

Preparing Data in ArcGIS for GPlates

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It has been updated by Behnam Sadeghi, using the latest Muller et al. (2019) plate reconstructions and GPlates 2.2 interface!

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Preparing Data in ArcGIS for GPlates

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Background

The vast majority of users that deal with geospatial data are likely to be using commercial or open-source GIS packages to display and edit their data. This tutorial will help you create and prepare data in ArcGIS (a common commercial GIS package) for viewing in GPlates. It is important to note that GPlates will import any shapefile (assuming it conforms to shapefile standards), and can export shapefiles for use in other GIS platforms.

The tutorial will involve loading GPlates data into ArcGIS to familiarise the user on the file conversion capabilities of GPlates. The later section deals with adding GPlates attributes, such as Plate IDs, to selected geological provinces in ArcMap, in order to create a shapefile that can be loaded into GPlates and reconstructed using the EarthByte rotation model.

Note: The shapefiles associated with this tutorial are in a WGS 84

geographic datum. If you are working in another projection within ArcGIS, you may need to apply a geographic transformation to the data. This is reasonably straight-forward and automatic in most GIS packages. Refer to the manual of your GIS package for more information.

Included Files

[Click here](#) to download the data bundle for this tutorial.

The data bundle should include the following GPlates files:

Muller_etal_2019_Global_Coastlines.gpmlz
Muller_etal_2019_CombinedRotations.rot

The data bundle should also include the following shapefiles:

CarpentariaBasin
EuclaBasin
GPlates_Coastline
MarionTerrain
QLD_Plateau
Muller_etal_2019_Global_Coastlines

This tutorial dataset is compatible with GPlates 2.2.

Loading GPlates Data in ArcGIS

1. Open a new empty map document in ArcMap.

2. Click the 'Add Data'  button in the main window.

3. The file needed is the "Muller_etal_2019_Global_Coastlines.shp" which can be found in the data bundle for this tutorial.

You may need to click 'Connect To Folder'  button to access some folders.

Once you have reached your tutorial data bundle folder, click on the 'Shapefile_Coastline' folder (figure 1) → select 'Muller_etal_2019_Global_Coastlines.shp' → click 'Add' (figure 2).

