

## Methodology for NAFTA Project

The following document illustrates the steps in converting Texas Parks and Wildlife Department's (TPW) Biological Conservation Database (TxBCD) from paper to a digital format. The TxBCD includes threatened and endangered species data as element of occurrence (point), transect, and polygonal information. The methodology will be broken up into the following seven sections :

- Overview
- Data Orientation
- Data Collection
- Data Preparation
- Digitizing and Editing Procedures
- Tips

### Overview

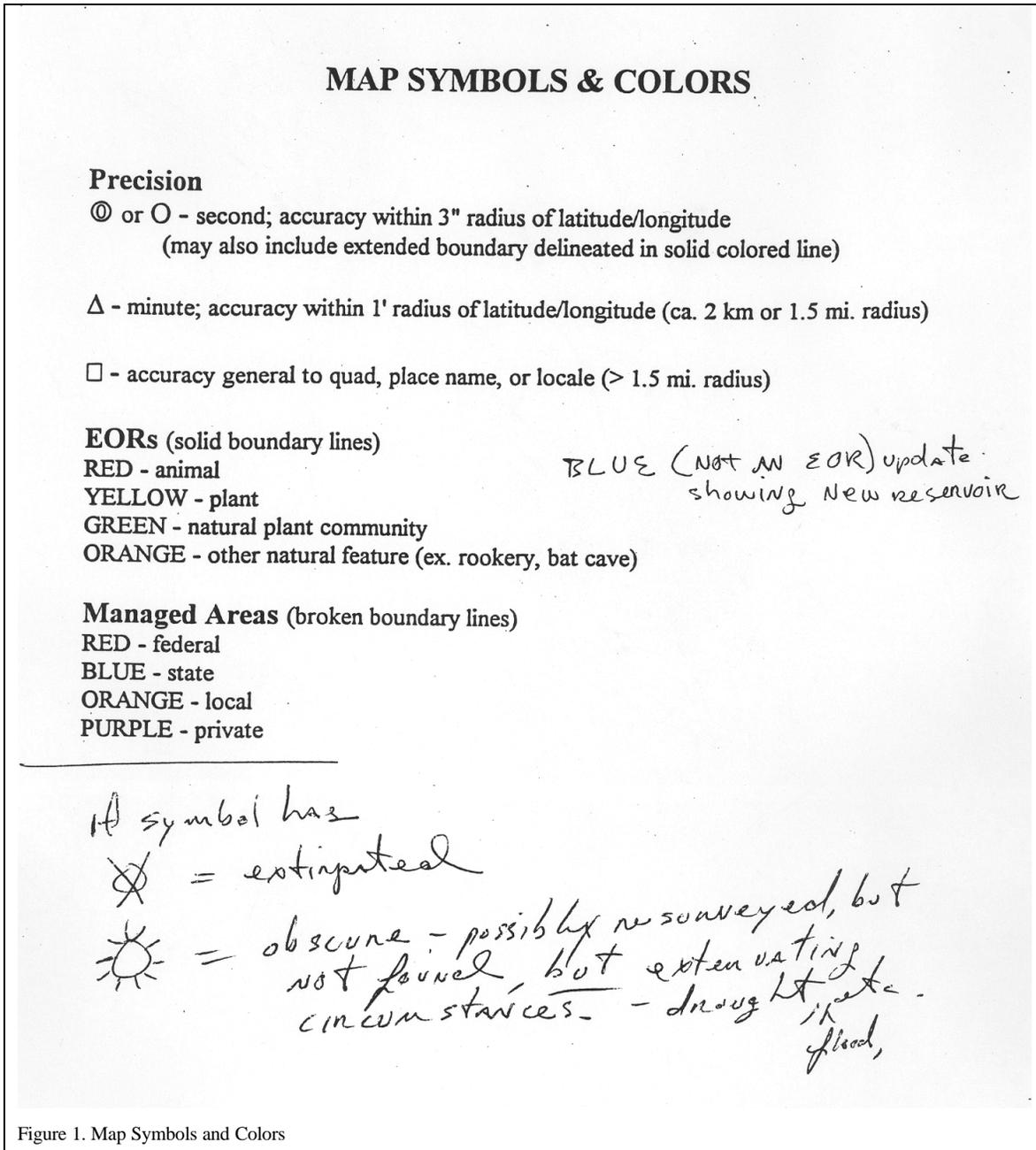
Before the conversion process can begin the analyst must first become familiar with the TxBCD features and symbology as well as the TxBCD grid and referencing system. The next step involves acquiring all the relevant ancillary data that will be used in the process. Digital datasets include 1x1 degree quads, quarter quad coverage and Digital Raster Graphs (DRG). Once the data has been gathered, a workspace and logical data directory structure must be defined and created. After the ancillary files have been prepared and projected into proper UTM zones, the digitizing process can begin.

