A Sample Geodatabase Structure for Managing Archaeological Data and Resources with ArcGIS

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ABSTRACT

Managing archaeological data with geographical information systems (GIS) is rarely addressed in archaeological literature. While the majority of literature from 1990 to the present focuses on predictive modeling or visualization, this article presents a method of organizing excavation data using a sample geodatabase structure that is available online. The use of such a structure permits authors of archaeological data to meet their ethical obligations as stewards by creating datasets that are accessible, integrative, updatable, and documentable. The assumption here is that readers have a basic understanding of the Environment Systems Research Institute's (ESRI) GIS software, ArcGIS.

Introduction

One of the greatest difficulties of using new technologies in archaeological investigations is the lack of educational materials that speak directly to the archaeological discipline. In relation to geographical information systems (GIS), a number of researchers have sought to remedy this situation since 1990 (Allen et al. 1990; Lock and Stancic 1995; Aldenderfer and Maschner 1996; Maschner 1996; Johnson and North 1997; Lock 2000; Westcott and Brandon 2000; Wheatly and Gillings 2002; Conolly and Lake 2006). Generally, GIS contributions tend to center on analytic methods such as viewshed analysis or least cost pathway analysis. The authors rarely discuss the scheme used to organize the data itself. The prevailing attitude to database design was recently summed up by James Conolly and Mark Lake (2006:33) when they stated, "It is not our intention to discuss … the appropriate structure of a spatial database for managing the archaeological record, as these decisions are most appropriately made by government bodies and the archaeologists charged with the tasks of recording and managing the archaeological resource."

When creating datasets, archaeologists must seriously consider ethical concerns. The Society for American Archaeology (SAA) and The Society for Historical Archaeology (SHA) have stipulated guidelines for the curation of archaeological data where archaeologists are obligated to maintain detailed archaeological records (*SHA Newsletter* 1993; Lynott 1997:589–599). These responsibilities are as important as the mission to protect sites or include descendant communities. The implementation of a "living documents" approach to GIS meets this goal, where a living document remains usable and useful after its initial creation. Datasets used in the creation of living documents should meet four criteria: (1) that the dataset remain accessible by more than one person; (2) that it can integrate with other types of data such as those from the natural sciences; (3) that it is easily updated with future research; and (4) that it results in the creation of accompanying documentation.

Advantages to Employing a Geodatabase Structure

There are numerous advantages to structuring GIS data in a geodatabase environment. Some of the most important concern the structure of GIS data. Vector data including points, lines, and polygons are typically stored in shapefiles referred to as feature classes. A geodatabase allows for the creation of feature data sets that enable coordinated relationships among feature classes. If a feature class representing artifact points is moved, the subsequent artifact polygon and line feature classes are also moved, ensuring their continued relationship. Another advantage of using a geodatabase structure is that it allows for the creation of domains. A domain assigns valid values or ranges for the attribute table that forms part of the information contained within a feature class, helping to reduce errors in data entry by eliminating invalid entries. It also reduces data entry time by creating a series of drop-down menus.

The construction of a geodatabase similarly has advantages for future research. The structure of a geodatabase with its domain settings in place mirrors the data-dictionary structure used by Trimble GPS receivers and survey units including Total-Stations. Since GPS and survey data are recorded in a format directly translated into a GIS file, these files can be incorporated into the geodatabase. Finally, a geodatabase relaxes the system requirements needed to run GIS software on a computer. The geodatabase is one system file, and the GIS software, no matter what is asked of it, only has to access one file, freeing up system resources.

Advantages to Creating Metadata

A problem this author has often encountered in the creation and use of archaeological GIS data is the lack of or misidentification of the data source. This occurs in a number of circumstances, such as the incorporation of numerous archaeological projects for regional analysis or when inexperienced users create data using unfamiliar techniques or technologies. An attribute field that records collection methods for field data can be included in the structural scheme as a redundancy. This redundancy ensures that data within the geodatabase, and its source, are identified. Additionally, entering metadata into GIS files is often time consuming, and few archaeologists carry out this task. Another benefit of the geodatabase structure is that metadata need to be entered only once for each geodatabase. As future features or feature classes are created, the master metadata for the entire geodatabase remain intact. The attribute fields for entering collection methods also allow users to identify the source for every feature included in the geodatabase.