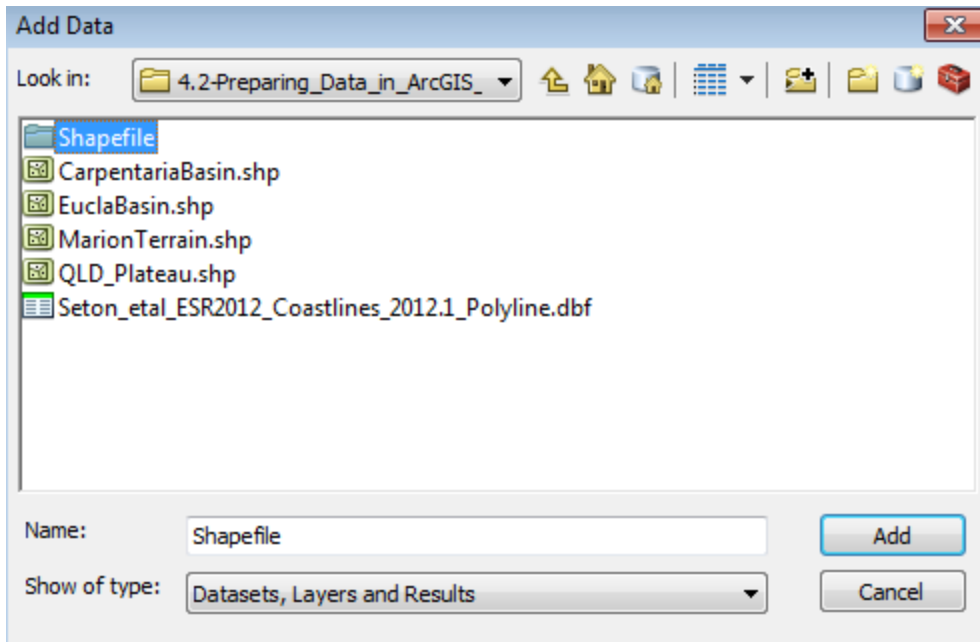


Figure 1: Selecting the shapefile folder in ArcMap

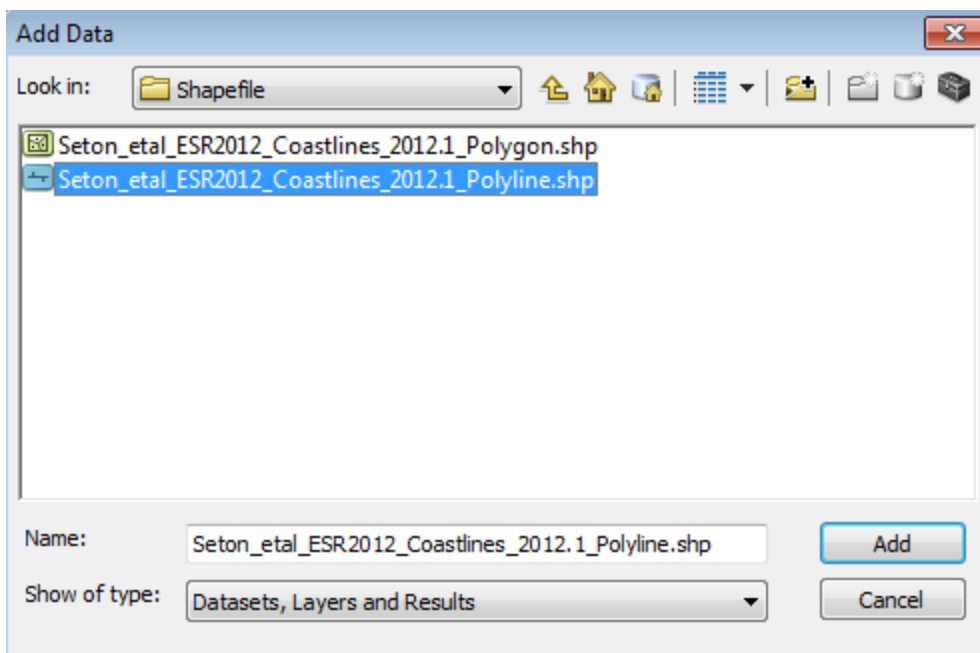


Figure 2: Selecting the Polyline Shapefile data, and adding it into ArcMap

4. The GPLates coastline contains feature attribute data. It may be useful to colour the coastline features by Plate ID. To do this, right-click on the "Muller_etal_2019_Global_Coastlines.shp" layer in the Table of Contents on the left side of the screen.

Click 'Properties' from the drop-down menu (figure 3).