### Orientation

1. *Review TxBCD data structure and symbology (refer to handouts)*

See figure 1. In the conversion process, the analyst is only concerned with transect and polygonal **Element of Occurrence (EORs)** and **Managed Areas**. The EORs are symbolized with a colored solid line on the map sheets. Red represents animals; Yellow symbolizes plants; Green denotes natural plant communities; and Orange designates other natural features (e.g. rookeries and bat

caves). The managed areas are symbolized by a broken boundary line. Red symbolizes federal; Blue indicates state; Orange signifies local areas and purple denotes private ownership.



2. Examine the TxBCD reference system (1x1 degree map bars), map sheets, map numbers, and the features

Each map bar represents one degree of latitude by one degree of longitude labeled by a number representing the lat/long found in the lower right corner of the block. For example, the map bar labeled 2930 represents a 1x1 degree block that covers latitude of 29 degrees North and a longitude of 30 degrees West. Each map bar contains all the USGS Quarter Quads for that 1x1 degree block. The quarter quads are referenced starting in the lower right corner moving left to right. Therefore the first quad on the map bar would be located at the lower right of the 1x1 degree block and the last quarter quad on the map bar will be located at the upper left corner of the 1x1 degree block. Each quad is labeled based on the map bar (lat/long), row and column. For example, the first quarter quad in the 2930 map bar would be labeled 293011 and the last would be labeled 293088.

Once the analyst has a grasp of the TxBCD reference system, the next step and one of the most important tasks is to familiarize oneself with the features on the map sheets themselves. The analyst will want to accustom themselves to scanning the entire quarter quad by reviewing the notes on the right-hand margin and locating the features on the map itself.

## **Data Collection**

### *1. Obtain or create 1x1 (correspond with map bars) and 1x2 degree grids*

These coverages are located here: <http://gis-data.tpwd.state.tx.us/>

The 1x1 coverage is used to track map bar progress and the 1x2 degree coverage is used to determine the proper DRG CD needed for the digitizing process. Each DRG CD contains all the DRGs for a 1x2 degree block.

### *2. Acquire quarter quad coverage*

This coverage can be obtained here:

[http://www.tnris.state.tx.us/DigitalData/data\\_cat.htm](http://www.tnris.state.tx.us/DigitalData/data_cat.htm)

The quarter quad coverage is used for progress and tracking purposes. It is essential in determining what you have done and what needs to be completed.

### *3. Acquire DRG coverage*

Gareth has state-wide coverage. Please contact him for assistance. Please be aware that the DRG coverage may not be complete. If coverage is not complete,

DRGs can be downloaded from Texas Natural Resources Information System ([http://www.tnris.state.tx.us/DigitalData/data\\_cat.htm](http://www.tnris.state.tx.us/DigitalData/data_cat.htm)).

### Workspace and data preparation

1. Directory development. In developing the directory structure, be sure to address the different UTM zones, ancillary datasets, and DRG datasets.
2. Project data to its appropriate UTM zone and/or statewide projections. For Example UTM Zone 14 or TSMS (Lambert Conformal Conic)
3. Clip and finalize datasets into the correct dir.
4. Get a nice large notebook to keep track of quads, features, and progress.

### Procedures for digitizing (Preparation)

#### 1. File naming convention

There will be a coverage for each biotype found in the TxBCD. These include plants, plant communities, animal, managed areas, and other natural features. Each coverage name must include the biotype, the feature class (line or polygon) and the UTM zone. Therefore, an animal polygon in UTM zone 14 will be titled: animal\_py14 and a plant transect in UTM zone 13 will be titled: plant\_ln13.