Research Design Considerations

The research design of an archaeological project is equally important in designing a project-specific geodatabase. While the basic structure of the geodatabase is drawn from a wide variety of recording schemes, it cannot address the range of potential research questions that are sometimes formed by researchers. One approach is to record as much information about each artifact and feature as possible. The benefit of using a geodatabase is the ability to assign an unlimited number of attribute columns to each feature class. Since attribute columns can be assigned at any time during the construction of the geodatabase, GIS creators are able to adapt and improve their recording schemes in real time as they find more descriptive categories and more nuanced classifications. Throughout this process, authors can document their decisions much in the same way material culture specialists document or chart their decision-making processes when creating hierarchical classifications for artifact classes. Support documentation detailing the decision-making process of GIS construction creates a true living document that can be used by others.

Structural Elements of a Geodatabase

The possible structural elements for a geodatabase number less than a dozen, and the overall design is uncomplicated. The most basic element is the feature class or shapefile consisting of point, line, or polygon features. Feature classes are grouped together to form feature datasets that can hold an unlimited number of feature classes.

Domains are set up in the properties of the geodatabase itself. These involve setting limits for inputs in the attribute tables of the feature classes. Domains create drop-down menus in the attached feature-class attribute tables that decrease data entry errors. A geometric network defines directional attributes, such as the flow of water through a network of pipes or electricity through a power grid. Relationship classes connect fields in one feature-class attribute table to fields in another feature-class attribute table. Archaeologists can take advantage of this aspect of ArcGIS to relate artifact spreadsheets with their spatial distributions across a site. This is an important consideration for the research design phase as well. GIS can map every object found in a site, provided detail of recording has been kept. Alternatively, the inclusion of feature identifications or excavation unit identifications in the artifact spreadsheet allows the archaeologist to minimally visualize which features or units contain which types of artifacts. A major benefit of using relationship classes is to save data entry time by eliminating the need to enter repetitive data in multiple feature classes or different programs. This means that archaeologists who are comfortable working with specific database or spreadsheet programs can continue to use these programs, and the GIS practitioner can import the artifact spreadsheets into ArcGIS (Figure 1).

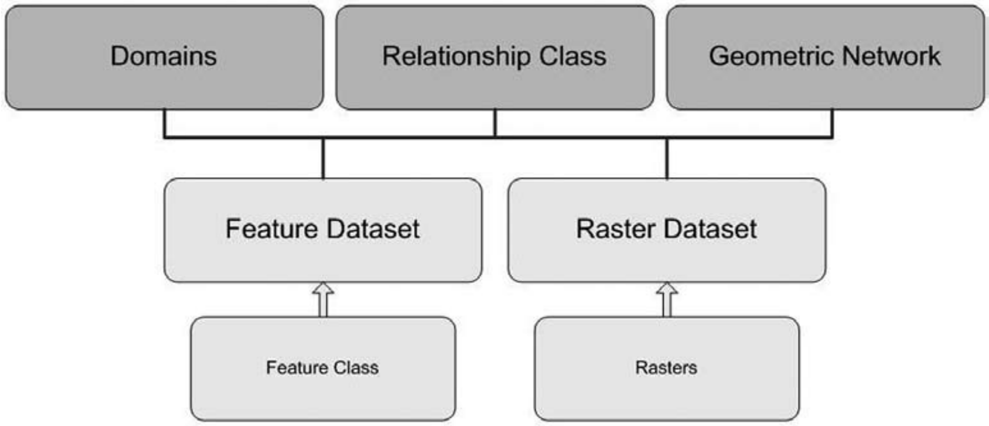

Figure 1. Structural elements of a geodatabase.