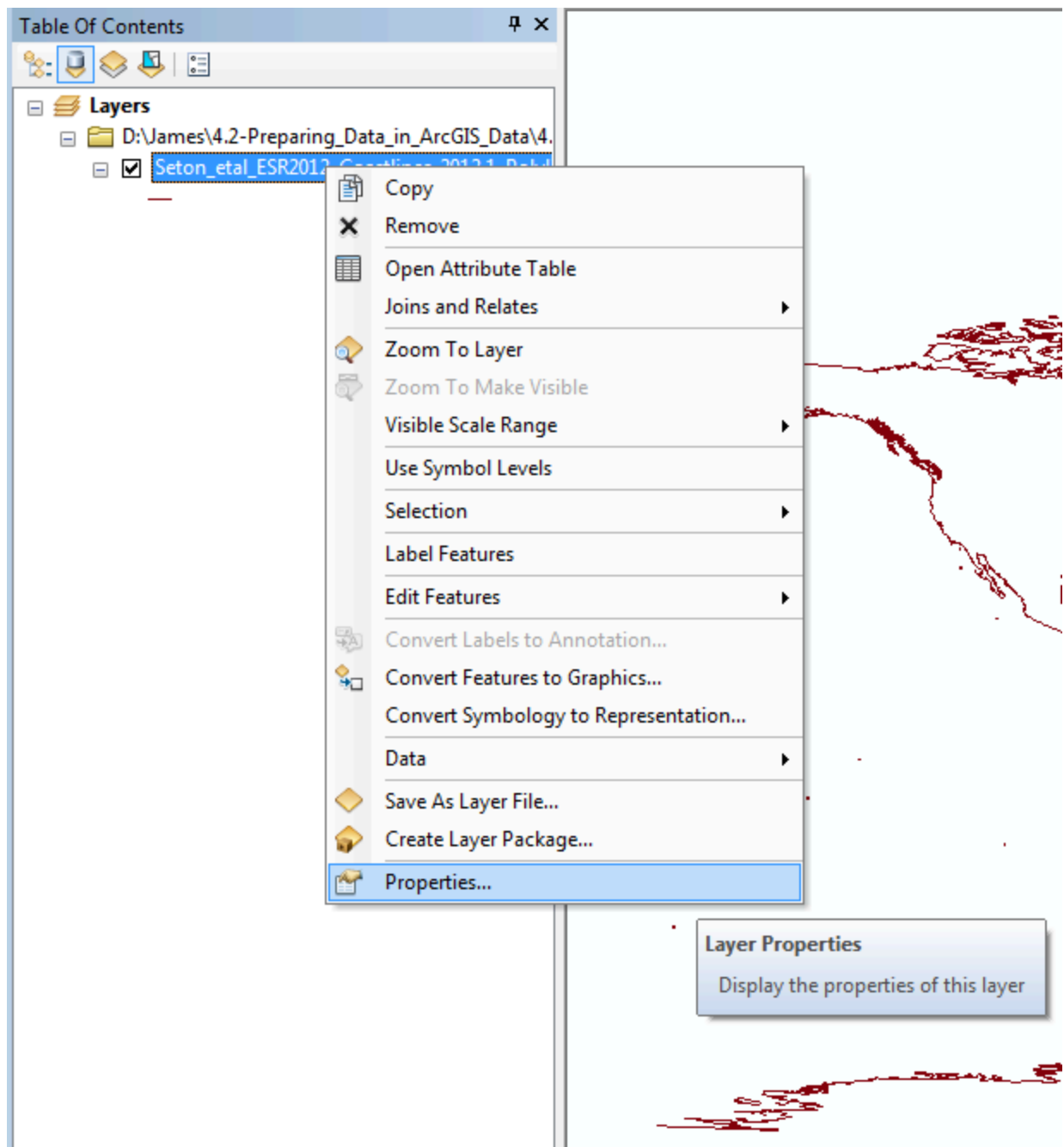


Figure 3: Selecting the properties of our shapefile layer, allowing us to view and change the attributes of this layer.

5. Select the 'Symbology' tab in the Layer Properties screen. Click on '**Categories**' → '**Unique values**'. The value field is the feature attribute that the colour ramp will be assigned to (figure 4).

Select the "PLATEID1" Value Field and choose a suitable colour ramp.

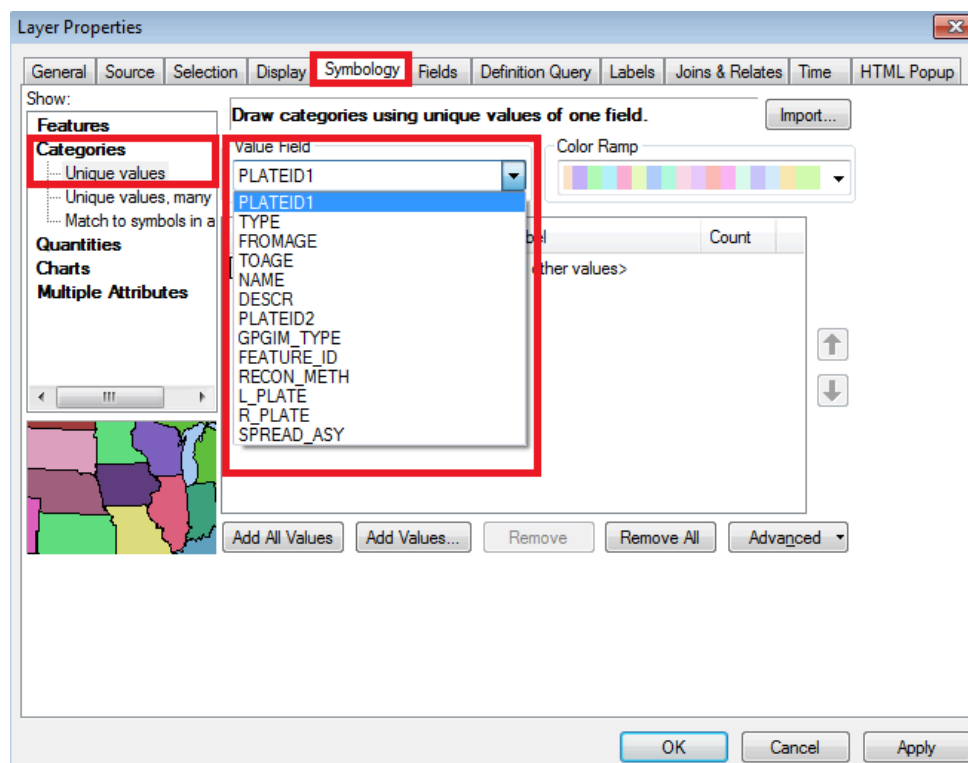


Figure 4: The symbology of our Shapefile layer

6. Click 'Add All Values' to load all the Plate IDs from the shapefile. The next step will be to make the displayed lines thicker. Click the 'Symbol' column and select 'Properties for All Symbols' (figure 5).

