ARCHAEOLOGICAL MAPPING TECHNIQUES

PURPOSE

The purpose of this course is to provide the basic academic and field skill to permit the avocational archaeologist the ability to undertake most mapping programs used in survey and excavation projects of the AAS and to provide assistance to the professional community as may be requested.

OBJECTIVES

At the completion of this course, the student should be able to:

1. Determine the purpose of mapping and the various types of maps which exist.

2. Understand the difference between mapping terms.

3. Name and define the various kinds of archaeological mapping techniques, including GPS.

4. List the various types and functions of instruments and tools used by the archaeologist during mapping projects.

5. Display the ability to use and plot-on USGS Topographic maps; also know of other various map types.

6. Explain how a site is mapped.

7. Indicate the use of photography and its importance in data collection; the same for aerial photography and its importance in site discovery and location plotting.

8. Understand the importance of site spatial relationships and map work/interpretation.

FORMAT

The student will receive a minimum of 12 hours of classroom instruction, coupled with 56 hours of actual field experience. Within the field work requirement, there should be no single specific activity necessary for fulfilling this requirement, though the following conditions must be met;

A. The student mapper should work in at least two different mapping settings, for example, excavation, and survey.

B. The student mapper should experience in the field at least three different mapping methods.

FORMAT (continued)

Normally the field work requirements will be fulfilled by work on at least seven different days. The last four hours of field work will be spent in finalizing field notes, site recordation forms, site maps, field maps, and any additional administrative tasks.

A brief final report of the field work undertaken, along with the successful completion of all written and administrative work assigned, coupled with the instructor's evaluation of both the student's classroom and field work, will determine the students successful completion of this course.

COURSE OUTLINE

A. Some general concerns
    1. Principles of mapping
    2. Organizational aspects of mapping
    3. Reasons for mapping
        a. Locational
        b. Excavation
        c. Survey
        d. How reasons for mapping affect how mapping is undertaken
    4. Demands of mapping
        a. Good physical condition
        b. Proper clothes and safety precautions
        c. Field logistics
    5. General mapping techniques
        a. Permits and clearance to do the project and survey particular land areas (i.e., land ownership)
        b. Background research before entering the field
            - Historical maps, photographs, reports
            - Recent field work, maps, report
        c. Determining site numeric designation system
            - MNA system
            - ASM system (including the AZSITE)
            - ASU system
            - Forest Service system
            - BLM system (part of the ASM system)
            - Smithsonian Institution system
            - Gladwin System
            - New Mexico System
    6. Kinds of surveying and mapping

B. Aerial mapping
    1. Problem formation
    2. Aerial photography
        a. Film types and their applications
            - B/W
            - Color

- Infrared

b. Flying altitudes
c. Use in survey
- Stereo
- Viewing, reading aerial photos
- Topography review/survey for course plotting
- Site discovery
- Locational plotting; transferring photo information to topographical maps

3. Determining survey boundaries
4. Boundary effects
   a. Linear transects, interception theory
   b. Quadrant block units, boundary bias

C. Mapping basics
1. Basic definitions
   a. Horizontal plane
   b. Angle
   c. Elevation
   d. Gradient
   e. Line
   f. Distance
   g. Contour
   h. Leveling
2. Units of measurement defined
   a. Acre
   b. Chain
   c. Degree
   d. Minutes
   e. Seconds
3. Environmental variables and mapping techniques: impacts of variation in:
   a. Soils
   b. Topography
   c. Slope
   d. Vegetation
   e. Climate
   f. Sunlight, shadow, reflection
   g. Surveyor's physical and mental state: tiredness factor
4. Mapping field notes
   a. Requirements
   - What constitutes good notes
   - Kinds of notes
   - Suggestions on recording notes
   - Types of field books

   b. Teamwork and coordination between staff and crew
   - There is no such thing as a "dumb" question or observation
   - Talk with each other about what you are seeing and doing

4. Mapping field notes (continued)

c. Assign specific crew member responsibilities
- Record keeping, site survey forms
- Topographic map location
- Site mapping
- Site photography and aerial work
- Site boundary determination, site marking (if warranted), site datum placement.

