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Comparison of 3 methods for locating buried remains

M. Damon Murdo

The University of Montana

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A COMPARISON OF 3 METHODS FOR
LOCATING BURIED REMAINS

by

M. Damon Murdo

B.A. University of Montana, Missoula, 1999

presented in partial fulfillment of the requirements

for the degree of

Master of Arts

The University of Montana

July 2001

Approved by:

Chairperson

Dean, Graduate School

Date
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A Comparison Of Three Methods For Locating Buried Remains (58pp.).

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The search for buried remains has involved many specialists from different disciplines (France et al. 1997). The goal and purpose of this thesis is to compare the effectiveness of the methods used from three different disciplines in the search for buried remains. The three different specialists used were law enforcement, a decomposition dog team, and archaeologists. The most common type of search method used when looking for buried remains is a visual search. The law enforcement and the archaeologists both used this method. The decomposition dogs use their sense of smell to find a buried body. The hypothesis states that a trained archaeologist will be able to locate a burial quickly, effectively, with less manpower, and in ways that provide more accurate information to the burial than the techniques used by law enforcement agents or decomposition dogs.

Two mature pigs were buried in trenches in this study and left for approximately one month before the specialists were allowed to search for them. The specialists were given as much time as needed to search for the buried remains. The archaeologists were able to locate the burials more quickly and accurately than the other specialists involved. There are many advantages to using archaeologists at the scene of possible buried remains. Archaeologists are trained to recognize indicators of buried features as well as to assess soils, stratigraphy, pollen, and other factors that can aid in the recovery of a buried body. This data recovered from this thesis shows why trained archaeologists should be an integral part of every search for buried human remains.
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INTRODUCTION – CHAPTER 1

When a murder has been committed and the remains of this individual have been buried the law enforcement agency in charge of the investigation has to use every available technique or method in the search for the remains. The law enforcement agency may be trained in search techniques, but these techniques may not be effective enough when searching for buried human remains (Morse et al. 1983, France et al. 1997). One type of specialist that should be called in on the search is a forensic anthropologist, or archaeologist who “is trained to recognize subtle indications of a buried feature in the outdoor setting” (Dirkmaat and Adovasio 1997).

Anthropology is an academic area commonly defined as “the study of human kind” (Boaz and Almquist 1997). Anthropology in the United States is divided into four sub disciplines: Cultural, Linguistics, Physical, and Archaeology. Cultural anthropologists study human societies, their belief systems, and their social behavior. Linguistics is the study of languages, their structures, origins, and the interactions of language in society. Physical anthropology is the study of human variation, biology, evolution, and adaptation. A specialty area within physical anthropology is forensic anthropology. Boyd (1979) defines a forensic anthropologist as “one who can assess skeletal remains and study man in relation to his origin, classification, relationships of races, physical characteristics, social relations, and cultures.” Archaeology is the study of past cultures and their life ways by use of preserved artifacts and features. (Boaz and Almquist 1997).
The goal and purpose of this thesis is to determine the effectiveness of the use of archaeologists in a search for human remains in comparison with other methodologies. Many specialists from different disciplines have been recruited in attempts to locate buried human remains (France et al. 1997). Three types of specialists and their methods will be examined here. The specialist most often used to locate and recover buried remains is someone from a law enforcement agency involved in the case. This law enforcement agency should be completely in charge of the investigation (Boyd 1979). Another type of specialist frequently called upon is a person with dogs that are trained to sniff out human remains. A third appropriate specialist is the archaeologist, but very seldom are archaeologists used for searches having the purpose of locating and recovering human remains. I hypothesize that the trained archaeologist will be able to locate a burial quickly and effectively, and that archaeologists and their techniques can be used to locate buried remains faster, with less manpower, in a manner less disruptive to the surroundings and in ways that provide more accurate information related to the burial than the techniques used by law enforcement agents or decomposition dogs.

Although archaeology often is linked to the discovering of ancient remains (Clark 1957, Heizer & Graham 1967, Fagan 1972, Hunter et al. 1996), more current situations could also benefit from the use of these methods. Morse et al. (1983) define forensic archaeology as “the application of simple archaeological recovery techniques in death scene investigations involving a buried body or skeletal remains.” Archaeologists are trained in the proper techniques needed to exhume the remains once a burial is found. This is especially important for potential crime scenes.
The reasons that fast recovery of remains is important include increased chances of proper identification, and of apprehending the individual that committed the crime. The faster a body is recovered the less arduous identification of the individual will be. The longer a body remains buried the more it will decompose, making a definite identification more difficult. Decomposition of a body starts immediately following death and then continues until only skeletal material is left (Bass 1997).

Each ecological area produces different decomposition rates. The environment in which a body is buried has a major role in the decomposition process. Temperature, moisture, soil type, and atmosphere all play a part in how a body decomposes. Other factors such as animal scavenging, insects, plants, bacteria, etc. also influence the rate of decomposition. Depending on how all these factors interact, decomposition of a buried body can be a fast or a slow process (Rodriquez and Bass 1985, Bass 1997, Clark et al. 1997, Galloway 1997, Gill-King 1997, Micozzi 1991, 1997).

The environment not only plays a role in the decomposition of a buried body, but also affects locating and recovering a buried body. The role the environment plays in the burial of a body is part of the field of forensic taphonomy. Forensic taphonomy, according to Haglund and Sorg (1997), is used “in forensic contexts to estimate time since death, reconstruct the circumstances before and after deposition, and discriminate the products of human behavior from those created by the Earth’s biological, physical, chemical, and geological subsystems.” The geology, geography, elevation, and time of year are all important when it comes to locating and exhuming a body. These factors can hasten the recovery of the remains or may make things very difficult for the investigators.
Little has been written or researched regarding the search for buried remains. Rodriguez and Bass (1985) authored one of the first extensive reports done on buried human remains. In their study Rodriquez and Bass buried six human cadavers at different depths and for different amounts of time. The purpose of their study “was to provide more reliable criteria for determining time interval since death of a buried corpse”. They were also very interested in looking at certain methods that might help in finding the locations of the buried remains.

Diane France et al. (1992, 1997) have conducted other research in this area. Project PIG (Pig In Ground) was a research project conducted in Colorado that was designed to use a multidisciplinary approach to detect the location and aid in the excavation of clandestine graves. The project was started because there were very few traditional methods in use at the time for locating clandestine graves. The main goal of the project was to find out “how could law enforcement best approach the recurring problem of location, evaluation and exhumation of a clandestine grave in such a manner as to preserve evidence and maximize its eventual use in a court of law”(France et al., 1992, pp.1445). My project is similar to Project PIG in that we are using many of the same methods to try and locate buried remains. The difference between my project and Project PIG is that I am focusing on the archaeologists and their methods.

