

Lab 5 - Introduction to the Geodatabase

1. Design Process

GIS is becoming an increasingly accessible and important tool for land managers. In this exercise you will begin creating a Personal Geodatabase for the OX Ranch in south central Idaho. The OX uses grazing allotments on 50,000 hectares of BLM, Forest Service, State and private land. 6,600 hectares is owned by Hixon Properties, the OX Ranch. The OX Ranch is in the process of creating a GIS database for inventory of land ownership, pastures, biomass production, vegetation, fuels assessments, sensitive wildlife habitat, water resources, and timber. Additional features of interest are roads, trails, culverts, fences, gates and buildings.

Exercise: What data layers would you suggest to include in the Geodatabase? Suggest sources of data, and what attributes you would like to see in the data layers.

Dataset	Source	Attributes
---------	--------	------------

What layers do you suggest would be naturally organized in *Feature Datasets*?

2. Create a Geodatabase in ArcCatalog

The first step in this process has been to GPS all fence lines on the ranch to incorporate in the Geodatabase. To begin with you will create a simple Geodatabase with only two data layers: fences and grazing allotments. The fences and allotments already exist as shape files located in *C:\NR506\data\Geodatabase*. The layers are named *fences.shp* and *grazing.shp*.

Assumptions: The fence lines were created using GPS with a 30 ft (~10 meter) accuracy. The grazing allotment layer was acquired from the Forest Service with an estimated spatial accuracy of 100 ft (~33 meter). Fence lines should coincide with the grazing allotment boundaries. Allotments should not overlap and fenced pastures should not overlap. Existing data is in the following coordinate system: UTM, zone 11, datum NAD27, units meters.

Step 1: Open ArcCatalog.
Right-click on the folder *C:\NR506\data\Geodatabase*
Select *New*, then *Personal Geodatabase*
Name the new Geodatabase *OX_data*

The fences and grazing allotment boundaries have coincident boundaries and later you will set up topological relationships between the two layers. Therefore you will create a new Feature Dataset and then import the two shapefiles into the same Feature Dataset.

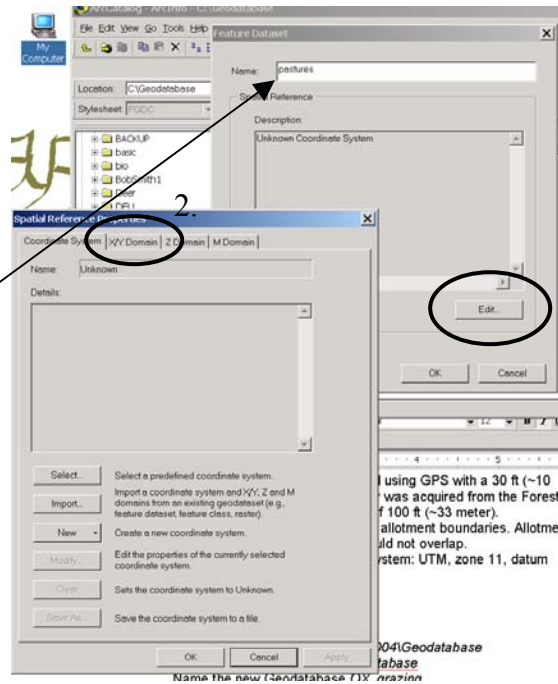
Step 2: Right-click on the new Geodatabase *OX_data*

Select *New*, then *Feature Dataset*

Name the new Feature Dataset *pastures*

Click the Edit button (1)

Click on XY Domain on the top bar (2)