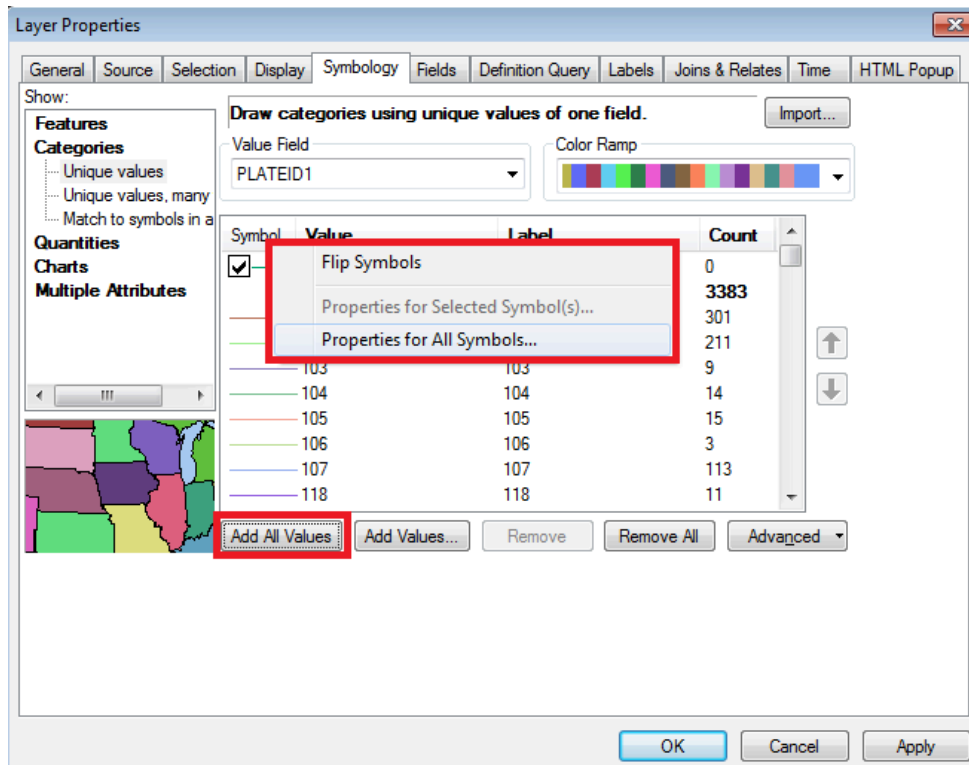


Figure 5: Changing the thickness of the lines by clicking on 'Properties for All Symbols'

7. Change the line width to '2.00' points.

Leave all the other settings as their default value and click 'OK'.

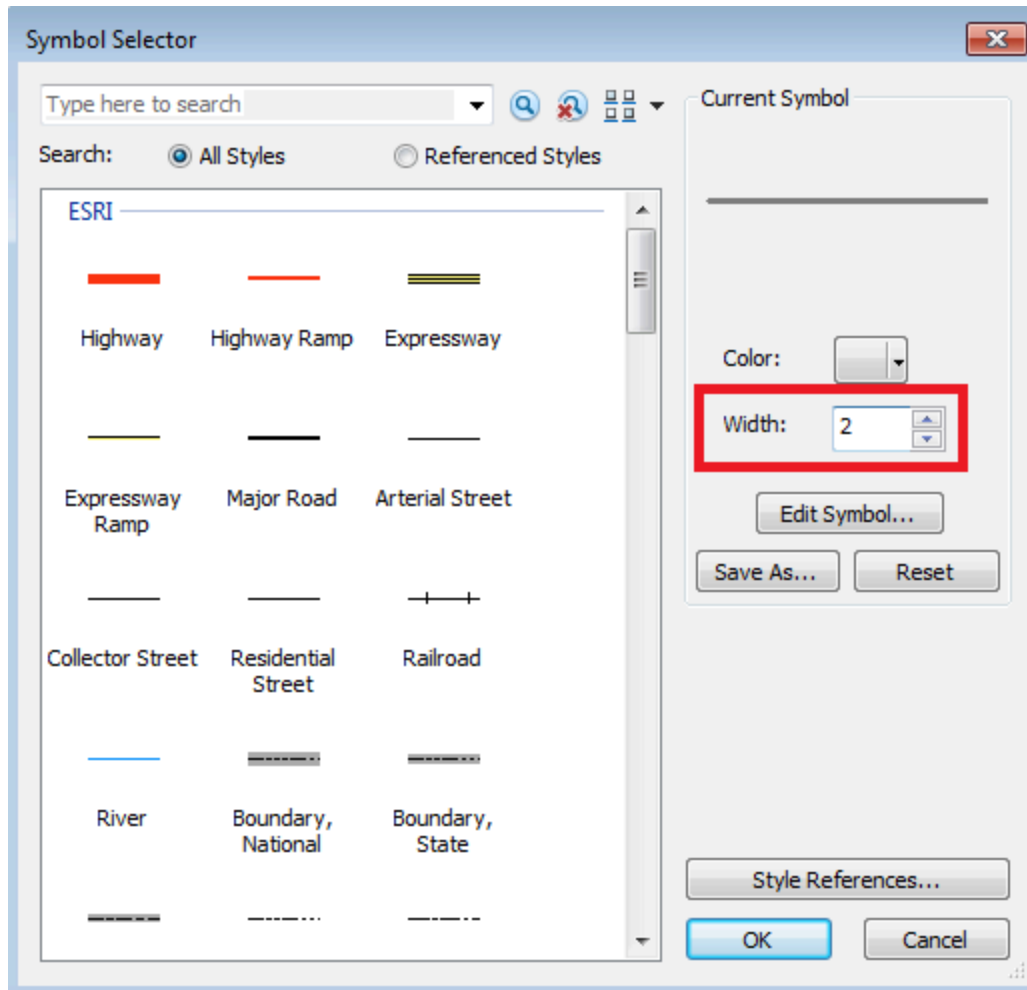


Figure 6: Specifying the width of our lines



8. Click 'OK' again to return to the map display window. The coastline will now be coloured by Plate ID. It will be essential to use the 'Identify'  tool to query Plate IDs and other attributes. The figure below shows the Australasian region coloured by Plate ID in an ArcGIS window.