The multidisciplinary approach of France et al. (1992, 1997) brought several fields of study together. It examined methods of aerial photography, geology, botany, entomology, geophysics, thermal imagery, scent-detection dogs, archaeology, naturalists, and law enforcement. These fields of study were used both before and after pigs were buried in a known location. Each had its own methods that were used to try and locate
the burials and each of these methods was assessed as to how advantageous or disadvantageous it was. The methods were also rated as to how destructive they were to the buried pigs.

Killams’ book *The Detection of Human Remains* (1990) describes many methods that can be used for locating human remains. This work brings together many different examples of how to locate buried remains, ranging from archaeological methods to geophysical methods, remote sensing techniques, aerial photography, and even parapsychological methods. The core of Killams’ book was written so it could be used as a guide to understand the methods that are used when trying to locate surface or buried bodies (Killam, 1990).

**DECOMPOSITION DOGS**

One technique often used in the search for buried remains is to bring in dogs known as decomposition or cadaver dogs. This is a useful technique, not only because the technique is relatively non-destructive (France et al., 1992), but also because the technique is fairly accurate. Decomposition dogs are becoming more and more widely available to assist law enforcement. If the dogs are not part of the law enforcement team, a cadaver dog team is usually brought in to work alongside law enforcement. The decomposition dog team is usually part of the search and rescue team, which is a volunteer position and therefore they do not cost the law enforcement agency money.

Decomposition dogs rely on their sense of smell to find a buried body. After a body is buried and starts to decompose certain gases and amino acids are released into the air and the ground from the body. These gases and amino acids are the scents that the dogs pick up on. There are certain conditions that may affect the ability of the dog to
pick up these scents. These conditions usually revolve around weather. Temperature, humidity levels and wind all have different effects on the dogs themselves as well as on the way the scents can be detected. Excessive heat or cold can reduce the ability of the dog to pick up a scent because it usually causes some discomfort to the dog (France et al., 1997). The dog may still be able to pick up the scent, but it needs to be within one or two meters from the source. Humidity, moisture and wind contribute positively in their effects on the dog’s work.

Moisture may help the dog pick up a scent of buried material by opening up cracks in the soil. This allows the scent to move out of the ground more easily. High humidity allows a dog to pick up a scent from a greater distance (France et al., 1997). Wind is beneficial when a dog is searching for buried remains. The wind allows the decomposing body scent to carry further allowing the dog to pick it up and follow it to the source.

Decomposition dogs are just one type of scent dog that is used in the search for human remains. Other types of scent dogs are drug detection, bomb search, and man-tracking dogs (Johnson 1977). All of these dogs are trained to detect a certain scent, or odor given off by the drugs, explosives, or bodies. Air-scent dogs are trained to search for scent that is airborne. This scent travels downwind in a cone-shaped pattern and can be picked up by a properly trained dog. The dog and handler work in a zigzag search pattern into the wind. When a dog picks up a scent it will follow it to the source and signal its location. The signal usually varies depending on how the handler trained the dog. Signals commonly used are sitting, barking, and digging (Sorg and David 1999).
ARCHAEOLOGICAL METHODS

Archaeologists have various different methods to use in searching for buried bodies. The main method that archaeologists use is to survey an area (Clark 1957, Heizer & Graham 1967, Fagan 1972). A visual survey involves no equipment. Forensic anthropologists with archaeological training are “experienced in observing the natural and artificial changes in soils, plants, and insect communities”. (Pickering and Bauchman 1997, 47) Archaeologists are trained to scientifically excavate objects that have been in the ground for a period of time. Archaeologists have effective methods for obtaining large amounts of relevant information on how human remains can be found and on the processes that were used when the remains were hidden (Brothwell 1972, Killam 1990, Chamberlain 1994). An archaeologist in the state of Montana, 2001, will charge on average twelve dollars an hour for their expertise (Lenert 2001).

**Signs**

**Disturbed vegetation** - When a body is buried the vegetation around the grave is going to be disturbed in some way. Any vegetation that was used to try and hide or cover up the site will give a clue as to where a body may be. The vegetation may be mixed with soil when the soil from the grave is put back in the hole. The change in color, height and amount of the vegetation from surrounding vegetation may also be a visual clue as to where a body may be (Boyd 1979, Morse et al. 1983). When a body is buried for over a year or more the organic materials put back in the soil by the decomposed body should increase the growth of vegetation over the burial location (Rodriquez & Bass 1985).

**Disturbed soil** - Along with the disturbed vegetation, disturbed soil is another visual sign as to where a body may be located. The soil may become mixed with soil
from areas around the grave. As stated earlier the soil may become mixed with the vegetation. The consistency of the soil in the grave will also be different from the soils around the grave because the soil is no longer compact, but mixed (Morse et al. 1983).

Compaction of soil- When a body is buried the soil that is on top of the grave will settle over time. The area over the top of the grave will become lower than the surrounding soil, forming a depression. The amount of time it takes for the soil to become compact will depend on the type of soil and the environment (Morse et al. 1983).

Secondary depression- A secondary depression is made when the abdominal cavity of a body has decomposed. The soil falls into the cavity and a small depression may be seen within the larger, grave depression. Graves that are deep may not show a secondary depression. Shallow graves usually yield a very pronounced secondary depression (Boyd 1979, Morse et al. 1983).

After an archaeologist has made a visual assessment of an area to be searched, he or she will assess the visual clues that may show the possible presence of a burial; disturbed vegetation, insect activity, and the difference in soil color and texture. Certain areas may call for more testing techniques to be used to determine accuracy of the assessments. Among the techniques for verifying the location of burials are the probe and shovel tests.

Probe Test- A probe is a metal rod, usually slightly pointed on one end, with a T-bar shaped handle at the other end (Morse et al., 1983). After the area to be searched has been marked off in a grid, searchers with their probes follow a grid pattern inserting the probe every 10 or 20 inches. Each person with a probe should be well aware of the soil characteristics in the area. Certain soils are harder to penetrate than others. Each probe
should become more difficult in its penetration after reaching a depth of approximately one foot. When an area of recently disturbed soil is probed, the penetration will be fairly easy and deeper compared to the surrounding soil. If that soil has been disturbed by a burial, the easier it will be for the probe to penetrate. Once this area is found it should be marked and the outline of the burial should be found with the probe. The depth of a burial shaft can also be determined by the use of the probe, although this may cause some damage to whatever may be buried (Owsley, 1995).

