TEXAS HISTORICAL COMMISSION
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Locating Unmarked Graves

Introduction

This guide is intended to help cemetery caretakers, stewards, and the general public understands the options that exist for locating unmarked graves. The most common ways of locating graves are discussed, as well as their advantages and disadvantages. It should be noted that no process is foolproof in finding unmarked graves. There are specific laws related to the protection of graves in Texas. Please see the National Historic Preservation Act (NHPA) of 1966, as Amended, the Antiquities Code of Texas, The Texas Health and Safety Code, Chapter 711, and the Native American Graves Protection and Repatriation Act (NAGPRA).

In cemeteries what you see on the surface does not always reflect what is below. For instance, gravemarkers can be at the head, foot, or center of a grave, or can be some distance from the grave. Burials can be oriented in any direction relative to a marker or nearby burials. The markings on the gravemarker may face towards or away from the burial. Multiple individuals may be buried under one marker. Burials may lack markers, perhaps due to cultural traditions, deterioration of original gravemarker material, or desecration. Markers may also be situated over empty graves. if there is a depression, it may be larger or smaller than expected. Depressions do not always indicate graves, since cemetery workers can borrow soil from one area to fill in low spots in another, creating depressions that may resemble graves. It is not a safe assumption, therefore, that surface conditions indicate what may or may not be below the surface. Where records are inadequate, some sort of remote sensing or subsurface testing is needed to locate burials. Described here are the most common techniques.

Rod probing

One of the most common ways to search for graves is to probe the soil in the area with a 6-foot long rod with a blunt end and a T-shaped handle. These rods can be purchased commercially or be made by the user. The soil is probed in various spots looking for the resistance one would expect from a coffin or vault or an area of less compact soil resulting from the presence of a grave shaft.

> **Advantages:** Inexpensive, easy to use, generally accurate for recent burials in coffins or vaults.
> **Disadvantages:** Invasive, some families may object. Cannot typically find burials that were not in coffins. Cannot find wooden coffins that have rotted, which is very common among graves from the 1800s and early 1900s. The coffin and remains decay and the coffin void fills in, leaving no resistance or voids to be found by the probe. Very difficult to find small coffins of infants or children. Rocks in the soil often give false readings, and it is very difficult to probe when the ground is hard or frozen. May still require ground-truthing by scraping or some other method.

Soil coring

A more-exact method of probing is soil coring, in which a 3/4-inch or 1-inch diameter hollow tube is inserted into the ground above a suspected grave. The core is pulled out, and the soil examined for evidence of disturbance through comparisons with nearby undisturbed areas. This work should be done by a trained archaeologist or soils scientist, since the differences between a disturbed and undisturbed soil can be very subtle, especially if the soil is homogenous or very complex.

> **Advantages:** better than rod probing, since it can detect burials even if the coffin is severely decayed. Cost is usually less than remote sensing. There are numerous qualified archaeologists in Texas who can help; a link to a list of Texas archaeology firms can be found at the end of this document.

Disadvantages: Invasive, so families may object. Requires an archaeologist or soils scientist, so cost is greater than rod probing. Difficult or impossible in rocky soil. Often, soil difference can be so subtle that even a trained archaeologist cannot tell if a grave exists for certain or not, especially if the original soil matrix is very homogenous or if the upper soil layers are disturbed by nongrave activity such as earth moving or burrowing animals. It is very difficult to core when the ground is hard or frozen. May still require ground-truthing by scraping or some other method.

Scraping/formal excavation

The most definitive way of determining if a burial exists in a plot is formal excavation or scraping. This is different from grave digging; typically a grave digger will not notice if they are digging an occupied grave until it is too late and the coffin or burial is damaged or destroyed. Human remains are occasionally found in back dirt or borrow piles at cemeteries, since grave diggers cannot always tell if they have gone through an existing grave. In contrast, formal excavation is the systematic removal of soil in a controlled fashion to locate suspected graves while causing minimal damage to them. Formal excavation is best performed by a trained archaeologist who has an understanding of soils and excavation methods. While there are many ways to perform formal excavation, a common way is to use a wide, toothless backhoe to slowly strip away the soil in level layers a few inches at a time. This allows the archaeologist to check for evidence in the soil of a grave shaft (the filled-in grave hole) above the burial. Once evidence of a burial is encountered, archaeologists can map the burial and leave it in place. This is often referred to as scraping. Formal excavation/scraping most commonly stops well above the grave if there is evidence of a shaft. This is often the method required for ground-truthing other types of grave location techniques.