Figure 7: Map view of shapefile layer with assigned coastline PlateID features

9. To query the shapefile, select the 'Identify'  tool and click on the desired feature. For example, clicking on the Australian coastline will display attribute information for that feature. The Plate ID of 801 belongs to Australia and will be used to assign Plate IDs to new shapefile features in the following sections.

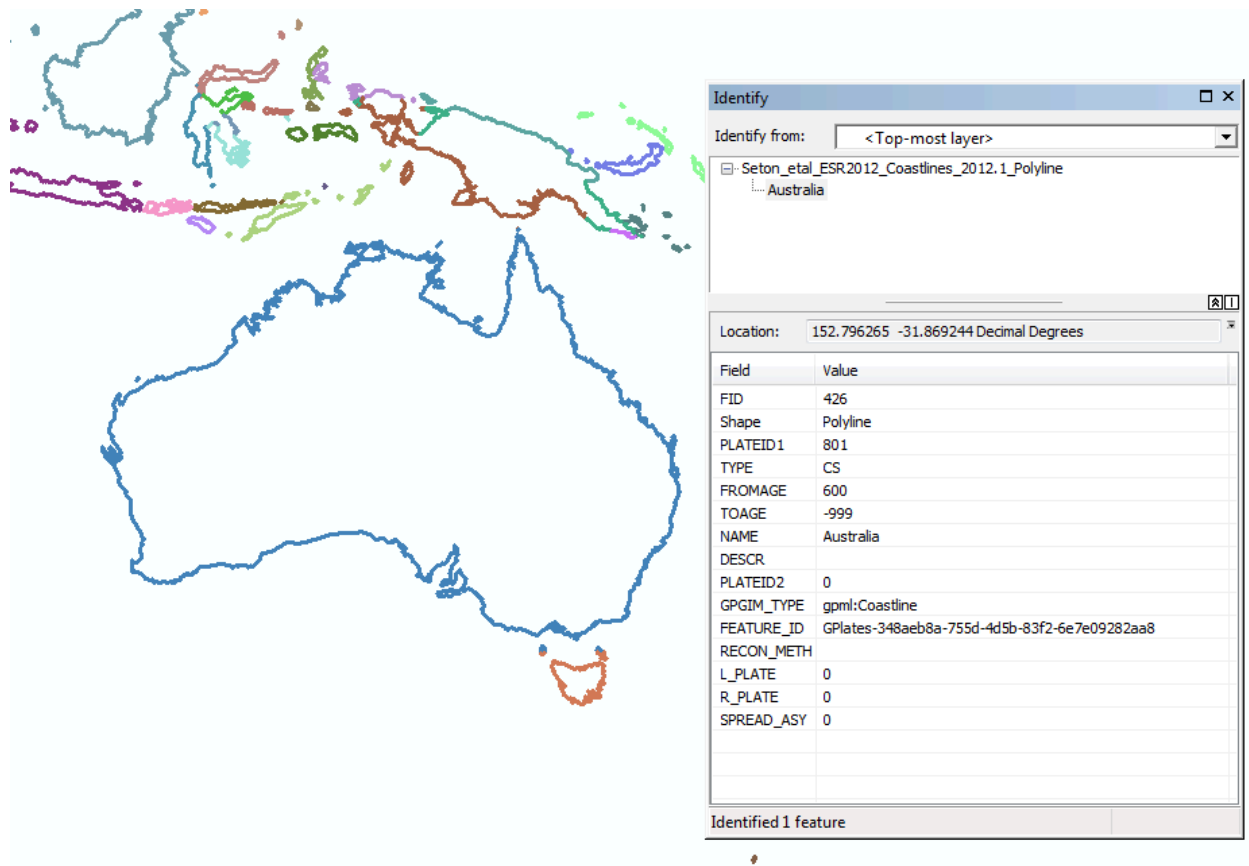


Figure 8: Querying the Australian Continent by clicking on its coastline with the query tool.


10. Save your map document.

Assigning Plate IDs to geological provinces

This tutorial section will describe the process of assigning Plate IDs to shapefile features in an external GIS environment such as ArcMap. This is because most of the data users work with does not have assigned Plate IDs. This step will allow you to load shapefiles directly in GPlates and reconstruct features through time using the GPlates/EarthByte rotation model.

Additional data is available from:

<http://www.earthbyte.org/gplates-2-2-software-and-data-sets/>

1. Open the map document from the previous section in ArcMap.
2. Click the 'Add Data'  button in the main window.
3. Once prompted, navigate to the ArcGIS Tutorial sample data folder.
4. Select the following shapefiles:

CarpentariaBasin.shp, EuclaBasin.shp, MarionTerrain.shp and QLD_Plateau.shp

Click 'Add' to display these geological provinces (figure 9).

