

# Digitizing Polygon Data Structure



## Introduction

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The purpose of this tutorial is to provide guidance on how to create polygons using the [QGIS](#) software. QGIS is an open-access software that is available for all platforms used to create, edit, visualize, analyze, and publish geospatial information. The instructions described here were mostly taken from the QGIS User Guide, and adapted to meet our needs.

## 1. Starting a new project



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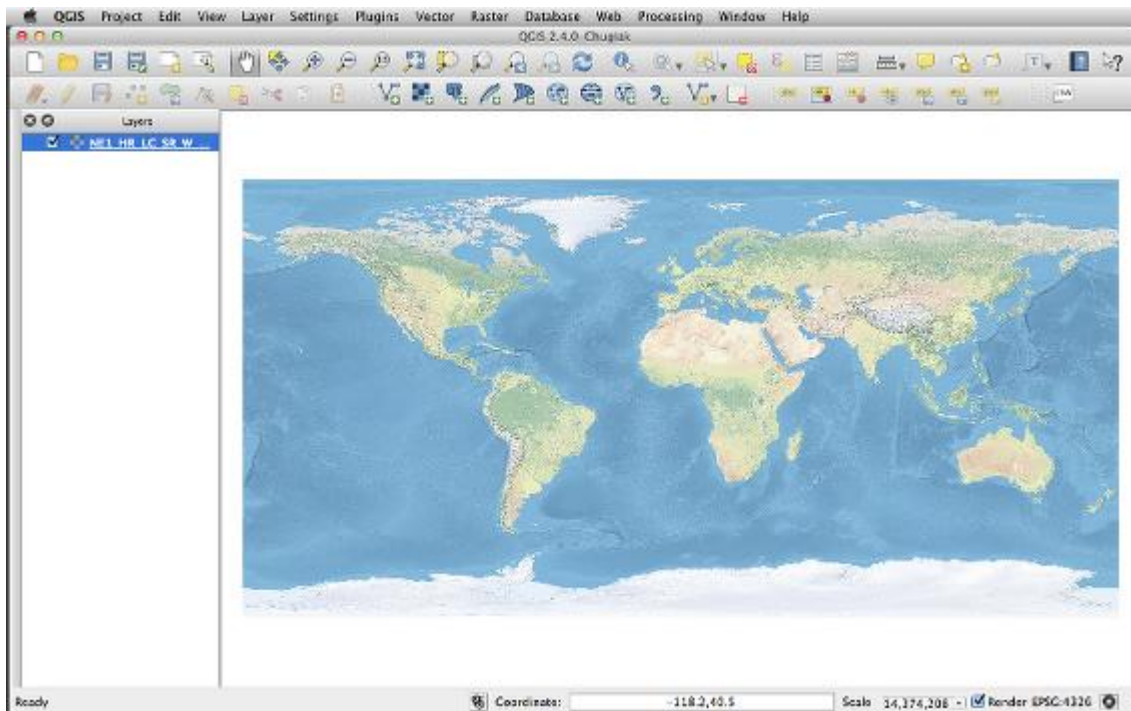
Go to menu Project →  Save or Project →  Save As (the same options are available in the toolbar). Then, choose the name for your project (e.g., my\_project) and the location to save it.




## 2. Loading raster data

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Raster data in GIS are matrices of discrete cells that represent features on, above or below the earth's surface. Each cell in the raster grid is the same size, and cells are usually rectangular. Typical raster datasets include remote sensing data such as aerial photography or satellite imagery and modeled data such as an elevation matrix.