The probe is a relatively non-intrusive way of searching for a burial. Probes are an easy to use, non-expensive and accurate way of narrowing down a search area for a burial. There is more than one type of probe that can be used in the search. The regular metal probe described earlier is the least expensive, but other probes are just as good to use. The gas probe has a sensor that can detect gases that are released from a decaying body. Certain gases are released from these decomposing bodies and a gas probe, when inserted into the ground, may be able to pick them up (Owsley, 1995). Another type of probe is the soil temperature probe. Decomposing bodies have been shown to raise the temperature of the surrounding soil by a few degrees. This can be detected by using subsurface soil temperature probes. The last type of probe that could be used is a soil pH probe. Besides increasing the temperature of soil around a burial, decomposing bodies have also been known to increase the alkalinity of the soil around a burial (Rodriquez & Bass, 1985). Soil pH probes can be used to measure this increased alkalinity and possibly detect a burial (Owsley, 1995).

The probe is a technique that is not used very often by archaeologists. It is inexpensive, easy to use, available to everyone, easy to transport and requires hardly any
maintenance. The main disadvantage of the probe is that the searchers using the probe need to be trained in how to handle and use it properly. It is a tool that, along with other archaeological search techniques, should be used more often than it is (Owsley, 1995).

**Shovel Test**: Once an area is discovered archaeologists often use a quick shovel test to determine if the area has a possible burial. When performing a shovel test an archaeologist will dig into the expected area to a depth of three to four feet, or until sterile soil is hit. By digging down this far archaeologists can determine if the stratigraphy of the soil is natural or reversed. This process is can be slightly destructive depending on how fast the archaeologist digs. If there is a possible burial a properly trained and cautious archaeologist may dig in 10 cm intervals only, causing little or no damage to anything that may be buried (Barker 1993).

**LAW ENFORCEMENT METHODS**

Law enforcement techniques and archaeological techniques for searching an area where a body may be buried are similar in some ways. The main similarity is in the initial searching that is done for the burial. Both archaeologists and law enforcement use visual clues to help in the location of a burial. These visual clues include disturbed vegetation, disturbed soil, compaction of soil, and possible depressions and secondary depressions. The actual techniques that are used differ only slightly. The only cost to law enforcement when searching for buried human remains is if they decide they need certain experts, or equipment that they do not already have (Grimmis 2001).

**Visual Search Methods**

**Strip or Grid**: When searching for a buried body certain methods are used. The first search method to be discussed is referred to as the strip or grid method. In this
method the area that is to be searched is marked off into a square or rectangle. Usually three or more searchers stand at an arm’s length away from one another and walk in a line parallel to the base of the square or rectangle search area. When the searchers reach the end of the marked off area they turn around and walk back along new lines that have not yet been searched. After the entire area has been walked parallel to the base, the entire area is then walked parallel to the side following the same rules. This allows an extensive area to be searched closely (O’Hara 1963, Hughes 1974, Snyder 1977, Geberth 1996).

**Zone Wheel**- Another method is called the zone wheel method. In this method the searchers all stand at the middle of the area to be searched and proceed outward from the center. This is repeated a number of times from the center with each searcher going in a different direction every time. The main problem with this method is that as soon as the searchers depart from the center and walk outward, the area that is searched decreases with each searcher moving farther and farther from one another (O’Hara 1963, Hughes 1974, Snyder 1977, Geberth 1996).

**Zone**- A third method that can be used is the zone method. Again, the area to be searched is marked off into a square or a rectangle. After this is done the area is divided up again and again into quadrants until small units are made. As soon as this is done one searcher is put in each unit where they search very closely (O’Hara 1963, Hughes 1974, Snyder 1977, Geberth 1996).

**Spiral**- The last method to be discussed is the spiral method. First the search area is marked off. The searchers then proceed to walk in a spiral toward the center of the marked off area. The searchers can either walk directly behind one another, or they can
walk side by side. This usually depends on how large the area being searched is. If these search techniques don’t reveal any visual clues as to where a buried body may be, other techniques like those of metal detectors and decomposition dogs may be used (O’Hara 1963, Hughes 1974, Snyder 1977, Geberth 1996).

**Metal Detectors**

One search tool that law enforcement commonly uses is the use a metal detector. Metal detectors are non-intrusive, and simple detectors can be easily obtained, but an experienced operator is needed. When using a metal detector to locate a buried body the assumption is that there will be metal objects on or with the body. A wide range of metal detectors is commercially available, with the ease of operation varying according to sophistication. Compared with some other methods used, metal detectors are relatively cheap in cost (approximately $150-1000) (Kellyco 2001).

The commonly used metal detectors contain a transmitter, powered by a battery, that radiates a low frequency signal into the ground by means of a coil that is placed at the bottom of the metal detector. The larger the coil’s diameter, and the more power, the better and more accurately the detector works. When the low frequency current signal reaches any metal or mineral that is in the soil, the metal or mineral re-radiates a signal back to the surface. This signal is what the metal detector’s receiving coil picks up (Killam 1990).

Metal detectors have a few disadvantages too. First, they can detect only metal material (ferrous, nonferrous), and only to a few feet in depth. The depth at which the detector can react to metal depends on the coil size and the size of the metal object.
(Killam 1990). Large metal objects can be detected at a deeper level than small ones, which can be detected only if they are close to the surface (Hunter et al. 1996).

Another problem is that metal detectors are often used ineffectively in the field (France et al. 1997). The operator of the metal detector needs to have a lot of experience in locating objects below ground level. The operator needs to know how to read the machine and understand how to use it properly. If a metal detector is being used in soil that it high in minerals, or near large metal objects the operator needs to know that the machine will not give reliable readings (Killam 1990).

OTHER SEARCH METHODS

There are many other methods that can be used in the location of buried human remains. These methods were not tested in this study due to lack of access and funding. France et al. in Project PIG used many of these methods, which include Ground Penetrating Radar, forensic botany, and entomology.

Ground Penetrating Radar (GP)- Ground penetrating radar is a technique that is becoming more widely available to archaeologists in the field. It is one of the most useful techniques for locating burials. GPR sends electromagnetic waves into the earth then records the energy that is reflected back from materials located below ground. The radar can detect any changes that have been made in the soil, patterns of excavation, and even metallic objects (Killam 1990, France et al. 1992).

Radars that are designed for probing into the earth operate 80 to 900 megahertz (France et al. 1992). It is necessary to use low frequencies because the earth absorbs radar waves well. One problem with using low frequencies is that they give long wavelengths, which give low resolution. A short pulse is used to allow accurate measurements of depth.
to the target. The echoes that are reflected back are displayed on an oscilloscope (Killam 1990).