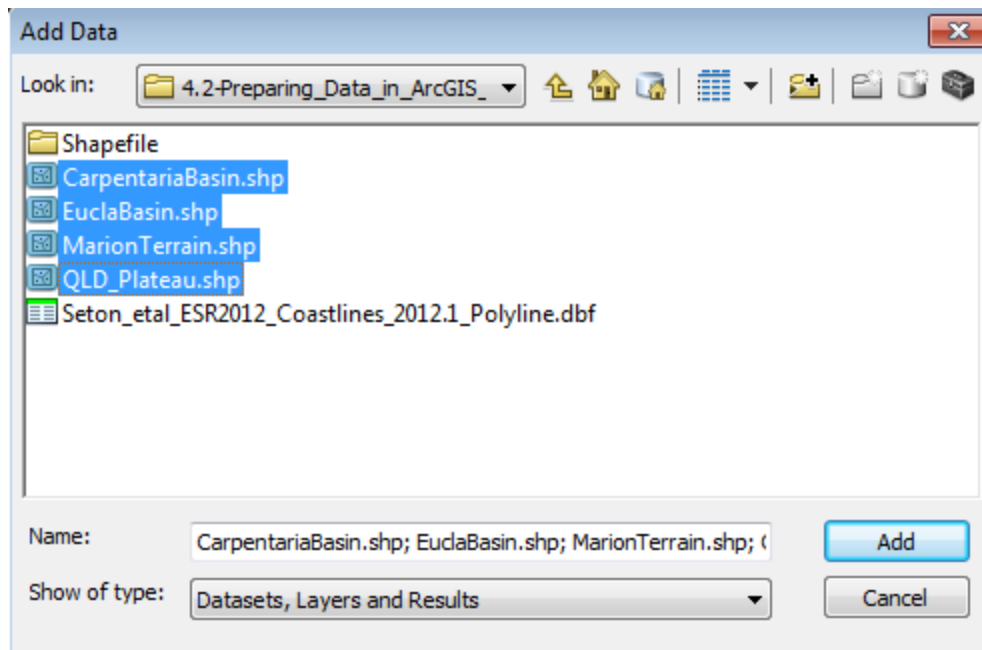


Figure 9: Selecting the specified shapefiles to display them on our ArcMap document.



Figure 10: Mapview with the added layers.

5. Right-click on the "CarpentariaBasin" layer, and select 'Open Attribute Table'.

The Attribute Table contains all the relevant information for the features in that selected shapefile. Fields can be added or deleted (be vary of this, they cannot be recovered once deleted) and attributes can be edited much like an ordinary spreadsheet.