A Sample Geodatabase Design for Archaeology

A useful starting point is to employ a model during the research design phase of archaeological research. Two aspects of geodatabase creation have to be carefully addressed by the designer. First, how will the geodatabase, its feature classes and feature datasets, be organized? Second, what kind of data will be included in the attribute tables of each feature class? The following sample geodatabase has six datasets, each containing a number of feature classes: Arch_Tools, Artifacts, Boundaries, Environment, Structures, and Transportation.

- Arc_Tools: Contains feature classes that represent data specifically related to the archaeological organization of work, such as base datum points, dimensions of the sites (polygons), and feature number annotations (labels).
- Boundaries: Contains polygons that represent survey and site boundaries as established during fieldwork.
- Structures: Contains point, multipoint, line, and polygon files used to represent all objects associated with buildings, whether standing or in ruin.
- Artifacts: Contains point, line, and polygon files representing individual artifacts or scatters of artifacts.
- Environment: Contains information from the natural environment or landscape, including contour data.
- Transportation: Includes point, line, and polygon files representing any type of transportation facility, such as roads and railways, with both historic and modern features included.

Approaching archaeological work with these classifications in mind ensures valuable information is not overlooked or lost. The selection of attribute data for any geodatabase is case-by-case and research design dependent; however, there are common types of information that should be attached to each feature class. These include site name, identification number, occupation data, method of collection, historic context, basic measurements, photographic information, information for linking to an external database, and similar types of records. It is important to emphasize that ArcGIS and the geodatabase design functions like a typical database management system in that researchers can search and select features by attributes, find features by searching for specific attributes, and generate reports using any of the attribute data. Creating a geodatabase that is project specific can be an ongoing process for future modification. Ultimately the life of any GIS is extended if its construction is properly documented.

In-Depth Examination of a Sample Archaeological Geodatabase

The following series of diagrams were generated using ArcGIS 9.1 and the available geodatabase diagrammer <*http://arcscripts.esri.com/*>. These figures illustrate individual feature classes and their descriptions, followed by figures explaining each domain individually. These feature classes and domains are presented only as a guide; any geodatabase created will require fine-tuning for each project (Figures 2–9).

Simple feature class
Excavation_Units

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
SHAPE_Length	Double	Yes			0	0	
SHAPE_Area	Double	Yes			0	0	
art_present	String	Yes		Artifacts Present			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
prev_excav	String	Yes		Previous Excavations			50
shrt_desc	String	Yes					100

Documents location of excavation units used in current/previous/future archaeological investigations.

Simple feature class
Sites

Geometry *Point*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
site_id	String	Yes					50
shrt_desc	String	Yes					100

Point locations with unique ID's across an area.

Simple feature class
Artifacts_Ceramics_Points

Geometry *Point*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_amt	String	Yes		Artifact Amount			50
type	String	Yes		Ceramic Artifacts			50
collec_met	String	Yes		Collection Method			50
condition	String	Yes		Condition			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100

Sample 'specific' artifact feature class, in this case recording the position and characteristics of ceramic artifacts.

Simple feature class
Artifacts_Lines

Geometry *Polyline*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_amt	String	Yes		Artifact Amount			50
type	String	Yes		Artifact Type			50
collec_met	String	Yes		Collection Method			50
condition	String	Yes		Condition			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100
SHAPE_Length	Double	Yes			0	0	

Documents the locations and attributes of artifacts represented as a line (e.g. a metal plumbing pipe).

Figure 2. Feature class explanations.

Simple feature class
Artifacts_Points

Geometry *Point*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_amt	String	Yes		Artifact Amount			50
type	String	Yes		Artifact Type			50
collec_met	String	Yes		Collection Method			50
condition	String	Yes		Condition			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100

Documents the locations and attributes of artifacts represented as a point or series of points (e.g. single and unique artifacts and/or scatters of artifacts).