Even though GPR is one of the least destructive and non-intrusive techniques that can be used by archaeologists there are some major disadvantages to its use. One disadvantage is that the GPR works well only in smooth areas with a constant elevation (Owsley, 1995). Smooth, level ground cannot be guaranteed when an archaeologist is working in the field. Another disadvantage to using GPR is that the equipment that is needed is very hard to obtain and relatively expensive (France et al., 1992). As previously stated with the metal detector, the GPR needs to be operated by a properly trained person. Rental of a GPR machine can cost anywhere from $200 to $700. The price of hiring a company or individual that is trained in its use varies depending on the amount of land to be covered (Geomodel 2001).

Botany- Forensic botany can also be used in the location of buried human remains. When a grave is dug and the soil is disturbed the vegetation is usually destroyed and dies. When new vegetation starts to grow on this disturbed soil and with extra nutrients in the soil from the decomposing remains, the vegetation may flourish. The types of plants on the disturbed area are usually noticeably different from those on the surrounding undisturbed areas (France et al., 1997). If an investigator has some knowledge of the plants located in the area where a body may be recovered, it may be helpful in locating some buried remains (Boyd 1979, Willey & Hellman 1987, Hall 1988, 1992).

Entomology- Insects are usually one of the first organisms to arrive at the location of a dead body. Specific insects are attracted to decomposing bodies. Knowing what type
of insects to look for when searching for a burial may aid an investigator locating a burial site. Forensic entomologists analyze the insects that are attracted to decomposing bodies and are able to tell time since death, or postmortem interval, of an individual based on the stages of development in the insects. The estimation of Postmortem Interval (PMI) by using insects and their stages of development have been well documented (Payne 1965, Payne et al. 1968, Johnson 1975, Borror et al. 1989, Catts and Goff 1992, Terneny 1997, Ubelaker 1997, Barnes 2000).
MATERIALS AND METHODS – CHAPTER 2

This project could not use real human cadavers in the burials, because of legal requirements involved in burying human remains and the need for scientific controls. A substitute cadaver needed to meet certain requirements. First it had to be similar in size and weight to a human. Second, it needed to be able to decompose at around the same rate that a human corpse would. And third it needed to be something that was readily available. Using pigs filled all three requirements. Pigs are similar to humans in their size and weight, and pigs have been used in studies similar to the one being conducted here (France et al., 1992). Pigs have been considered to be biochemically and physiologically similar enough to humans to be used in studies of patterns and rates of decay and scavenging (France et al. 1997, Terneny 1997, Barnes 2000).

Only two mature pigs were used in this study. Although a larger sample size would possibly be preferred for this study the use of only two pigs was a result of limited access and the cost of the pigs (approximately $120 each). Both pigs were obtained from Hamilton Packing in Hamilton, Montana. The amount of land that was being used for the study also was a factor. Finding a plot of private land big enough to bury two mature pigs without them being directly next to each other was difficult.

RESEARCH AREA

The area in which my study took place is located in the Bitterroot Valley of Western Montana. Western Montana is comprised of many mountain ranges that are part of the Northern Rocky Mountains. Broad, smooth-floored valleys, ranging from 3,000-5,000 feet above sea level, separate the mountain ranges. These mountain ranges and
valleys are the result of glaciers and erosion. Victor, Montana, is located within the wide flood plain of the Bitterroot River. This river deposits large amounts of sediment that block the path of the river, forcing it to form new channels. These sediments from the river are being deposited on the floor of a dropping fault block located between Stevensville and Hamilton, Montana (Alt & Hyndman, 1986). Without these sediments filling the depression, that section of the valley, including my study area, would be a lake (Alt & Hyndman, 1986). The temperatures and precipitation in the valley are primarily influenced by moist Pacific maritime air from the west. In western Montana, as compared with the eastern plains area, winters tend to be milder while summers are cooler (McRae and Jewell 1990).

The area in which this study was conducted is located on private property owned by Bill and Phyllis Groff. Their land is located just west of Chief Victor Camp road and North of Sweathouse Creek in Victor, Montana. The site is frequently used as a pasture for cattle. It has also been used as a burial location for the Groffs’ cattle that have died. Cattle were in the search area up to one week before this project started. The area of land that was used contains a small hill with a few lodgepole pines on it, a large area of flat pasture and an irrigation ditch. The vegetation consists of grasses, some cactus, and sagebrush. The elevation of the land ranges from 3,400 feet in the pasture, to 3,480 feet at the top of the hill. Besides cattle in the area, some coyotes, chipmunks, a marmot, and a few neighborhood dogs can be seen on the property from time to time. Some skeletal remains of bovines can be found scattered around the entire property.
Montana, United States

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Two burial trenches were dug for the pigs, one on top of the hill, and one on the side of the hill. The location of each trench was measured from a datum point that was placed in the northeast corner of the study area. Trench #1 was dug facing in an east/west position approximately 90 meters west from datum and 28 meters south from the northern fence line. The ground on the top of the hill where trench #1 was dug was relatively sparse in vegetation. Only a small amount of grass was present. The stratigraphy of this trench consisted of a layer of vegetation 5cm thick followed by a layer of sand that continued for 75cm to the bottom of the trench. At a depth of around 60cm small pebbles and rocks appeared and by 70cm only sand was present (Fig. 1).

Trench #2 was dug facing in a north/south position on the western slope of the hill approximately 129 meters west from datum and 80 meters south from the northern fence line. The vegetation was sparser on this side of the hill. The stratigraphy of this trench consisted of a layer of vegetation 4-5cm thick followed by a continuous layer of sand to the bottom of the trench (Fig. 2).

The first pig to be buried (Pig #1) was buried in trench #1 by 4:30 PM on March 30, 2001. Both pigs were buried only hours after they were slaughtered. Pig #1 was 157cm long (snout-tail), 31cm wide (side-side) and weighed 159 pounds. Trench #1 was 61cm wide, 175cm long, and had a depth of 76cm. Along with the pig a handful of nickels and pennies as well as two human ribs were added. The nickels and pennies were buried in the hopes that a metal detector could be used to try and locate a buried body with the assumption that a body had metal on it when it was buried. Unfortunately an experienced metal detector operator could not be located for the research. The human
Fig. 1. Stratigraphy of burial trench #1.

Fig. 2. Stratigraphy of burial trench #2.
ribs were buried with the pigs so that scent detection dogs trained to locate human remains would detect the burials.

Pig # 2 was 137cm long, 30cm wide and weighed 152 pounds. It was buried in trench # 2, which was 66cm wide, 175cm long, and at a depth of 91cm. Pig # 2 was buried by 5:00 PM on March 30, 2001. The same items noted above were buried along with Pig # 2 for the same reasons.