Advantages: Almost fool-proof and, if properly done, will provide a definitive answer. Can be performed in any soil type, rocks are not a problem. If other methods will require ground-truthing, scraping first will be a cost savings. There are numerous qualified archaeologists in Texas who can help; a link to a list of Texas archaeology firms can be found at the end of this document.
Disadvantages: Invasive, so families may object. Expensive; it requires an archaeologist and machinery (though less expensive than a geophysical survey followed by scraping to ground-truth). There is always a chance that a very ephemeral burial will be missed and destroyed by machinery, although this is highly unlikely.

Ground-penetrating radar (GPR)

With GPR, a radar wave is sent into the ground and the reflected signal is recorded. The time it takes for the signal to return reflects the depth of penetration, and the returning signal can be stronger or weaker depending on the type of material it is passing through and reflecting off. This data can be used to make an image of the subsurface. A GPR technician will move an antenna over an area, recording data. This data is then processed in a computer to create a two- or three- dimensional image of the subsurface. Under ideal conditions, the grave shaft and possibly the coffin or vault will be visible, but under even the very best normal conditions, only the upper part of the grave shaft may be visible. May still require ground-truthing by scraping or some other method.

Advantages: GPR is non-invasive, so families typically do not object. Under ideal conditions, it can provide a highly-detailed image of the subsurface. GPR is probably the best form of remote sensing if the clay content of the soil is low and the surface conditions are favorable. Geophysical practitioners can be found by contacting one of the archaeologists on the list referenced below.
Disadvantages: GPR's effectiveness depends greatly on soil conditions; it does not work well in clay-rich, rocky, or saturated soils. Success also depends on surface conditions and vegetation. GPR can be expensive and often requires some form of ground-truthing.

Resistivity

Resistivity can often be useful in finding graves, it is based on the principle that soils have differing moisture retention properties and therefore conduct electricity differently. A small electric charge is run between spikes

placed in the ground, and the resistance is measured. When a soil is disturbed, as in a burial, different types of soil are brought near the surface which has very slight differences in electrical resistivity. The surveyor will probe at close intervals over a large area collecting data, which is then downloaded into a computer to show areas of disturbed soils. In a cemetery, these often correspond to marked and unmarked graves.

> **Advantages:** The spikes only penetrate a few inches into the soil, so it is relatively non-invasive and families typically do not object. Can give some idea if disturbances are deep or not. Under ideal circumstances, resistivity is quite effective. Geophysical practitioners can be found by contacting one of the archaeologists on the list referenced below.
> **Disadvantages:** Resistivity is ineffective if the upper level of soil is disturbed over a large area (for example, by previous bulldozing), and it is ineffective under certain conditions, such as when the soil is very wet or very dry. Can be expensive. May be adversely affected by rocky soil. May still require ground-truthing by scraping or some other method.

Conductivity
Conductivity is often effective in finding graves. It works by applying a magnetic field to the ground surface. This magnetic pulse causes the soil to generate a secondary magnetic field, which is recorded to make a map. When a soil is disturbed, as in a burial, different types of soil are brought near the surface which have very slight differences in conductivity. The surveyor will walk an instrument over a large area collecting data, which is then downloaded into a computer to show areas of disturbed soils. In a cemetery, these often correspond to marked and unmarked graves.