#### 2. Create a new Coverage(s)

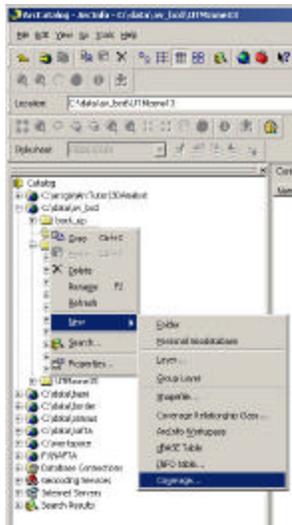


Figure 2

New coverages are created in ArcCatalog. In the example that follows, the user will create a new animal polygon coverage for UTM zone 13. In creating a new coverage always keep in mind the naming convention and projection information. Open ArcCatalog and navigate to the proper workspace. For example, C:\data\av\_bcd\UTMzone13. Right-click on the directory and select new>coverage from the pop-up window (Fig 2). The new coverage dialog window opens. Insert the proper title in the text field (in this

case, animal\_py13) and select next (fig 3). Click the define button to initiate the projection wizard. Follow the appropriate steps remembering

that the coverages must have the same projections as the DRGs (UTM, meters, Zone 13/14/15, NAD 83). See figure 4.

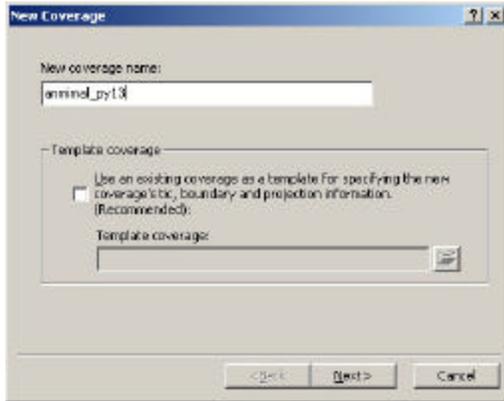


Figure 3

Click next; in the new dialog that appears select the proper feature class for the coverage. In this case polygon was selected, but if the feature to be digitized was a transect then line would be the appropriate response (fig 5). Click on the finish button to complete the process.

Next, two fields have to be added to the coverage, *EOCODE* and *NOTES*. The EOCODE is a 14 character string used to link the coverage to the BCD database. NOTES is a 150 character string that contains the margin notes from the quad sheets. Not only are both needed for the GIS but both are useful markers in determining accuracy and progress. In ArcCatalog, select the new coverage, select the preview tab, and finally select the table option in the preview drop down box (fig 7). An empty table appears in the preview window. Click on options> new field (fig 8) and type in an appropriate title for the field. The EOCODE field is type: text and is 14 characters in length (fig 9). NOTES is a also type: text but needs to be 150 characters long to make sure there is enough room to copy all the margin notes into it.