The main methods that were looked at in this research were Archaeological survey and probe use, law enforcement survey, and cadaver dogs. These techniques have been chosen because of their availability when an actual search for the location of a burial is needed and also because they are all relatively inexpensive. In this research four factors were looked at when the participants were searching. Whether or not the searchers located both burials, the amount of time that it took them to search, the number of people used in the search, and whether the search process was destructive.
The search area was the same for everyone. It equaled approximately 9 acres. The northern side of the search area boundary was a fence line. The eastern and southern side of the boundary was an irrigation ditch and the western boundary of the search area was an imaginary line running north south at approximately 210 yards west of the datum point. Each individual was told to search within the boundary limits. Because the complete recovery of the burials was not part of the experiment, all participants were asked to report their picks on where the search should be continued further. None of the participants was told that anything was actually buried. They were only told that it was possible human remains had been buried in the location.

RESULTS FROM DECOMPOSITION DOGS

Decomposition dogs were the first to search the area. Deb Termenstein and her two dogs, Fergus and Ruby, conducted the research. Ms. Termenstein has been doing search and rescue with dogs for the past 17 years. Her dogs are trained for search and rescue on land and water as well as for the detection of human remains.

The analysis took place on May 1, 2001. The weather conditions consisted of temperatures around 30-40 degrees, with occasional rain and snow. The wind was not constant and was blowing in gusts from all directions, but primarily came from the west and the south. As described in the previous chapter, the decomposition dogs are supposed to be able to detect the scent of human remains. The dogs were used separately.
The first dog to search was Fergus. Fergus has been doing search and rescue as well as human remains detection for the past eight years. Because the area to be searched was so large both dogs were taken off of their leash and allowed to search freely. We started in the northeast corner and walked south until we came to the border of the search area. From here Deb followed Fergus around the hill to the western border of the search area and then back north. Fergus and Deb searched the entire western side of the hill and Fergus never really hit on anything.

The search continued moving north and south until Fergus started to seem interested in a particular location about 25 meters directly east of burial #2. Fergus was interested in this area where a large tree and a stump were located. Deb stayed in this area awhile and let Fergus search until he was no longer interested. At the time Fergus was interested in this area the wind was blowing from the west to the east. The wind was blowing directly over burial #2 towards this area.

The next area Fergus was interested in was about forty yards north of the previous area of interest. Again it was below a large tree. The area had many small depressions where cattle most likely had been lying down. This area also had a large amount of cow manure around. Fergus stayed interested in this area for quite some time. The whole time that Fergus was at this location the wind was changing constantly, but mostly it was blowing from the west. This location was about ten yards north of burial #1.

Deb and Fergus searched the rest of the search area with no more locations being marked. Fergus was put back into the truck and Deb’s other dog, Ruby, was allowed to search as well. Ruby has been doing search and rescue and search for decomposing human remains for only two years. The same search pattern was used, starting in the
northeast corner and moving south. The results were very similar to the search done by Fergus.

The first area Ruby was interested in was the same as Fergus' second area. This was the area that was below the tree with the manure and small depressions. Ruby was only interested in this area for a little while before she moved on. When she was interested in this area the wind had stopped blowing completely.

Ruby’s next area was another tree about ten yards east of the previous marked area. Ruby was very excited about this area and proceeded to jump and bark repeatedly at the tree. At this point Deb told me that sometimes scent gets stuck and lingers in trees when the wind is blowing. The scent cone can be distorted which can cause secondary scent pools remote from the remains (Sorg and David, 1999). At that time the wind was blowing in a northeast direction directly over burial # 1 and at the tree. Deb then turned Ruby around and worked the dog back and forth in a cone-like formation towards the location of burial # 1.

After the searching was completed Deb gave me three locations that the dogs seemed to be very interested in. She said that the search should be concentrated in those general areas, but because the weather was fairly uncooperative she stated that she wasn’t very confident.

Each dog was given as much time as it needed to search the area. Fergus searched for approximately one hour and fifty minutes. Ruby searched for approximately one hour and thirty-five minutes. Neither dog found the two burial locations even though both dogs had walked directly over them (Tables 1 & 2).
Fig. 3. Decomposition Dog Search

Marker | Border Line | Elevation Line
RESULTS FROM ARCHAEOLOGICAL METHODS

Two archaeologists were recruited for this part of my research. Mike Lenert and Nathan Goodale, both graduate students in archaeology at the University of Montana. The search method that the two decided on was a linear search pattern where both archaeologists start at a boundary, ten meters apart, and walk straight in a given direction until they hit another boundary. This is much like the strip or grid method discussed in the previous chapter under law enforcement. Once they arrive at the next boundary line they simply turn around, move ten yards over and repeat the process until the entire search area has been covered.

The archaeological search was conducted on May 2, 2001. The weather on this day was very similar to the previous day when the decomposition dogs were used. The temperature was between 40 and 50 degrees with some wind, rain, snow, and sun. Starting in the northwest corner of the search area, Mike and Nathan started, ten meters apart, and walked south in parallel straight lines. While they were doing the search they were looking for the visual clues described in the previous chapter. The visual clues they were looking for were a small mound of dirt, disturbed or lack of vegetation, disturbed soil and soil compaction, or a slight depression.

On the first pass, walking south, three areas of interest were marked with pin flags. The first two areas marked, No. 1 and No. 2, were slight depressions found beneath three large trees. This area looked like an area in which cattle had been laying down over a period of time. The third marked area (No.3) on this first pass was an area where the soil was soft and lacked vegetation.
On the second pass, walking north, five areas of interest were marked with pin flags. The first two areas marked on this pass (No. 4 and No. 5) were located at the southern end of the hill where a cattle trail had disturbed the ground. These two areas were a result of the cattle trail eroding away from the side of the hill and slumping down. Markers No. 6 and No. 7 were both on the north side of two trees that had fallen down. Both of these areas showed disturbed vegetation. The last area marked on this pass, # 8, was located about five feet from the northern fence line search area border. This area lacked vegetation.

Walking south again for the third pass five areas were marked by the archaeologists. The first area marked on this pass, # 9, was that of burial # 2 (Table 2). Both archaeologists agreed that this spot was an area that would get a shovel test. The area showed three of the visual characteristics they were looking for: a small mound of dirt, disturbed vegetation, and disturbed soil. Marked areas No. 10 and No. 11 were located below a tree, one on the east side of the tree and one on the west. Marked area No. 10 had disturbed soil and vegetation. The archaeologists looked at marked area No. 11 very closely because of disturbed soil, vegetation, and a large depression. Markers No. 12 and No. 13 were both marked because of disturbed soil and vegetation.