> **Advantages:** Conductivity is non-invasive, so families typically do not object. Can cover a large area in a fairly short period of time. It can be very effective under the proper conditions. Suitable instruments are often available from local soil scientists, but one must be certain the operator understands how to identify variation associated with graves. Geophysical practitioners can be found by contacting one of the archaeologists on the list referenced below.
> **Disadvantages:** Conductivity is ineffective if the upper level of soil is disturbed over a large area. It is ineffective in the presence of ferrous metal (iron, steel, etc.), so the survey area has to be very clean and checked with metal detectors; metal markers, vases, etc., must be removed. It can be less effective if the soil is saturated, very dry, or rocky. It is affected by nearby power lines. May still require ground-truthing by scraping or some other method.

Magnetometry
In some circumstances, magnetometers can be an effective way to quickly identify the location of graves. Magnetometers are devices that measure minute changes in the magnetic properties of soil. When a soil is disturbed, as in a burial, different types of soil are brought near the surface which have very slight differences in magnetism. The surveyor will walk a magnetometer over a large area collecting data, which is then downloaded into a computer to produce maps that show areas of disturbed soils. In a cemetery, these often correspond to marked and unmarked graves.

> **Advantages:** Magnetometry is non-invasive, so families typically do not object. Can cover a large area in a fairly short period of time. Can be very effective under the proper conditions. Geophysical practitioners can be found by contacting one of the archaeologists on the list referenced below.
> **Disadvantages:** Magnetometry is ineffective if the upper level of soil is disturbed over a large area. Soils need to have significant iron oxide content, or it will not work. Ineffective in the presence of ferrous metal (iron, steel, etc.), so the survey area has to be very clean and checked with metal detectors; metal markers, fences, vases, etc., must be removed. Because of its limitations, Magnetometry can be less effective than conductivity or resistance. Magnetometry can be expensive. May still require ground-truthing by scraping or some other method.

Dowsing/witching

A common way to search for graves is dowsing, or as it is frequently called, "witching," or occasionally "divining". The dowser walks over an area with two copper wires or rods bent in an L shape, holding the short ends in each hand and pointing the long ends forward. Dowsers believe the wires will cross over a grave. This practice is ultimately derived from an old English and German folk belief that willow or hazel sticks have an uncontrollable desire for water and will point to underground reservoirs. In America, the willow was replaced with copper rods and used not only to find water, but also graves. One common folk belief is that the two rods will converge if the grave is of a male, and diverge if it is female. Supposedly the magnetic properties of disturbed soil or coffin hardware attract the copper rods. However, this is illogical. First, soil and coffin hardware do not attract metal, as simple experimentation will show. Soil is so weakly magnetic that a hyper-sensitive magnetometer is required to measure it reliably. Second, even if soil or coffin hardware were strongly magnetic, they would not attract copper wire, which is unaffected by magnetism– experimentation at home will show that you can't move a copper wire or penny with a magnet. Third, even if soil or coffin hardware were magnetic, and non-copper rods were used, the rods would *never* cross when exposed to a magnetic field; long metal objects always run *parallel* with strong magnetic fields. Remember the grade-school science project with iron filings on a glass plate over a magnet? The filings line up parallel and curve with the field, they do not cross each other. All credible scientific trials of dowsing have shown that dowsing is no better than random luck or commonsense intuition at finding graves or water (for further information, refer to Robert Todd Carroll's reviews of scientific tests of dowsing in the Skeptic's Dictionary [John Wiley & Sons, 2003], www.skepdic.com/dowsing).

> **Advantages:** There are no advantages to dowsing.
> **Disadvantages:** Dowsing is no better at finding graves than common-sense intuition. Dowsing could put yourself or your organization at legal and financial risk and could lead to public embarrassment. When you make determinations about the presence or absence of burials in a plot you are making decisions about other people's property which carries legal and financial liabilities. Since there is no scientific basis behind dowsing it will likely not be legally defensible. While other technologies and methods described here are not foolproof, they can at least be explained and justified in court because they are based on scientific or observational principles.

How to contact archaeologists and geophysicists (remote sensing practitioners):

A full list of qualified archaeologists working in Texas is maintained by the Council of Texas Archeologists on their website. View the contractors list at: www.c-tx-arch.org.

This guide was based on a publication of the Iowa Office of the State Archaeologist