Innovating in Cultural Resource Detection: Geophysical Surveys on Ancient Native American Archaeological Sites

Jarrod Burks, PhD
Ohio Valley Archaeology, Inc.
Columbus, Ohio
Phase I: Finding Sites

Shovel Test
Phase III: Site Mitigation
Magnetic Data
Earthworks
Radar Data
Brick Kilns
Magnetic Susceptibility
Cabin Sites
Graves: Radar
Radar Data
Brick Kilns
Graves: Radar
Ground Penetrating Radar (GPR)

Detects: hard targets, differential moisture, 3D datasets
Vertical Map of the Ground

Radargram--Profile

Horizontal Map of the Ground: Time/Depth Slices
Radar Slice Map

Church Foundation

Headstone Base

Building Destroyed 1813

unmarked graves dug through foundation

10 meters
Ground Penetrating Radar Survey

Radar Slice 11: 84-86 cmbs

- Foundation
- Well/privy
- Cistern
- House
Geophysics Instruments for Archaeologists

Magnetometer

Detects: Pits, Burned Areas, and Iron Objects

Magnetometer x4
Magnetic Data

Filled Ditch

Junction Group

Plowed Down
Embarkment

50 meters
Geophysics Instruments for Archaeologists

Electrical Resistance Meter

Detects: differential moisture-foundations, roads, pits, disturbed areas
Holder-Wright Group, Dublin, Ohio

Magnetic Gradient

Electrical Resistance

House

Jarrod Burks, PhD
Ohio Valley Archaeology, Inc.

50 meters
Surveying: collecting data

Survey Block

Transects/Traverses

Readings or Samples per meter
Types of Native American Archaeology Sites Commonly Encountered in Ohio

(1) Clusters of Artifacts in and on the soil

(2) Settlements or work areas with artifacts and buried architecture/feature remains

(3) Sites with larger features, such as mounds and earthen enclosures
Locating Archaeology Sites: Phase I Work
Magnetic Susceptibility

Sensor

Meter

GPS

Shovel

2008, Spring
A Circular Village in Southern Ohio

Ohio River

Reinhardt Site
Ohio Earthworks
as of 1914
587 Enclosures

Earthwork Complex
Circular Enclosure
Other Enclosure

from Mills Atlas
Earthworks

Fort Ancient
Warren Co.

Chillicothe

Baum
Ross Co.
Ohio Earthworks…often are flat!

Steel Group, Ross County
ANCIENT MONUMENTS
OF THE MISSISSIPPI VALLEY

EPHRAIM G. SQUIER and EDWIN H. DAVIS
Edited and with an introduction by DAVID J. MELTZER

SMITHSONIAN CLASSICS OF ANTHROPOLOGY

Finding Sites

In Squier & Davis
1848
Newark Observatory Circle and Octagon
Hopeton Works

Aerial Photos
Dache Reeves, 1934
Jones Group Earthworks, Pickaway Co.
Magnetic Survey Results, as of 4/30/2015

Jarrod Burks, PhD
Ohio Valley Archaeology, Inc.
Heartland Earthworks Conservancy
About 210 acres: 85 ha

DOT Corridor
Two Multi-Probe Magnetometer Carts
Objectives of Geophysical Surveys

1) Phase I: Are Cultural Resources Present?

2) Phase II: Determining Site Integrity
Assessing the Integrity of a Hopewell Settlement
<table>
<thead>
<tr>
<th>Anom. #</th>
<th>Anomaly Centroid</th>
<th>Probing Location &amp; Results</th>
<th>Radial Interval</th>
<th>Charcoal</th>
<th>Burned Earth</th>
<th>PZ Depth</th>
<th>Max Depth</th>
<th>Comments</th>
<th>Evaluate</th>
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<td>Light-med., burned bone, pg FCN, soddened, pottery (gray-colored, burned shell)</td>
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<td>Compact at surface, med. Dark, plain, gray-colored pottery</td>
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<td>80+</td>
<td>Starts to turn red around 80, pit filled with sandy subsoil, burned sand, burned bone in pg</td>
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</table>
Brown's Bottom
Ross Co., Ohio
2005

- Excavation Block?

Probing Results
- Excellent
- Good-Excellent
- Good
- Fair-Good
- Fair
- Nothing in Probes

20 m
Earth Ovens & Pit Features
Magnetic Data
Red - Houses
White - Storage and Cooking Pits

Integrity = Good!

Guard Site
Fort Ancient Village
C. AD1100

Red - Houses
White - Storage and Cooking Pits
Steel Group

Integrity at Earthworks

Squier and Davis
1848

Plateau
200 ft. High.
Objectives of Geophysical Surveys

1) Phase I: Are Cultural Resources Present?
2) Phase II: Determining Site Integrity
3) Phase III: Mitigation and Intensive Study
Ohio Earthworks

as of 1914

587 Enclosures

Earthwork Complex
Circular Enclosure
Other Enclosure

from Mills Atlas
Map after Squier and Davis 1848
Magnetic Fluxgate Gradiometer
8 readings/meter
50 cm transect interval
Area D  Electrical  Resistance

Ravine Area

Tree Line

Park Roads

Stone Mound

High

Low

50 meters

2 readings/meter
1 m transect Interval

RM 15
Electrical Resistance Meter
Electrical Resistance Data

Structure Floors

Interior Pits

Trees
Geophysical Data Interpretation

Magnetics - Red/Black
Resistance - Blue

Block A

20 m
Wright State University
2006 Excavations
One of Ohio's Best-Known Earthworks = Totally NEW Enclosure!
Geophysical Data Interpretation

Magnetics - Red/Black
Resistance - Blue

Block B

20 m
One of Ohio’s Best-Known Earthworks = Totally NEW Enclosure!
One of Ohio's Best-Known Earthworks - Totally NEW Enclosure!
Riordan’s Map
Radar Amplitude Slices

Depth
- 8-20 cmbs
- 8-30 cmbs
- 6-38 cmbs
- 6-48 cmbs
- 2-54 cmbs
- 0-62 cmbs
- 6-68 cmbs
- 2-74 cmbs
- 80-82 cmbs

18-20 cmbs
28-30 cmbs
36-38 cmbs
46-48 cmbs
52-54 cmbs
60-62 cmbs
66-68 cmbs
72-74 cmbs
80-82 cmbs

10 meters
Grant from Ohio Archaeological Council
To Wrap Up: It’s all about your Objectives

1) Geophysical surveys will not find everything
   Dependent on feature size and geophysical contrast

2) In many cases, one instrument will do the trick
   *But Multiple Instrument Surveys can be very Useful

3) Ground truthing important