Simple feature class
Artifacts_Polygons

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_amt	String	Yes		Artifact Amount			50
type	String	Yes		Artifact Type			50
collec_met	String	Yes		Collection Method			50
condition	String	Yes		Condition			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100
SHAPE_Length	Double	Yes			0	0	
SHAPE_Area	Double	Yes			0	0	

Documents the locations and attributes of artifacts represented as a polygon (e.g. can scatter).

Simple feature class
Boundaries_Polygons

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
SHAPE_Length	Double	Yes			0	0	
SHAPE_Area	Double	Yes			0	0	
date_rec	String	Yes		Date Recorded			50
site_id	String	Yes		Site ID			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100

Boundaries used in relation to features recorded: such as political, site, or ownership extents.

Figure 3. Feature class explanations.

Simple feature class
Environment_Lines

Geometry *Polyline*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_present	String	Yes		Artifacts Present			50
collec_met	String	Yes		Collection Method			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
type	String	Yes		Environmental Type			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100
SHAPE_Length	Double	Yes			0	0	

Lines representing specific features of the environment (e.g. contour lines).

Simple feature class
Environment_Points

Geometry *Point*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_present	String	Yes		Artifacts Present			50
collec_met	String	Yes		Collection Method			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
type	String	Yes		Environmental Type			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100

Points representing specific features of the environment (e.g. a well).

Simple feature class
Environment_Polygons

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_present	String	Yes		Artifacts Present			50
collec_met	String	Yes		Collection Method			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
type	String	Yes		Environmental Type			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100
SHAPE_Length	Double	Yes			0	0	
SHAPE_Area	Double	Yes			0	0	

Polygons representing specific features of the environment (e.g. lakes).

Figure 4. Feature class explanations.

Simple feature class **Structures_Lines**

Geometry *Polyline*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_present	String	Yes		Artifacts Present			50
collec_met	String	Yes		Collection Method			50
condition	String	Yes		Condition			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
in_use	String	Yes		In Use			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
use	String	Yes		Original Use			50
type	String	Yes		Structural Type			50
material	String	Yes		Dominant Material			50
feat_id	String	Yes		Feature ID			50
prev_excav	String	Yes		Previous Excavations			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100
SHAPE_Length	Double	Yes			0	0	

Lines representing structural features (e.g. wodden fence).

Simple feature class **Structures_Points**

Geometry *Point*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_present	String	Yes		Artifacts Present			50
collec_met	String	Yes		Collection Method			50
condition	String	Yes		Condition			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
in_use	String	Yes		In Use			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
use	String	Yes		Original Use			50
type	String	Yes		Structural Type			50
material	String	Yes		Dominant Material			50
feat_id	String	Yes		Feature ID			50
prev_excav	String	Yes		Previous Excavations			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100

Points representing structural features (e.g. fencepost).

Simple feature class **Structures_Polygons**

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_present	String	Yes		Artifacts Present			50
collec_met	String	Yes		Collection Method			50
condition	String	Yes		Condition			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
in_use	String	Yes		In Use			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
use	String	Yes		Original Use			50
type	String	Yes		Structural Type			50
material	String	Yes		Dominant Material			50
feat_id	String	Yes		Feature ID			50
prev_excav	String	Yes		Previous Excavations			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100
SHAPE_Length	Double	Yes			0	0	
SHAPE_Area	Double	Yes			0	0	

Polygons representing structural features (e.g. house footprint).

Figure 5. Feature class explanations.

Simple feature class
Transportation_Lines

Geometry *Polyline*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_present	String	Yes		Artifacts Present			50
collec_met	String	Yes		Collection Method			50
condition	String	Yes		Condition			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
in_use	String	Yes		In Use			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
type	String	Yes		Transportation Type			50
use	String	Yes		Original Use			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100
SHAPE_Length	Double	Yes			0	0	

Lines representing transportation features (e.g. roads).