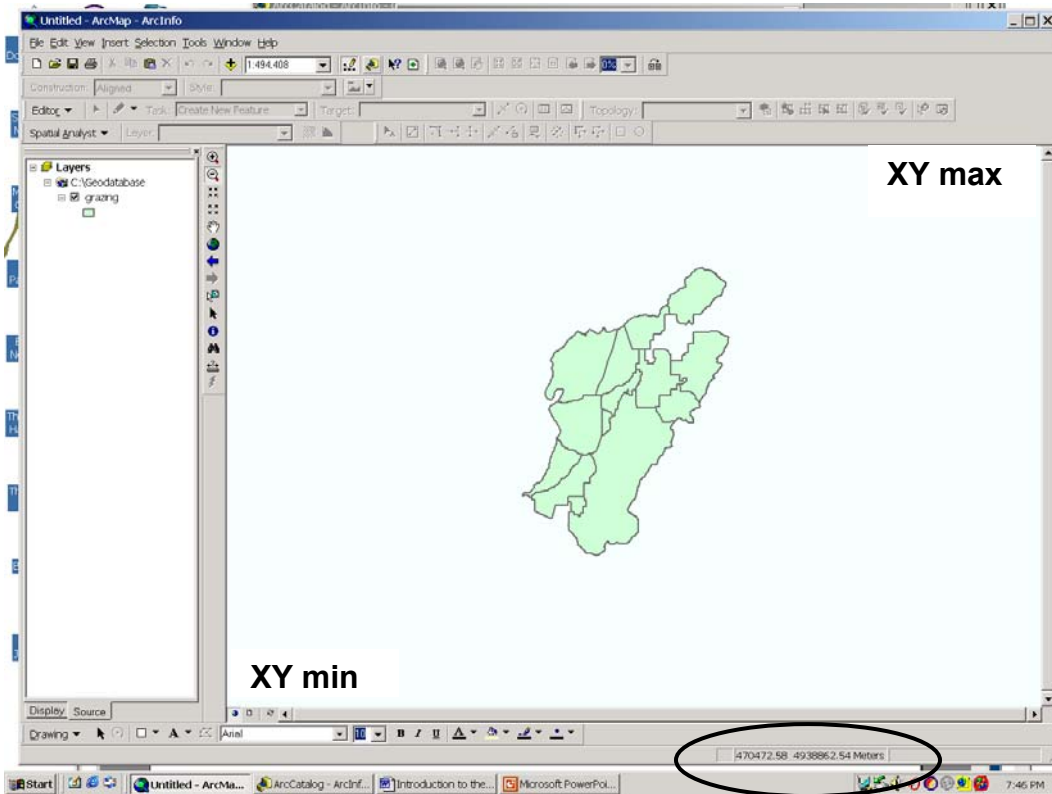


3. Defining Domains

The coordinate range, or domain extent of the feature dataset is dependent on the minimum X & Y, maximum X&Y and the Precision. Precision is the number of system units per unit of measure, and therefore specifies the degree of resolution.

Defining Precision: We are working in UTM coordinates with units meters. Setting the precision to 1000 will result in a database accuracy of 1/1000 m (one millimeter). This is plenty accurate - set the precision to 1000.

Defining min and max X&Y: Open a new ArcMap project. Add the data layer c:/NR506/Geodatabase/grazing.shp. This data layer defines the extent of the OX Ranch. Zoom out according to the graphic below to give yourself some margin when defining the XY Domains.



Place the cursor over the lower left corner and read the X&Y minimum coordinate. Repeat for maximum XY in the upper right.

minX_____

minY_____

maxX_____

maxY_____

Your answer should be similar to the one below

minX: 448000 minY: 4930000
maxX: 600000 maxY: 5020000

Use the formula below to calculate your minimum and maximum X and Y for your shifted domain.

$$(\text{MinX} + \text{MaxX})/2 - (2.14 \times 10^9) / (1000 \times 2) = \mathbf{X \text{ min}}$$

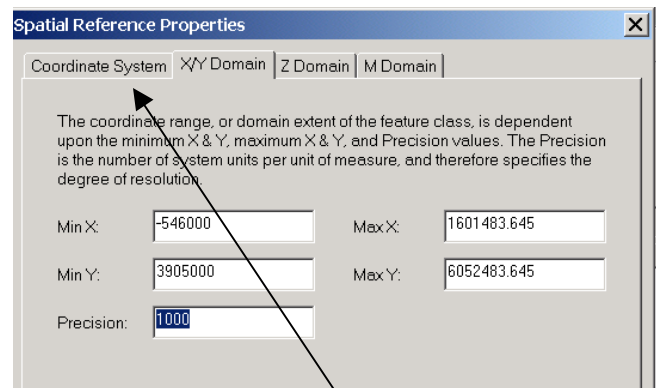
$$(\text{MinY} + \text{MaxY})/2 - (2.14 \times 10^9) / (1000 \times 2) = \mathbf{Y \text{ min}}$$

$$(\text{MinX} + \text{MaxX})/2 + (2.14 \times 10^9) / (1000 \times 2) = \mathbf{X \text{ max}}$$

$$(\text{MinY} + \text{MaxY})/2 + (2.14 \times 10^9) / (1000 \times 2) = \mathbf{Y \text{ max}}$$

Step 3: Enter precision 1000 and your calculated X and Y shifted domains.