The fourth pass resulted in a total of six areas being marked. Nos. 14 and 15 featured disturbed soil caused by trees stumps that had been pulled out of the ground. The areas behind the stumps were most likely disturbed by the tree when it fell over. Number 16 was a small mound of dirt that was the direct result of a rodent hole next to it. The small mound of dirt was the backfill from the dug out hole. Number 17 was also a small mound of dirt that was looked at very closely by the archaeologists. This mound
had some vegetation growing on it. The area that was marked No. 18 was burial # 1 (Table 1). This area showed two of the characteristics they were looking for: disturbed vegetation and disturbed soil. The archaeologists showed a great deal of interest in this area. Marked area No. 19 was a small depression below a few trees. This area looked very similar to the depressions of marked areas Nos. 1 and 2. This was most likely an area where cattle were laying down. It was also the area that Fergus and Ruby were interested in.

The last pass, walking south, resulted in the discovery of only one area. Marker No. 20 was on flat pasture ground and consisted of an area of disturbed soil lacking vegetation.

After the search was finished the archaeologists walked back through the areas that they had marked and proceeded to pick their top five places on which they would do a shovel test. It should be noted that most of the markers that were placed early on in the searching were removed after the archaeologists took a second look. Markers Nos. 9, 17, 18, 11, and 4 were marked as their top five respectively. The archaeologists examined Nos. 9, 17 and 18 very closely by using a trowel to dig down a few inches into the soil to determine whether the soil was different. It was concluded, after using the trowel, that the top three (Nos. 9, 17, 18) would be shovel tested to see if they could find the burials.

The shovel test was not actually done by the archaeologists because it would have been disruptive to the soil, and the law enforcement part of the research had yet to be conducted. By doing a shovel test a hole, 3-4 feet deep, would have been dug and the first signs of pig # 1 would have been discovered at around 1 and a half feet (45cm). The
first signs of pig # 2 would have been discovered at around 2 feet (61cm). The total search time spent by the archaeologists was one hour and 20 minutes. The shovel testing would have taken approximately another 10 to 15 minutes.

**Probe Results**

Probe testing took place on the archaeologists’ top five marked areas. The probing was conducted on May 6, 2001. The first area probed was marker No. 9 (burial # 2). The probe was placed on the disturbed area and pushed down approximately 25 cm. The resistance of the soil was minimal and little pressure had been applied to the probe. The probe should sink deeper and more easily in disturbed soil (Killam, 1990).

Marker No. 17, a small mound of dirt, was probed next. In this area of disturbed soil the probe sunk easily for the first 30 cm then the soil became more compact and offered more resistance to the probe. Marker No. 18(burial # 1) showed little resistance to the probe. Once pressure was applied the probe sank quickly.

Probing the area of marker No. 11 also required little pressure before the probe sank rapidly. The depression and disturbance of the soil made the probing very easy in this location. The last area to be probed was marker No. 4. This area gave the greatest amount of resistance to the probe. At approximately 15 cm depth the soil became compact and harder to push the probe through.

After these five areas were probed they were ranked in order of how easily the probe sank into the disturbed area. Markers Nos. 9, 11, 18, 17, and 4 were marked as the top five respectively for probing. Once the areas were all marked a more thorough probe search would be conducted in these areas to find an outline of the disturbed area from the surrounding compact area. This was not done however, because like the shovel test, it
would have been disruptive to the soil and I wasn’t sure if more research was still going to take place.

**RESULTS FROM LAW ENFORCEMENT METHODS**

Providing the law enforcement portion of the research was sheriff deputy Jason Grimmis from Lewis and Clark County. After arriving at the search area and reviewing the area to be covered the deputy ascertained that normally a search and rescue team would have been used to search the entire area. In this case only two searchers were used while looking for the burials, deputy Grimmis and his wife, who had volunteered. The law enforcement search used the same search techniques as the archaeologists: the strip or grid method described in chapter 1.

The law enforcement search took place on May 5, 2001. It was a cloudy day with an average temperature of around 50 degrees. Some wind and rain were present at various times throughout the searching period. The search began in the southwest corner of the designated search area. According to the searchers, they were looking for areas of disturbed soil and depressions that were approximately five feet in length.

On the first pass, walking north, two areas were marked with pin flags. The first area marked, No. 1, was an area of disturbed vegetation in the flat pastureland. Marker No. 2 was a slight depression below a stand of trees. This area looked similar to areas where cattle had been laying down.

On the second pass, walking south, five areas were marked. Nos. 3 and 4 were the same two areas that had been marked Nos. 1 and 2 by the archaeologists in their search. As stated previously these two areas were slight depressions where some cattle
had been laying down. Marker No. 5 was an area that the archaeologists had marked as their No. 3, an area with a lack of vegetation and disturbed soil. Nos. 6 and 7 on the second pass both had disturbed soil. This area is where the pasture starts to rise in elevation at the base of the hill.

On the third pass only one area was marked. Marker No. 8 was an area of disturbed soil. Within five feet directly south of this area were three large marmot holes. These holes may have contributed to the disturbed soil marked by the deputy.

The fourth pass had three areas marked, including burial #2. Marker No. 9 was placed on burial #2 (Table 2). At first the deputy believed very strongly in this location, but as I will discuss later on he changed his mind. He liked the area at first because of the amount of disturbed soil. Markers 10 and 11 were marked because the soil had been disturbed. Marked areas 10 and 11 were on the same cattle trail discussed in the archaeological survey and were caused by the erosion of the side of the hill. Number 11 was the same as area No. 4 marked in the archaeology survey.

Pass five featured another area marked that the archaeologists also had marked previously. Number 12 (No. 5 of the archaeologists) was another area of disturbed soil associated with the eroding cattle trail. Marker No. 13 was an area of disturbed soil caused by the falling of a large tree and the roots getting torn up out of the soil. Number 14 was another area previously marked (No. 12 of the archaeologists) and it had some disturbed soil and vegetation. The law enforcement officer looked at marker No. 15 (No. 11 of the archaeologists) closely because of the disturbed soil and large depression.
The next pass was the first in which no markers were placed, but it was not the last. On pass number eight no markers were placed. No areas within their search had the characteristics for which they were looking.

On pass seven five markers were placed. Marker No. 16 was an area where a tree stump had been pulled from the ground. This marker was the same as marker No. 14 placed by the archaeologists. Number 17 was a small area of disturbed soil beneath a tree. Numbers 18 and 19 were the same as numbers 15 and 17 marked by the archaeologists. Number 18 was an area of disturbed soil caused by a fallen tree, and number 19 was a small mound of dirt with some vegetation growing on it. Marker 20 placed by the law enforcement was burial #1 (Table 1). The deputy marked this area because of the disturbed soil, the size of the area disturbed and the fact that a large number of ants were covering the soil.

