosceles triangle. One side paralleled a service road leading to a gas and electric plant and consisted of a steep slope covered with brush and small trees. The opposite embankment had been used as a dump for construction materials, discarded household appliances, automobile parts, and other debris. It intersected an abandoned railroad bed and was covered with larger trees and brush. At the base of the triangle was the dilapidated residence thought to be a "crackhouse." Along paths that led through the ravine were remnants of tents, bedding, clothing, food containers, and other evidence of temporary habitation. The floor of the ravine was waterlogged.

The first step was a visual and probe search that led eventually to a mound of subsurface soil and a surface depression that did not seem to be the result of natural erosion. There was little vegetation on the area and two low branches of an adjacent tree appeared to have been broken manually. On top of the suspected grave were a large automobile tire, a gasoline can, and a concrete construction block. Probing the depressed area revealed soft, wet, sandy soil. At a depth of 20 inches a soft object was encountered. Digging at this point exposed a shirt and the left elbow of a body. As excavation continued to determine the orientation of the body, the subsurface area immediately filled with water. After the arrival of the Medical Examiner and Fire Department personnel with a pump, digging resumed. The remains that were recovered were in a moderately advanced state of decomposition, but facial features were recognizable and the body was sufficiently intact to be lifted from the grave without separation or loss of any elements.

Mass Disaster

The Branch Davidian Compound at Mount Carmel, Texas, was the focus of a multidisciplinary investigation in which physical anthropologists assisted in both the location and the osteological examination and inventory of the remains. One area that had to be searched was the Subterranean Firearms Range (underground bunker) where informants reported that bodies had been buried. The underground room was 30 × 100 feet and oriented south to north, with the outside door at the south end. Another room opened off the north end. In the southwest corner was a large pile of garbage, including rotten food, cans, glassware, diapers, human hair, and other debris. The floor was dirt, muddy in places, with areas of standing water, sometimes as much as ten inches deep. The northwest corner contained building materials, a broken wheelbarrow, a bag of concrete, planks, and cement blocks. A cadaver dog had surveyed the area, and Texas Rangers had been digging at places where the dog showed mild interest, but no burials had been located. The dog was attracted by the pile of garbage in the southwest corner, and the informants had stated that the bodies were under a pile of garbage. After this area was cleared and probed with no results (Fig. 1), I probed around the perimeter of the room. In the northwest corner, the probe penetrated several feet with virtually no resistance, indicating disturbed soil. The

FIG. 1—*Probing the garbage pile in the southwest corner of the underground firearms range of the Branch Davidian Compound eliminated this location as a burial site.*

surface soil was extremely mottled, also indicating that digging had occurred there. Further probing (Fig. 2) detected a soft, spongy, subsurface mass, suggesting a burial in this corner, probably a body wrapped in some sort of material. In a number of the probe holes a yellow liquid (oily) began to well up, further indicating the presence of a body.

Continued probing resulted in the outline of a grave shaft that was about eight feet long and 3.5 feet wide, with distinct side walls. Its depth was approximately three feet. The soil was mainly clay and was extremely wet. A large quantity of body fat continued to seep up during probing. When digging began, darker soil appeared, and as excavation proceeded an odor was apparent. Large concrete blocks were removed from the shaft, and then a glove was found. When material (a sleeping bag) covering the body was detected, I continued the search by hand in muddy water and located the cranium of what turned out to be the uppermost burial.

Subsequently, four bodies were recovered from this grave shaft: (1) a black male, enclosed in a sleeping bag, together with a foam pillow, pillowcase, photographic slides in plastic cases, a wadded sheet, and a sweater; (2) two individuals, a female and a male, covered with a red blanket and so oriented that the head of the female was above the feet of the male; and (3) at the lowest level of the shaft, a male resting on a blanket.

Again, the probe proved to be effective when a cadaver dog failed and geophysical techniques probably would not have been feasible. One of the Texas Rangers who had been digging all day to no effect, came up to me after the burials were excavated and remarked: "I don't mind digging; if they want me to dig a hole, I'll do it. But I sure was glad to see somebody come along who had a plan, something definite to go on."

Early 19th Century Family Cemeteries

Two examples illustrate the use of a probe in locating historic burials and draw attention to a type of survey increasingly in demand as development encroaches on formerly rural areas and small, family cemeteries are desecrated or obliterated. In one instance, though a burial plot was respected for many years, the grave stones were removed, and as land use changed, the site was eventually lost. In the other, a family cemetery was deliberately desecrated—bulldozed and graded—to make way for a residential housing development. Under Virginia State Code 18.2–127, damage to a graveyard is a Class 6 felony, and omission of a cemetery from development site plans or plats is a violation of State Code 15.1–475. Both government and private organizations concerned with protection of historic sites and commercial organizations concerned with development projects and land use increasingly require the assistance of physical anthropologists and archaeologists in locating unmarked historic burials and documenting instances of deliberate or unintentional desecration. The easily transported, inexpensive probe is well suited to such small-scale, relatively rapid field surveys.

FIG. 2—*The mass grave of four individuals was located in the northwest corner (shown) by probing. The floor of the underground bunker was muddy, with pools of standing water, debris, and holes dug by earlier searchers.*

In one such case, undertaken at the request of a private company, the objective was to determine whether a small family cemetery consisting of two late 19th century burials was present in an area currently operated as a sod farm. Land conveyance records dating from 1917 indicated the presence of two burials, but no trace of them remained in the open, grass-covered area.

