Metal detecting is a widely used survey technique in archeology since the late-1950s on sites where metals are present. Metal detectors are relatively inexpensive and effective remote sensing devices that should be part of the tool kit of archeologists working at sites where metal artifacts are likely to be a part of the site assemblage. Metal detectors find metal objects just as shovel tests or test units might be used to discover a site’s content, depth, or boundary. Archeological applications of the metal detector, coupled with precise and accurate recording techniques, are very similar to the well-accepted routine shovel test field survey technique.

There are two types of Metal Detectors. The most used is the very low frequency (VLF) detector which can read buried metals to a depth of 30 cm with the proper coil and soil conditions. Most VLF machines have the capability to identify the type of buried metal. The second is the Pulse Induction (PI) or Zero Voltage Technology (ZVT). This type cannot discriminate metal types nor determine a possible depth, but they can penetrate the ground to a depth of just over one meter and can find objects as small as a straight pin at that depth. Both types can be used for archeological investigation effectively in most soils and field contexts.
COMPONENTS

Knowing your tools is critical for ensuring a successful survey.

• All metal detectors work on a basic configuration that includes a handle, a search coil, an electrical cable, and a control housing for the battery and tuner.

• The handle allows the operator to swing the coil along the ground.

• The search coil contains an antenna that generates an electromagnetic field. When metallic objects are near the coil, an electrical current is created which is detected and converted to visual and audible signals.

• Smaller coils penetrate less deeply compared to larger coils. The 20 cm (8 in) and 25 cm (10 in) coils are a compromise between the desire for depth and practicality. These coils detect to a depth of 30 to 36 cm (12 to 14 in).

• An electrical cable connects the antenna in the coil to the control housing and is wound around the handle stem. It is important to keep the cable wound tightly and securely so that the tuning of the detector does not change during use.

• Most control housings attach to the handle of the detector.

Diagram depicting the components that comprise a typical metal detection unit.

PREPARATION

Preparation for metal detecting surveys involves an understanding of detector components, their functions, and practical applications.

• When a detector is first used in an area, it needs to be tuned (ground balanced), to the background level of moisture and metal in the soil. Even with proper tuning, false signals may occasionally be triggered by mineralized rocks, pockets of metallic or other mineralized soils, or even areas of high moisture.

• The electromagnetic field that detectors create penetrates the soil in a cone shape for mono coil machines. Mono coils are found on less expensive machines. The more common coil is the Double D. The signal from the Double D goes straight down and does not cone allowing for better coverage at depth. The larger the coil, the greater the electro-magnetic field and the deeper subsurface materials can be detected.

Patrick Severts (left) instructing Kirk Cordell (right) on metal detecting imaging displays at Pecos National Historical Park.
A good method of survey consists of three operations: Metal Detecting, Artifact Recovery, and Provenience Recording.

- During metal detecting, targets are located and marked. A recovery crew follows and carefully uncovers the objects, leaving them in place. The recording team then plots individual artifact locations, assigns field specimen numbers, and collects the specimens.

- Visual inspection of the surface can be carried out simultaneously with the metal detector survey. A metal detector crew may consist of a crew chief, metal-detector operators, and visual inspectors who also flag the targets found by the detectors. Detector operators should walk abreast, following transects across the area to be inspected. While walking, the operators use a sweeping motion over the ground making sure their sweeps overlap the preceding one. Coils should be held as close to and as level with the ground as possible to provide maximum vertical and horizontal coverage.

- Once an operator locates a target it should be marked for further investigation or mapping. The flaggers can also visually examine the ground for surface artifacts, allowing the detector operators to concentrate on their machines. Metal pin flags may be used, but also introduce new metal to the site, which should be avoided. Pin flags with plastic shafts should be used to eliminate the problems found with metal shaft pin flags whenever possible.

Pinpointing precisely locates objects

- Recovery crews pinpoint and excavate the artifact locations marked by the detector team. The usual procedure is to trowel earth away to expose the artifact using traditional hand tools. Traditional excavation techniques can be employed when site stratigraphy, time, and project design require it.

- The recovery team should also include a metal detector to pinpoint the buried target. A metal detector using a small, 3 to 4 in. (7.5 to 10 cm) diameter coil that allows precise location of the object while it is still in the ground works best for this task. Handheld pinpointers are also available and can be used to minimize the area to be checked and time for artifact recovery.

Visualizing field data during a metal detector survey involves recordation of proveniences, GPS locations, and field cataloging data as well as excavation to ground-truth metal detection.

As with any archeological investigation, it is essential to record provenience data to allow for later interpretation of artifact patterns. The recording crew may include a transit operator, a rod holder, or a GPS and data collector, and personnel to assign field-specimen numbers and bag the finds. The recording crew also backfills the excavated holes.
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National Center for Preservation Technology and Training
645 University Parkway
Natchitoches, LA 71457
Website: www.nps.gov/ncptt
Phone: (318) 356-7444

Series Editor: Kirk A. Cordell, NCPTT Executive Director
Authors: David J. Watt and Tad Britt, NCPTT Archeology and Collections

Preservation in Practice: Metal Detecting