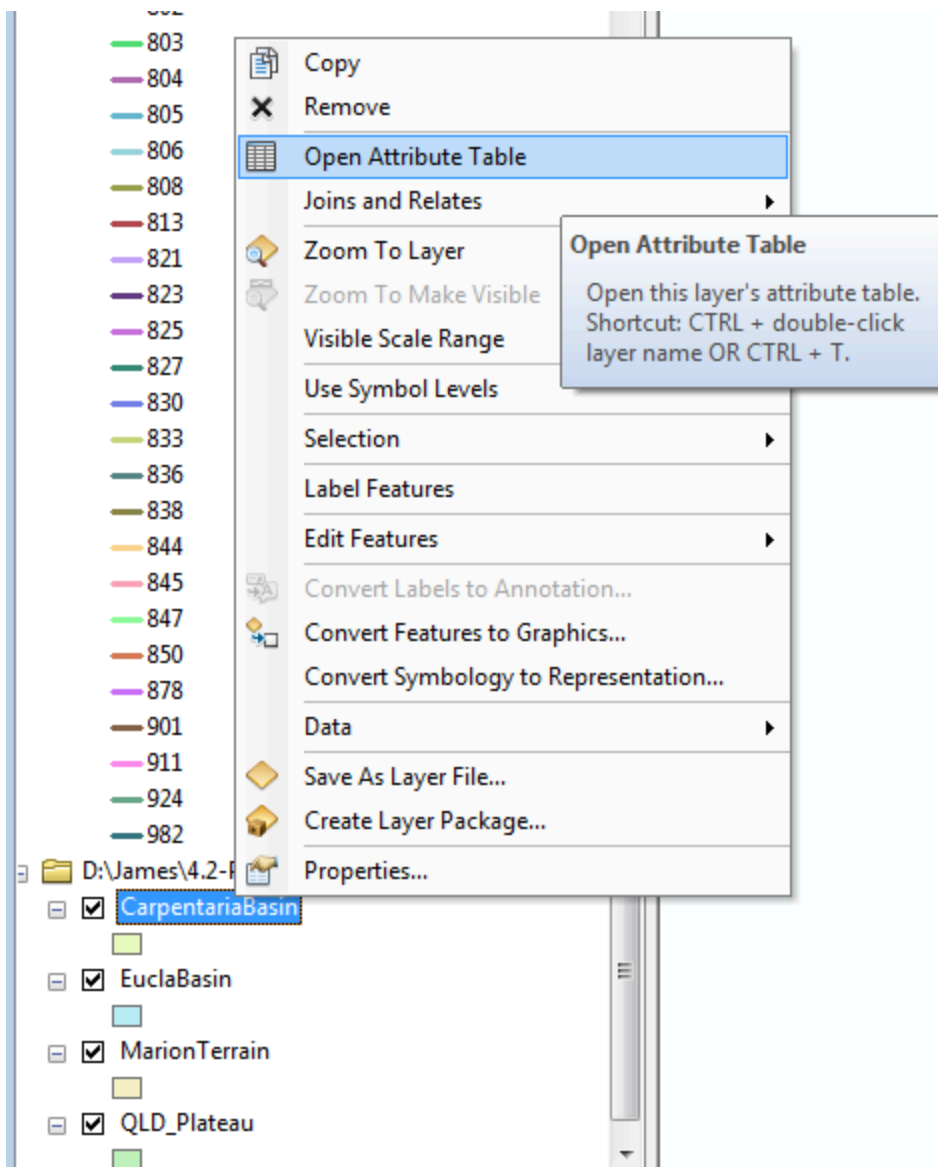


Figure 11: Opening the attribute table for the Carpentaria Basin

6. The Attribute Table for the Carpentaria Basin contains only one polygon feature. We want to add a "PlateID" column (the ArcGIS term is 'Field') so that these geological provinces can be loaded into GPLates and reconstructed through time using the EarthByte rotation model.

In the Attribute Table click 'Options' → 'Add Field' (figure 12).

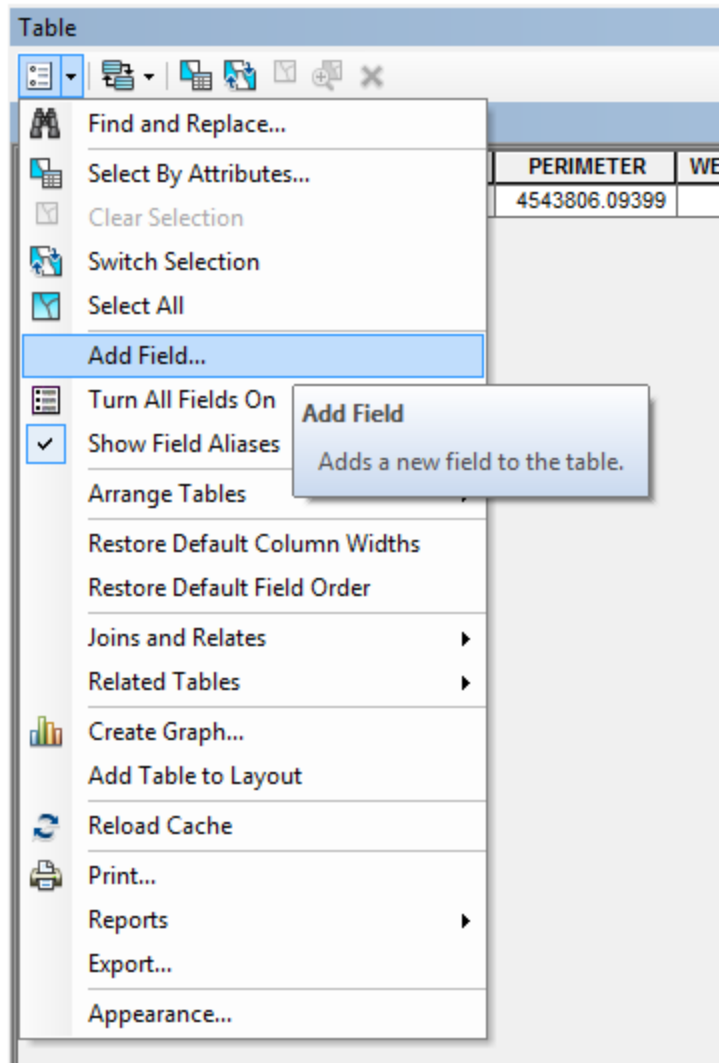
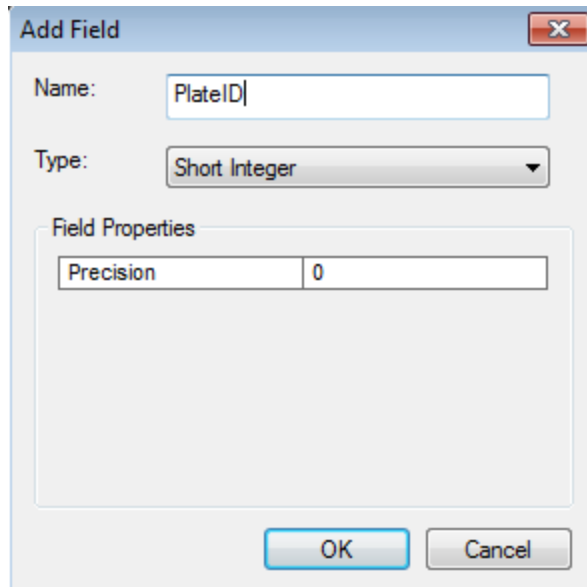