Simple feature class
Transportation_Points

Geometry *Point*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_present	String	Yes		Artifacts Present			50
collec_met	String	Yes		Collection Method			50
condition	String	Yes		Condition			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
in_use	String	Yes		In Use			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
type	String	Yes		Transportation Type			50
use	String	Yes		Original Use			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100

Points representing transportation features (e.g. signposts).

Simple feature class
Transportation_Polygons

Geometry *Polygon*
Contains M values *No*
Contains Z values *No*

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID						
SHAPE	Geometry	Yes					
art_present	String	Yes		Artifacts Present			50
collec_met	String	Yes		Collection Method			50
condition	String	Yes		Condition			50
date_rec	String	Yes		Date Recorded			50
disposition	String	Yes		Disposition			50
in_use	String	Yes		In Use			50
photos	String	Yes		Photographs			50
site	String	Yes		Site ID			50
feat_id	String	Yes		Feature ID			50
type	String	Yes		Transportation Type			50
use	String	Yes		Original Use			50
file_update	String	Yes		File Updated			50
shrt_desc	String	Yes					100
SHAPE_Length	Double	Yes			0	0	
SHAPE_Area	Double	Yes			0	0	

Polygons representing transportation features (e.g. bridge footprint).

Figure 6. Feature class explanations.

Coded value domain
Artifact Amount

Description *Number of artifacts*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Single	Single
Multiple	Multiple artifacts (2-5)
Scatter	Many artifacts (>5)

Coded value domain
In Use

Description *Is feature still in use*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
No	No
Yes	Yes
Unknown	Unknown
N/A	N/A

Coded value domain
Artifact Type

Description *Type of artifacts*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Metal	Metal objects
Ceramic	Ceramic objects (stonewares, earthenwares, porcelains, etc.)
Wood	Wooden objects
Leather	Leather objects
Buttons	Buttons
Other	Other
Unknown	Unknown
N/A	N/A

Coded value domain
Jurisdiction

Description *Jurisdiction (managing agency, if any)*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
NPS	National Park Serivce (NPS)
USFS	US Forest Service (USFS)
State	State
County	County
Private	Private
N/A	N/A

Coded value domain
Artifacts Present

Description *Were artifacts present?*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Yes	Yes
No	No

Coded value domain
Metal Artifacts

Description *Type of metal artifact*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Nail(s)	Nail(s)
Stake	Stake
Unknown	Unknown
Structural	Structural
Domestic	Domestic

Figure 7. Domain explanations.

Coded value domain
Ceramic Artifacts
Description *Type of ceramic*
Field type *artifact*
Split policy *String*
Merge policy *Default value*

Code	Description
Coarse Earthenware	Coarse Earthenware
Stoneware	Stoneware
Refined earthenware	Refined earthenware
Porcelain	Porcelain

Coded value domain
Collection Method
Description *Methods used to generate/collect data*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Total Station	Total Station
Survey Grade GPS	Survey Grade GPS (accuracy <1m or greater)
Digitized from 7.5 min. guad map	Digitized from 7.5 min. guad map
Digitized from historic map	Digitized from historic map
Located from PLSS location	Located from PLSS location
Digitized from aerial photograph	Digitized from aerial photograph
Commerical Grade GPS	Commercial Grade GPS (accuracy 1-5m or less)

Coded value domain
Condition
Description *Condition of artifact/feature/structure*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Good	Good
Fair	Fair
Poor	Poor
Ruined	Ruined
Standing	Standing
Restored	Restored
N/A	N/A
Unknown	Unknown

Coded value domain
Original Use
Description *Original Use*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Residential	Residential
Commercial	Commercial
Industrial	Industrial
Unknown	Unknown

Coded value domain
Photographs
Description *Were photographs taken*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Yes	Yes
No	No
N/A	N/A
Unknown	Unknown

Coded value domain
Previous Excavations
Description *Previous excavations carried out?*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Yes	Yes
No	No
Unknown	Unknown

Coded value domain
Short Description
Description *Short description of feature*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description

Figure 8. Domain explanations.