The last pass done by the law enforcement search party turned up only one marked area. This area, No. 21, was the same area that the archaeologists had marked as their No. 20. This area located on flat pastureland had some disturbed soil and a lack of vegetation.

It should be noted that most of the markers that were placed early on in the searching were removed after the initial searching was done because both the archaeologists and the deputy got a feel for what the entire search area landscape looked like and most of the marked areas were no longer places that they thought remains were buried. After removing the markers the deputy picked his top five places where he thought he would concentrate the search even further. His top five marked areas in order from first to last were Nos. 20, 15, 12, 11, and 4. After the top five were picked the
The deputy said his next step would have been to get a canine unit or search and rescue dogs to search those five areas more closely and then to dig in the areas where the dogs had reacted. If the dogs didn’t react to any of these areas in particular, they would dig the top five spots in the order of which ones most likely had buried remains within (Grimmis 2001).

The total time of the search by the law enforcement officer was one hour and thirty minutes. The time it would take to use the dogs is minimal because they could be used as soon as an area was marked. Digging time would be approximately 10 to 15 minutes. It should be noted that the deputy did look at burial # 2 closely earlier on in the search before changing his mind when he picked his top five. The fifth pick in his top five was between Nos. 4 and 9 (burial # 2), but he settled for No. 4 instead.
Fig. 5. Law Enforcement Search
Table 1 – Results From Burial # 1

<table>
<thead>
<tr>
<th>METHOD</th>
<th>BURIAL # 1 LOCATED</th>
<th>TIME IT TOOK TO LOCATE # 1</th>
<th>MANPOWER USED</th>
<th>DESTRUCTIVE OR NON-DESTRUCTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archaeologist</td>
<td>Yes</td>
<td>1hr 20 min</td>
<td>2</td>
<td>Slightly Destructive</td>
</tr>
<tr>
<td>Law Enforcement</td>
<td>Yes</td>
<td>1 hr 30 min</td>
<td>2</td>
<td>Non-Destructive</td>
</tr>
<tr>
<td>Decomposition Dogs</td>
<td>No</td>
<td>Fergus 1 hr 50 min Ruby</td>
<td>1 handler 2 dogs</td>
<td>Slightly Destructive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 hr 35 min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 – Results From Burial # 2

<table>
<thead>
<tr>
<th>METHOD</th>
<th>BURIAL # 2 LOCATED</th>
<th>TIME IT TOOK TO LOCATE # 2</th>
<th>MANPOWER USED</th>
<th>DESTRUCTIVE OR NON-DESTRUCTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archaeologist</td>
<td>Yes</td>
<td>1 hr 20 min</td>
<td>2</td>
<td>Slightly Destructive</td>
</tr>
<tr>
<td>Law Enforcement</td>
<td>No</td>
<td>1 hr 30 min</td>
<td>2</td>
<td>Non-Destructive</td>
</tr>
<tr>
<td>Decomposition Dogs</td>
<td>No</td>
<td>Fergus 1 hr 50 min Ruby</td>
<td>1 handler 2 dogs</td>
<td>Slightly Destructive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 hr 35 min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DISCUSSION – CHAPTER 4

It was found by doing this research that there are many factors that come into play when searching for buried human remains. These factors include, but are not limited to, the environment, the methods used, the people used, the amount of time allowed, and the amount of time the remains have been buried. Each time a new method was used new factors were involved that affected the result.

The results obtained when the decomposition dogs were used in the search were close to what was expected before the search had begun. It was known that the environment would play a role in the effectiveness of the dogs search, and it did. Although the dogs did react to scent when they were downwind of the burials, the wind needed to be fairly strong and constant. When wind patterns are variable it can cause uneven distributions of the scent molecules and the scent cone can break or distort (Sorg and David, 1999). This is not always going to occur. The dogs never reacted when they were within 10 yards of the burials and not even when they were directly above them. According to other research, the ideal weather conditions for locating human remains need to be within a temperature range of 40 to 60 degrees Fahrenheit, with some humidity, moist ground, and a constant wind speed (France et al., 1992). The temperature on the day of the search was around 40 degrees Fahrenheit with slight humidity and moist ground, but the wind speed was not constant.

Another factor previously not discussed, or at least not found, in other research was distractions for the dogs that may come up when searching. While Deb and her dogs were searching the area many things caused slight distractions for her dogs. One main distraction for the dogs was the cow and marmot manure. The surrounding wildlife,
neighborhood dogs, and the irrigation ditch were also somewhat distracting for the dogs. Even though the dogs were some times distracted Deb quickly got them back to searching. In previous studies it was shown that one disadvantage to using decomposition dogs was that the dogs may not be totally qualified and the handler may overstate their qualifications (France et al., 1992).

The results obtained by the archaeologists were close to what was expected from them before the searching had started. The actual search time was shorter than expected, but the results were precisely what were expected. Both burials were found by the archaeologists and placed in their top three picks. The archaeologists were the only participants to correctly identify both burials and the only ones to state that they believed there was more than one burial.

One observed factor that could have affected the results of the archaeologists was the amount of time the object was buried. The two pigs had been buried only for one month, so the ground was still slightly disturbed. With only one month’s time vegetation was not able to grow over the soil, which may have possibly made the searching more difficult.

Probing the disturbed areas that had been previously marked by the archaeologists returned some positive results. Both burials were found using the archaeological visual methods and then probing to see if the ground had been disturbed. By using the probe the outline of the burial trenches could have been located and a shovel test or careful excavating could begin.

One factor that plays a role in probing is that of time and the area to be covered by the search. A search of the area can be done, by using the probe, if negative results are
obtained by using the archaeological visual search methods (Morse et al., 1983). If this occurs then a larger search grid can be laid out and many searchers can probe the entire area. This takes many searchers and a large amount of time to cover a large area.

Another factor that may come in to play in the search for buried remains is that of disrupting a crime scene or possibly even damaging evidence. This comes into play when archaeologists are doing their shovel tests or probing. They may come into contact with evidence or the remains themselves. One disadvantage of using archaeological methods is that it can be destructive and intrusive (France et al., 1992). This may happen with all three methods that were used in my study. The dogs may dig when they find the remains, and the law enforcement may rush too fast when digging and cause some damage. The main benefit of the archaeologists is that they are trained in proper data collection and excavation of buried material.