Figure 12: Under the attributes table, we are able to add a new field by clicking on the 'table options' button

7. Name the new field as "PlateID" and assign it the Short Integer data type. Click 'OK'.



The image shows a 'Add Field' dialog box with the following details:

- Name:** PlateID
- Type:** Short Integer
- Field Properties:**
 - Precision: 0
- Buttons:** OK, Cancel

Figure 13: We must specify the properties of the new field

8. Right-click on the 'PlateID' column heading, and select 'Field Calculator' from the drop-down menu. In the Field Calculator screen, type in 801 (without spaces) and click 'OK' to assign the Plate ID. When this shapefile is loaded into GPlates, this feature will reconstruct using the rotation entry for Plate ID of 801 (Australia).

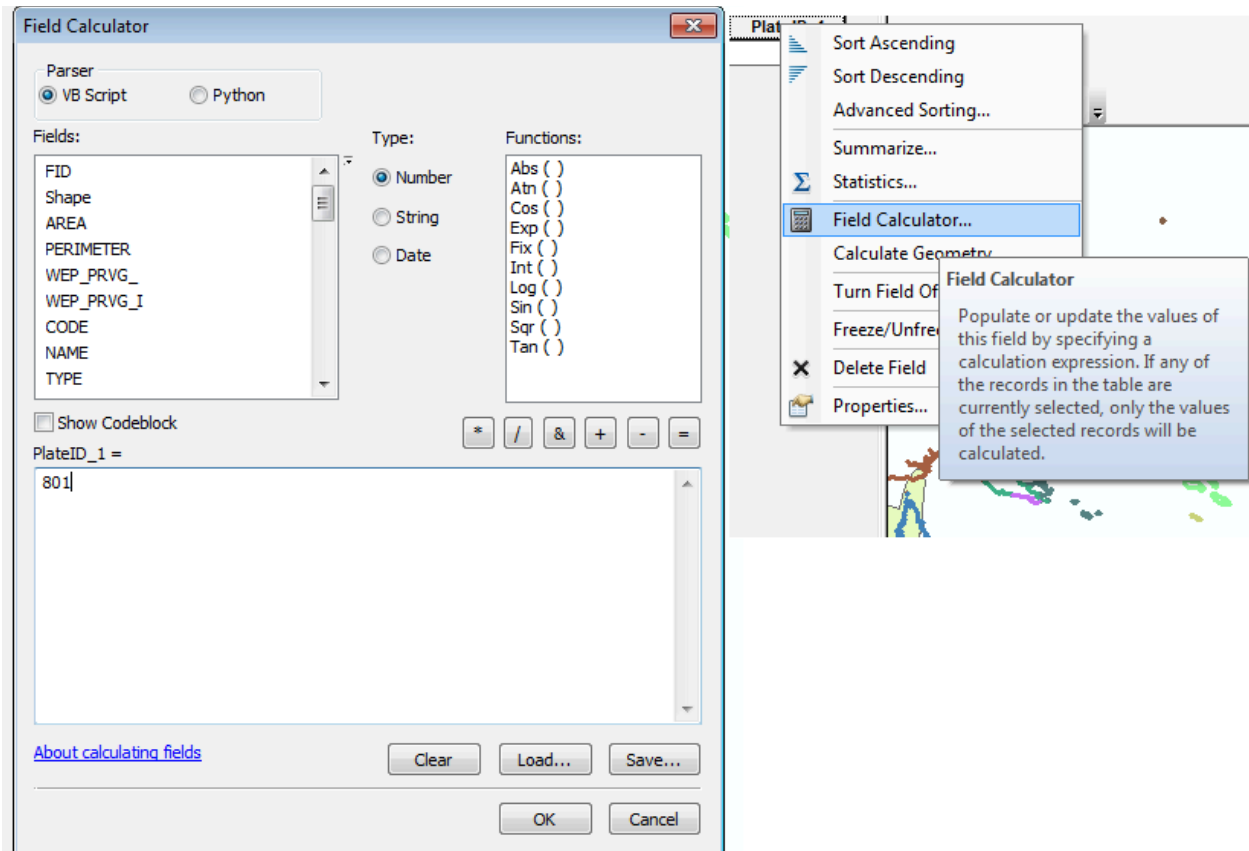


Figure 14: Assigning a plate ID in ArcGIS, so that this feature will reconstruct appropriately in GPlates.

9. Repeat Steps 5-8 for the other three geological provinces, adding a PlateID field and assigning the Plate ID of 801 to each shapefile.

Changes that are made using the Field Calculator are automatically appended to the shapefile. The shapefiles are now ready to be loaded in GPlates and reconstructed using the EarthByte rotation model.

Note: In case you want to make changes to individual records in the shapefile using the shapefile Attribute Table in ArcMap, you will need to enter an edit session. This is outside the scope of this tutorial – refer to the ArcGIS documentation on how to use 'Editor'.