D. Intensive examination of site surface
1. USGS Topographic Maps
a. Types
- 15 minute
- 7.5 minute

b. Reading a map
- Township, Range, Section
- Miles, acres, feet, kilometers, meter
- Elevations
- UTM's
- Longitude and Latitude
- Magnetic vs true north

c. Using a map
- Triangulation
- Map wheels
- Dot
- Grid matrix
- General locational plotting procedures

d. Using a compass with a topographic map
- Types of compasses
- Range Finder (Silva) compass
- Brunton compass
- Setting the declinations for both compasses
- Walking a transect line with a compass

2. Other types of area/locational maps

E. Basic site mapping (for both survey and excavation)
1. Site mapping
a. Mapping techniques
- Compass and pace
- Compass and tape
- Brunton tripod and tape
- Alidade mapping
- Theodolite mapping
- Global Positioning System instruments

b. Establishing a permanent site datum (site tag placement)
c. Establishing N/S and E/W base lines

d. Learning typical mapping symbols for features, rocks, trees, artifact scatters, mounds, etc.
e. Precise methods vary from site to site and project to project

2. Field photography
   a. Types of cameras
   b. Types of film
   c. Lighting conditions
   d. Exposure settings
   e. Scale, directional indicators, and photo
   f. Keeping photographic records
   g. Photographic distortion
      - Large scale objects
      - Small scale objects
   h. Photographing site features and artifacts
   i. Aerial photography of the site

F. Measurements of horizontal distances
   1. General methods
      a. Pacing
      b. Taping
      c. Odometer readings
      d. Electronic Distance Measurement (EDM)
      e. Tacheometry
         - Transit/theodolite and stadia rod
         - Alidade and stadia rod
      f. Subtence bar
      g. Global Positioning System
   2. Taping
      a. Care of taping equipment
      b. Taping on level ground
      c. Horizontal measurements on uneven ground
      d. Slope measurements
      e. Sources of error in taping
      f. Laying out a right angle with a tape
      g. Measuring an angle with a tape by the chord method
      h. Measuring an angle with a tape by the tangent method
      i. Laying off angles
   3. Electronic Distance Measurement (EDM)
      a. Classification of EDM instruments
      b. Principles of EDM instrument operation
      c. Computing horizontal distances from slope distances

G. Leveling
   1. Methods for determining differences in elevation
   2. Instruments for differential leveling
      a. Engineer's level
      b. Transit/theodolite
      c. EDM
      d. Hand level
      e. Alidade and stadia rod

G. Leveling (continued)

3. Field procedures and computations for differential leveling
   a. Carrying and setting up the level
   b. Using a stadia rod
   c. Differential leveling
   d. Profile leveling
   e. Sources of error in leveling

H. Measurements of angles
1. Units of angle measurement
2. Kinds of horizontal angles
3. Direction of a line
4. Bearing versus azimuths
5. Calculation of bearings
6. Measuring angles using a transit/theodolite
7. Measuring angles and computing angles
8. Establishing a datum point
9. Laying off a base line and turning angles from the base line

I. Determining direction
1. Compasses
   a. Types of compasses
   b. Their different uses
2. The mysteries of north
   a. True north versus magnetic north
   b. Determining and setting magnetic declination
3. Taking a map bearing with a compass
4. Typical problems and sources of error in compass
   a. Compass out of level
   b. Pivot needle or sight vanes bent
   c. Fence lines, power lines, cans, pocket knives, or other metal nearby
   d. Reading wrong end of compass needle
   e. Setting declination off wrong side of north

REFERENCES

A. SUGGESTED:

Spier, Robert F. G.
1970 *Surveying and Mapping: A Manual of Simplified Techniques*. Holt, Rinehart and Winston, New York.

B. ADDITIONAL REFERENCES:

Hester, Thomas R., Robert F. Heizer, and John Graham
1975 *Field Methods in Archaeology*. Mayfield, Palo Alto.

Joukowsky, Martha
1980 *A Complete Manual of Field Archaeology: Tools and Techniques of Field Work for Archaeologists*. Prentice Hall, Englewood Cliffs.

Dancey, William S.
1981 *Archaeological Field Methods, An Introduction.* Burgess Publishing, Minneapolis.

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