The precision will change as you enter X and Y but should stay close to 1000 if your calculations are correct.

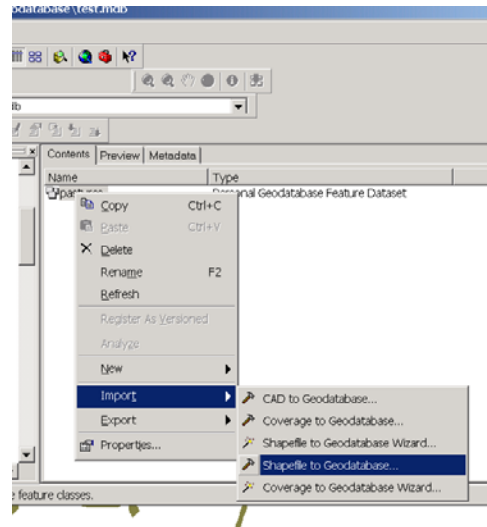


Step 4: After you have defined the XY Domain, click on the Coordinate System tab on the top bar. Use the *Select* icon to select the coordinate system: UTM, NAD27, zone 11 north (this is the coordinate system the fence and grazing allotment shapefiles are in). You have to go through a few dialog boxes to define the projection. When done, click OK for the Spatial Reference Properties dialog box. Click OK for the Feature Dataset dialog box.

You can check that the coordinate system and XY domains were correctly entered in the Feature Dataset Properties. Right-click on the Feature Dataset (pastures) – select Properties – then click the Edit button. Check the coordinate system and XY Domain values.

You are now ready to import data to the empty Feature Dataset (pastures) in the Geodatabase (OX_data). ArcCatalog has many wizards and dialog boxes to ease import of data to a Geodatabase. Many data formats can be imported, for example: shapefiles, coverages, and CAD files. A personal Geodatabase will NOT store raster data such as grids and images. Also remember that a personal Geodatabase has a size limit of 2 mbyte.

Step 5: Right-click on the feature dataset pastures, select Import then Shapefile to Geodatabase.



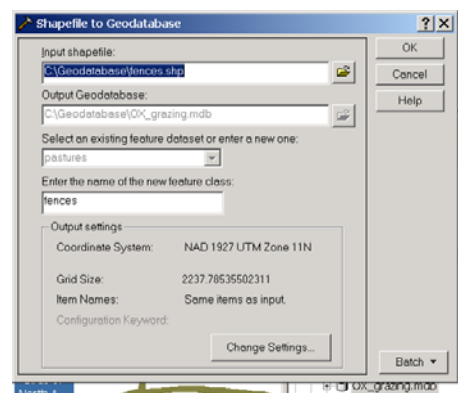
Step 6: Input shapefile is
c:\NR506\data\geodatabase\fences.shp

Output Geodatabase is
c:\NR506\data\geodatabase\OX_data.mdb

Existing feature dataset is *pastures*

Name of new feature class is *fences*

Click OK



Repeat *Step 6* for
c:\NR506\data\geodatabase\grazing.shp.
The two shapefiles should be imported to
the same feature dataset (pastures)

You have just created a new
Geodatabase (your first?)

Add the new Geodatabase to a
new or existing ArcMap project!

What did you learn in this lab – self-test.....

Question 1: What is a feature class? What is a feature dataset? Describe how feature datasets and feature classes are organized within a Geodatabase.

Question 2: Give three examples of GIS data types that can be imported to a personal Geodatabase!

Are there data that cannot be imported to a personal Geodatabase?

Question 3: Why is it important to define the XY domain for each new Feature Dataset in a Geodatabase?

Question 4: What is the significance of the *precision* when defining the XY domain?

Question 5: Do you see any use of the Geodatabase format for fire GIS data?