The results from the law enforcement were definitely better than expected. The search technique was slow and careful, and the results were fairly accurate. With the number one pick being burial # 1 they would have been able to find the remains. Even though burial # 2 was not in the top three picks, it was on the list only a little farther down.

The factors coming into play with the law enforcement were not numerous, but there were some that could possibly play a role in the search process. The first is the methods that were used. Although the search technique was good, the reasoning for why they believed there were burial locations was not as fine-tuned as that of the archaeologists. The primary if not only reasoning was that the ground had been disturbed, whereas the archaeologists used trowels to actually check the composition of
the soil. As France et al (1992) point out; the main disadvantage with law enforcement agencies is that they want the information immediately. This can cause people to rush, which may hurt the results.

Another factor could be who the people are and how many are being used in the search. On a typical search and rescue, volunteers are used to do the searching. These do not always consist of people who know what they should be looking for, causing some unreliability in the searching process. The more people that are used in the search the faster a burial may be found.

The multidisciplinary approach used by France et al (1992) to locate buried remains can be put to good use by all law enforcement agencies. The numerous approaches used by France et al. to locate buried remains had never been tried before, and their study has given us a wealth of information. Not all the different types of people and equipment used in the France et al. study are generally available, which was a factor in my study. All three that were used in my study are readily available almost anywhere and their cost to the law enforcement agency involved is very minimal.
CONCLUSION – CHAPTER 5

Archaeologists should be an integral part of every search for buried human remains. Out of the specialists that were used in my thesis all three seemed to do fairly well. By using all three together in a search the possibility of locating buried remains is high. Using archaeologists for the search process can be beneficial in many ways. I suspect that the reason archaeologists are not used by law enforcement agencies in searches more often is due to a lack of knowledge of the effectiveness of archaeologists.

I, therefore, conclude that my initial hypothesis that trained archaeologists can locate buried remains faster, with less manpower, and more accurately than law enforcement and decompositions dogs is tentatively supported. Although other studies have used far more methods than just the three used here, the fact that these three are usually located everywhere and are cost effective only shows that they should be used first before trying the more complex and costly methods. The information gleaned from this Master’s thesis can be used to help law enforcement officials realize the benefits of the trained archaeologist. By compiling a list of local archaeologists, law enforcement agencies may be able to benefit from their expertise.

Law enforcement and criminalists can benefit from the use of archaeology when looking for buried remains. The need for archaeological techniques in the field of criminalistics has long been recognized but only recently been used (Killam, 1990). In instances where law enforcement hears reports that a body has been buried in a general location, but has no specifics an archaeologist could be helpful in determining the location and recovery. An archaeologist is trained to recognize the indicators of buried features and may be helpful if the approximate area of a burial is known. An
archaeologist is trained to assess soils, stratigraphy, pollen, and other factors that can aid in a buried body’s discovery.

There are many advantages to having archaeologists at the scene of a possible burial. One advantage is that archaeological training may help in the search for the buried body. Another advantage is that the archaeologist can help exhume the body in the proper way. They can also determine whether or not bone is human or non-human, and whether the remains are recent or historic (Dirkmaat and Adovasio, 1997). With the techniques of the archaeologist being beneficial to the location and recovery of buried remains it is hard to understand why archaeologists aren’t used more often by law enforcement.

If this project were to be conducted again the results may possibly be different than what I found while doing my research. The factors that played a role in my research, mainly the weather, the searcher sample size, the number of locations, and the amount of time the pigs were buried may be completely different from what might appear when another search was performed.

For the decomposition dogs the main factor that played a role was the weather. If the weather conditions were optimal then the dogs may have acted differently and had a better chance of locating the burials. The archaeologists and the law enforcement could say the same thing when it comes to the weather. If it was snowing, raining, or excessively hot or cold the searchers may not be giving the search the attention that it deserves. The snow and rain could also cause the ground surface to be changed thus disguising the burial more than it would be on a more optimal day. By letting the
searchers search a number of different times on different days may increase their effectiveness.

The searching could also be conducted with a larger sample size of searchers. By having more dogs, more archaeologists and more law enforcement searchers the chances of finding a burial may possibly increase. By only having two of each in my study may have reduced the effectiveness of the dogs and the law enforcement with more people and dogs searching the variability or the results would be greater. The archaeologists might have found the burials faster if there were more archaeologists searching.

If the search were to be conducted in more than one location the results would also have been different from what I found. Using many locations would have allowed the dogs to possibly have fewer, or possibly even more distractions than what there were in my study. The searchers would have had to deal with different types of soils and vegetation, which could make the searching easier, or more difficult.

One other factor that could be different in another search is the amount of time the pigs are buried. If the searching was being conducted in many different locations the amount of time the pigs were buried could be different in each one. The researcher could bury the pigs at different intervals of time and then allow the searching to take place. This would allow the researcher the chance to see if a shorter or longer burial time has any effect on how the searchers do. The dogs may be better at finding very recent burials as to finding burials that have been around a long time. The archaeologists and law enforcement might be the same way, or they might be better at finding burials that were many months’ even years old.
By repeating the process that I used in my thesis a number of times would show how reliable these results could be. By allowing the decomposition dogs, archaeologists and law enforcement to search the area a number of times would show how reliable each one is at finding the remains. Repeating the search even ten, or more times would show which one of these methods were more reliable than the other when searching for buried remains.

It would be interesting to see, upon further research, if factors like the weather and of using a larger sample size of searchers would help or become a hindrance when looking for buried remains. It would also be intriguing to find out how the all of the specialists fared after a longer period of time had elapsed from when the remains were first buried. If I were to conduct this research project again I would try my hardest to make the changes that I have suggested here. By doing this I believe my research would have been more thorough and my results would have been more complete and accurate. The use of more specialized fields, new techniques and technologies will help in adding to the information on the location of buried remains.
REFERENCES


Lenert, Mike. 2001. Personal Communication. M.A. University of Montana Department Of Anthropology, Missoula, MT.


Pic. 1. View of search area looking to the north.

Pic. 2. View of search area looking to the east.
Pic. 3. View of search area looking west.
Pic. 4. View of burial area #1 before being dug.

Pic. 5. View of burial area #2 before being dug.
Pic. 6. View of trench #1.

Pic. 7. View of trench #2.
Pic. 8. View of pig #1 next to trench #1.

Pic. 9. View of pig #2 next to trench #2.
Pic 10. Pig #1 in trench #1 before final burial.

Pic 11. Pig #2 in trench #2 before final burial.

Pic. 13. Burial #1 looking east.

Pic. 15. Burial #2 looking west.
Pic. 16. Archaeologists checking soil differences.

Pic. 17. Archaeologist placing pin flags.