A farmer who had resided on the property before it became a sod farm reported that two fieldstone markers had once been located near a pear tree and adjacent to the fence line. By matching details of the farmer's description with earlier aerial photographs, the test area was narrowed to a 32 × 32-foot square with a mound at the center. The mound probably resulted from plowing around it; that is to say, the cemetery site was probably undisturbed for many years (possibly until about 20 years ago).

After marking the perimeter with stakes and heavy cord, the test area was divided into eight four-foot-wide search lanes oriented east/west. Half-inch-diameter steel rods with rounded tips were used to probe across each search lane at intervals of six inches. Preliminary probing and soil sampling in the surrounding area revealed several inches of root matting and humus, followed by 2.0 to 2.5 feet of yellow-gray, sandy clay, then hard brown clay, and bedrock of brown siltstone. The soil was extremely moist from heavy rains.

When a difference in soil density from the surrounding area was detected in the test area, red markers were inserted, and all flagged areas were retested by a second investigator for verification. The pattern of red marked areas showed two grave shafts of sufficient size to accommodate adult burials. The northernmost was at a depth of 3.3 feet from grade level, and the southern, at a depth of 3.7 feet. After probing, cores were taken with a one-inch diameter collecting tube (Fig. 3). Deteriorating wood occurred at the bottom of both burial shafts, and one also contained soil stained by iron oxide. The hard brown clay beneath each shaft was probably the reason that the graves were so shallow. After probing and coring, the graves were outlined with tape, mapped, and photographed.

In a second example, the desecration of the George Millan family cemetery was called to the attention of the Fairfax (VA) County Board of Supervisors by a historian/archaeologist who had been doing research on this prominent family of the early Federal era and discovered that the cemetery had been obliterated between 1984 when he did research there and 1990 when he revisited the site. As a result, the Board of Supervisors directed the staff of the Heritage Resources Branch of the County Office of Comprehensive Planning to undertake a survey. The Smithsonian assisted in this effort.

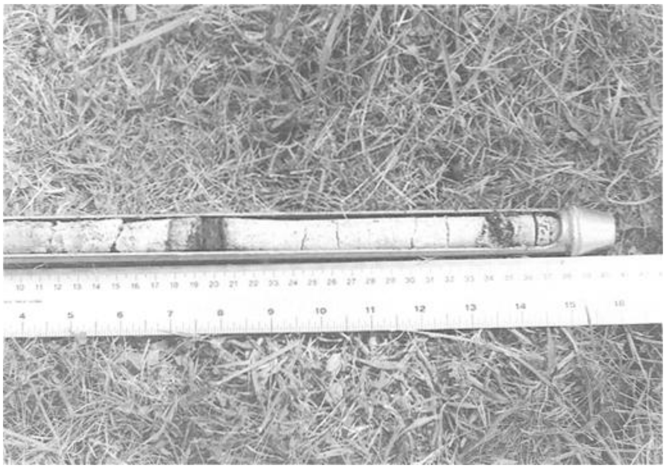

FIG. 3—*Core sampling confirms the location of a 19th century burial by the dark bands representing the lid and floor of a wooden coffin.*

The 35 × 40-foot area, now part of a residential yard, had been bulldozed and graded in 1988 or 1989 and all stone markers removed or buried. Some three to six inches of subsoil fill covered the site, with about two inches of the old topsoil layer below it. Beneath that was undisturbed subsoil, a silty loam with schist in it. The soil was hard, and the probe penetrated only six to twelve inches, except in the grave shafts, where it sank to the hilt. The corners of the grave shafts were easily located, and nine such shafts were found. One was wide enough to have held two burials, and three were small, probably children's graves. In addition, probing revealed three, possibly four, gravestones about five inches below grade level at the bottom of the fill. The broken footstone of George Millan's grave was also identified, broken and lying flat at the bottom of the fill. This stone, which had been seen above ground, unbroken and in place in 1984, contained the initials G M. It was about 3.5 inches thick and had been professionally carved and etched in the same pattern as Millan's headstone (in the custody of the Fairfax County Archaeological Survey for repair and safekeeping after being vandalized a decade or so ago).

The grave sites were mapped and photographed, and the findings of the survey transmitted to the Board of Supervisors and other governmental organizations concerned with infringement of state and county codes and with possible future restoration of the site.

Summary

The main goal of this discussion of search techniques and of the successful application of a probe is to draw attention to a simple, portable, inexpensive, readily available tool for detection of contemporary and historic burials. It can be used effectively both in conjunction with other more complex field survey techniques or as the principal tool of search. Successful use requires training and depends to some degree on the size of the area to be searched and the nature of the soil. It is especially well-suited for small-scale surveys in which time and cost are major factors. Carefully applied, it is more likely to prevent than to cause damage, for example, by indicating the level at which the removal of overburden by heavy equipment should stop and excavation by trowel and brush should begin. In the hands of an experienced investigator it can provide a broad range of information in a short time—and it represents a substantial improvement over the "ice pick, screwdriver, or heavy wire" [2] once suggested by Bass as instruments for probing.

Acknowledgments

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