Next, two fields have to be added to

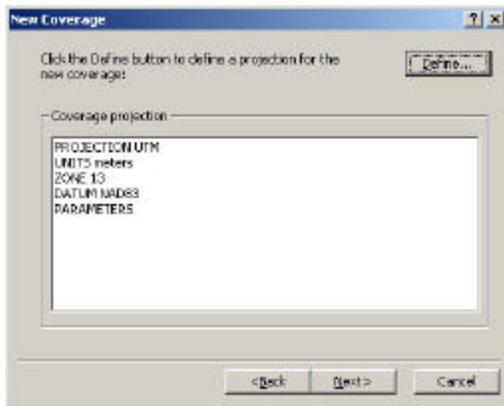


Figure 4

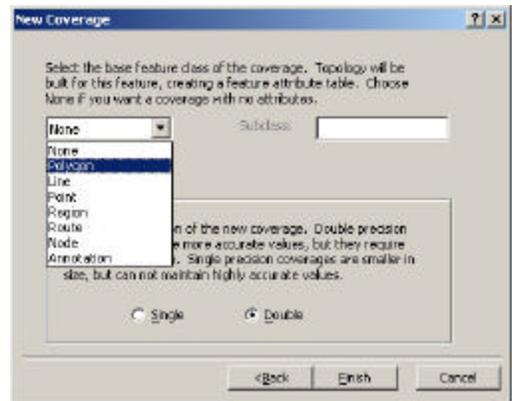


Figure 5

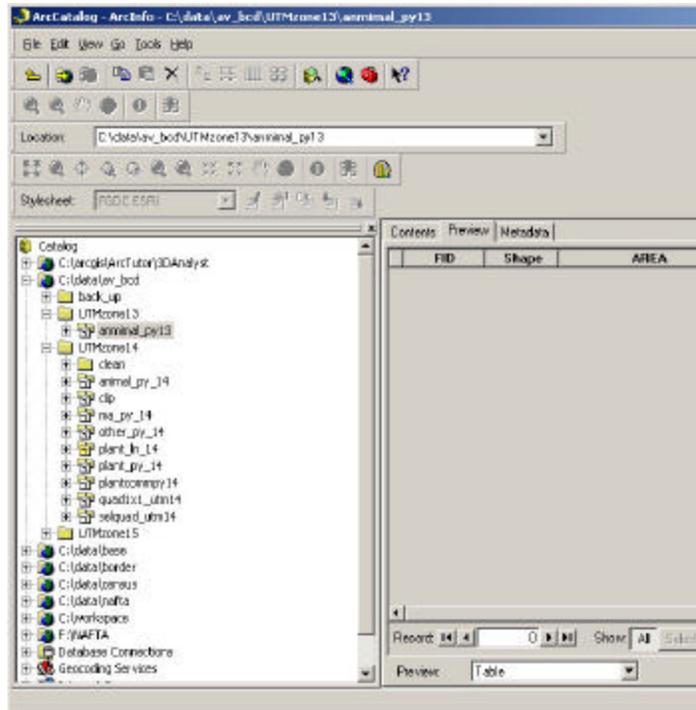


Figure 6



Figure 7



Figure 8

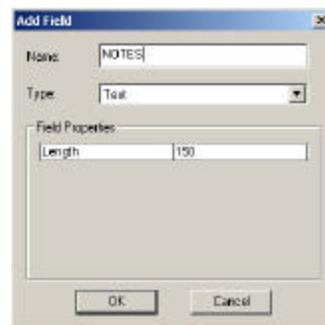


Figure 9

### 3. Add to ArcMap.

Use correct symbology. To change the symbology, left-click the symbol displayed in ArcMap to open the Symbol Selector. The empty coverage now becomes the ‘canvas’ that the paper features will be transposed on to.

## Digitizing and editing coverages in ArcMap

### 1. Start the Editor

Tools>Editor Toolbar or you can right-click on the menu area and select Editor(Fig 10).



Figure 10

### 2. Start editing

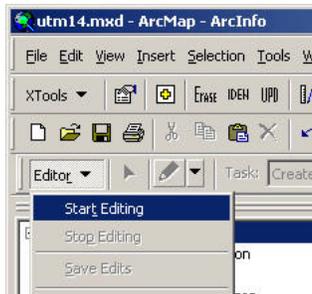


Figure 11

Select Start Editing in the Editor drop down tool bar (Fig 11). From the Task drop down menu, select Create New Feature and select the appropriate target from the target drop down menu (Fig 12). Click on the pencil/Add points to edit a new sketch (Fig 13).

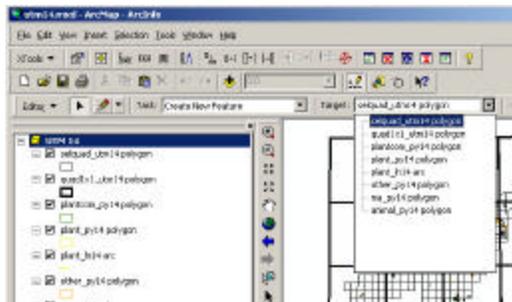


Figure 12



Figure 13

When editing in ArcMap, every existing feature on a map has an alternate form, a sketch. A sketch lets you see exactly how a feature is composed with all vertices and segments of the feature visible. To modify a feature, you must modify its sketch. To create a feature, you must first create a sketch. You can only create line and polygon sketches, as points have neither vertices nor segments. Sketches help complete the current task. For example, the Create New Feature task uses a sketch you create to make a new feature. The Extend/Trim Feature task uses a sketch you create to determine where the selected feature will be extended or trimmed. The Cut Polygon Feature task uses a sketch you create to determine where the polygon will be cut into two features.