Coded value domain
Date Recorded

Description *Date recorded*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description

Coded value domain
Site ID

Description *Unique Site ID*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description

Coded value domain
Disposition

Description *Disposition*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Observed First Hand	Observed First Hand
Observed Second Hand	Observed Second Hand
Digitized from Form	Digitized from Form

Coded value domain
Structural Type

Description *Structural Type (Structures feature classes)*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Building	Building

Coded value domain
Dominant Material

Description *Dominant Material*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Brick	Brick
Wood	Wood
Cement	Cement
Stone	Stone

Coded value domain
Transportation Type

Description *Transportation Type (Transportation feature classes)*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Road - Modern	Road - Modern
Road - Historic	Road - Historic
Path	Path
Railroad	Railroad
Tramway	Tramway

Coded value domain
Environmental Type

Description *Environmental Type (Environmental feature classes)*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description
Contour	Contour

Coded value domain
Wood Artifacts

Description *Type of wooden artifact*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description

Coded value domain
Feature ID

Description *Unique Feature ID*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description

Coded value domain
File Updated

Description *Date file was last updated*
Field type *String*
Split policy *Default value*
Merge policy *Default value*

Code	Description

Figure 9. Domain explanations.

Implementing the Sample Geodatabase Structure for Archaeological Projects

There are a number of ways to integrate data into GIS, and these are usually dependent on the method of collection. Data collected with Trimble Total-Station and GPS receivers can be exported directly into ArcGIS file types. Two methods are discussed for implementing the preceding geodatabase design for archaeological work.

In method one, a geodatabase is manually produced using ArcCatalog. This involves creating the geodatabase, defining its dimensions, creating the individual feature datasets and feature classes, defining domains, and assigning domain values to attribute fields within each feature class. This relatively quick process should not take an experienced user of ArcGIS more than a few hours. In the end, this expenditure of time is justifiable, as this initial set-up time helps create a dataset that can be used by multiple people.

Method two is less time-intensive but requires downloading a set of sample files from the following website <*http://little-yeti.com/gis_little_yeti/tuts/gdb.htm*> (go to A Sample Geodatabase Structure for Archaeology). Once the files are downloaded, authors can begin using the sample files by importing their specific datasets. This technique produces a project-specific geodatabase quickly.

Regardless of which method is used, the first task after creating a geodatabase is to define its dimensions. The simplest method is to create a polygon surrounding the site that delimits a space larger than the site's boundaries. Once this is completed, the polygon shapefile is imported into the geodatabase, creating a feature class, and the spatial extent as well as the coordinate system will be defined. The downloaded files then can be opened. These files consist of a series of shapefiles and tables. The Table to Domain tool located in ArcToolbox under Data Management Tools/Domains is used to import each domain into the geodatabase. Feature classes are then imported into their appropriate feature data sets. Feature class properties subsequently are opened, and the appropriate domain to each attribute is assigned.

Once a geodatabase is constructed, data specific to a project can be added. This typically increases the number of domain values as site-specific artifact types and other information are input. Documenting this process is important for future reference.

Conclusion

This article presents a justification for and a workable model of a geodatabase for archaeological research. A discussion of data structuring in this process is important for present and future uses by researchers.

The documentation of archaeological resources in a systematic way, especially over a large area, is a critical component of contemporary archaeology and archaeological resource management. GIS inventories maintained by other fields involved in resource management often seek to include heritage resources. The ability to structure data in a maintainable way, such as employing a geodatabase, helps to ensure cross-disciplinary cooperation in the management and protection of heritage resources.

Finally, the author has prepared a number of ArcGIS-specific tutorials that can be accessed at <*http://gis.little-yeti.com*> where a more detailed description of archaeological geodatabases is included.

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