Start digitizing by left clicking in the data frame. Double click to finish. You can also right-click and select finish sketch. Be sure to note all the tools and abilities in the right click menu. One tool that will be used a lot is the delete vertex. The great thing about editing in ArcMap is that you can pan, zoom, change tools, change documents, and the editing tools remember right where you

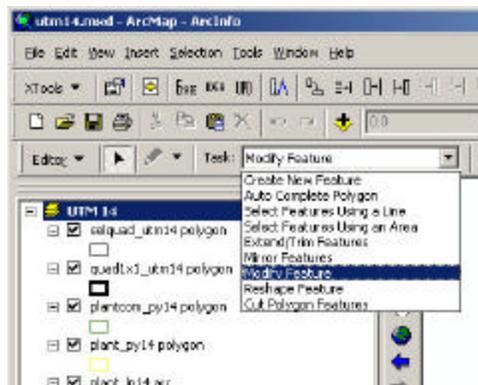


Figure 14

left off. In another example, let's say you finish your polygon but want to go back and tweak it a bit. In order to do this you need to change the task. Change the task to Modify Feature (Fig 14). Then you select the Shared Edit button (Fig 15). Coverages share boundaries and have topology! Select the feature you want to edit. The vertices appear and you can edit using the right click menu. To finish you can either double click or right-click and select finish sketch.

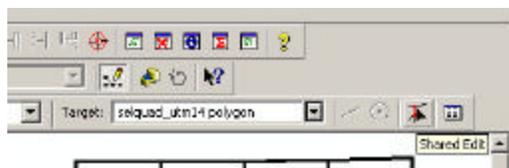


Figure 15

### 3. Adding polygons that share a boundary

Now we want to add polygons that share a boundary. A good example here would be features that lie over multiple quad sheets. Again, we want to change the Task.

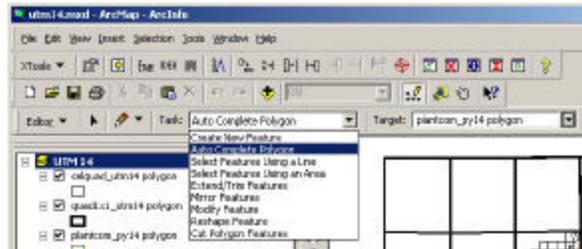


Figure 16

Click the Current Task dropdown arrow and click Auto Complete Polygon (Fig 16). Click the Target Layer dropdown arrow and click a polygon layer. Select the pencil icon (fig 13) Notice the title changes to Auto Complete Polygon since you have selected

a new task. Create a sketch that starts and stops at any of the existing polygon boundaries to enclose the new polygon. You can overshoot the existing boundaries because they will be trimmed automatically. Double-click to finish the sketch. All the vertices and boundaries of the polygon are created and automatically shared. You can use the snapping environment to help you snap to existing polygon boundaries when creating a sketch.

### 4. The snapping environment

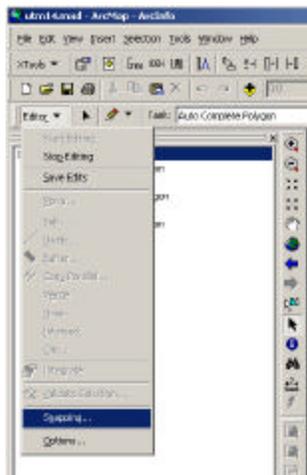


Figure 17

The snapping environment can help establish exact locations in relation to other features. Suppose you're creating a new polygon that begins from an existing polygon; you want to ensure that the vertex of the new polygon connects precisely to the old polygon. The snapping environment makes this type of task accurate and easy. The snapping tolerance is the distance within which the pointer or a feature is snapped to another location. You can also choose the part of the feature,



is add a database connection in ArcCatalog. Select the appropriate table and drag and drop it onto your ArcMap session. Right click on the table and select Open Table. Only 2000 records appear at a time so you'll have to scroll down until another 2000 show. Keep doing this until all the records appear. You will have to do this every time you save an edit or add new data. Be sure to add the EOCODEs at frequent intervals, at least each time you complete a map bar. This is also a good time to double check your features and to make sure you haven't missed a quad or a hard to see polygon on the paper quad sheets

#### 6. *Tips and tricks*

- a. Back-up files! A minimum of once a day.
- b. Check the attribute table of the coverage you are working on to see if you have any sliver polygons or polygons that have not been updated (e.g. empty notes field).
- c. Scan the paper quad sheets multiple times for features. They can be hard to see! One good method is to go down the list of EORs, find each one on the map, and make a note in your log book of each feature that needs to be digitized . Double check, even triple check, digitized results with side notes on the paper quads.
- d. It is a good idea to Build a coverage after any edit session. The Build command creates or updates a feature attribute table for a coverage. The Command can be accessed either through Arcatalog or ArcToolbox.