Raster layers are loaded either by clicking on the  Add Raster Layer icon on the toolbar or by selecting the Layer →  Add Raster Layer menu option. The file that we need is TIF file. Browse to the folder where you saved the file, and click the button [Open]. You might be asked to select the correct projection for this layer; in this case, select WGS 84, and click [OK]. Now, on the Map view area, you should see a topographical world map, like this:



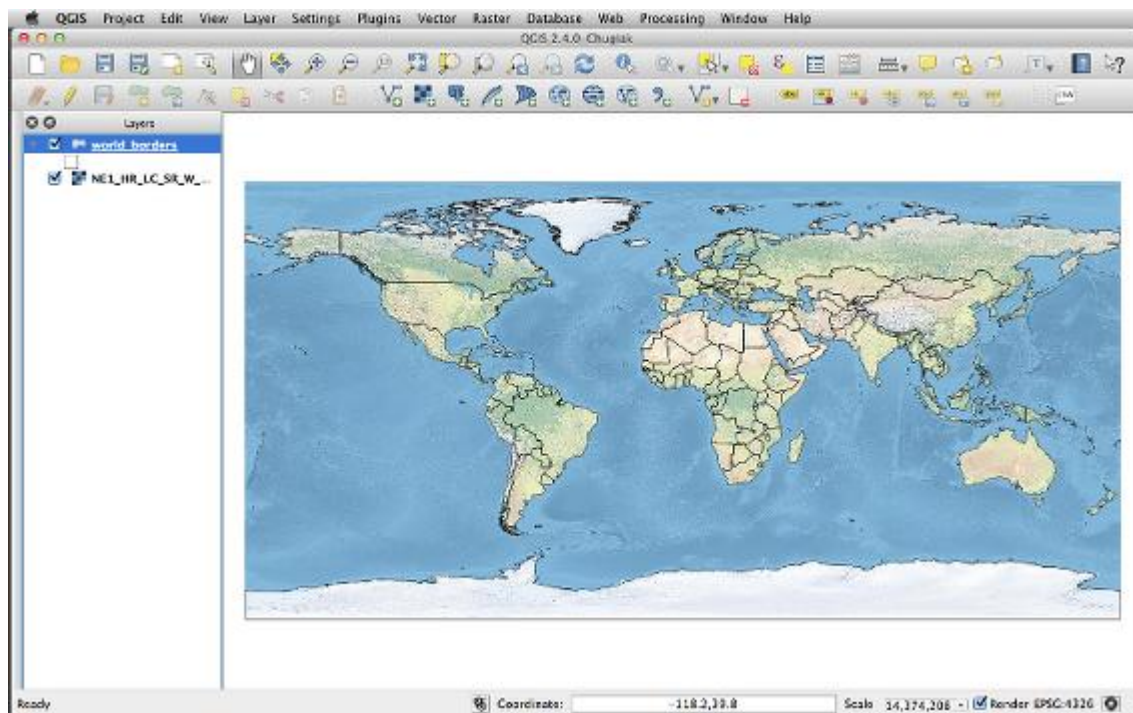
On the toolbar, select the function  Pan Map; this function is used to move the map around. Also, use  or  to Zoom In or Zoom Out. On the layers list, uncheck the box and this will make the layer invisible (this is useful when you are working with multiple layers). Now, check the box to make it visible again.

### 3. Loading shapefiles


Shapefiles describe vector features. Vector data provide a way to represent real world features within the GIS environment. A vector feature has its shape represented using geometry. The geometry is made up of one or more interconnected vertices. A vertex describes a position in space using an X, Y axis.

To load a shapefile, click on the  Add Vector Layer toolbar button or, on the menu, select the option Layer →  Add Vector Layer. This will bring up a new window. From the available options check File. Click on button [**Browse**] to navigate the file system and select the shapefile. The file that we need now is world\_borders.shp that is inside the folder world\_borders. You can also select the Encoding type for the shapefile if desired. For now, choose "System". Then, click the button [**Open**]. You might be asked to select the correct projection for this layer; in this case, select WGS 84, and click [**OK**].


A random color is assigned to every layer you add. To change the style of a layer (for instance, to make it more transparent), open the Layer Properties dialog by double clicking on the layer name or by right-clicking on the name in the legend and choosing Properties from the popup menu. Under Style you can change colors and patterns. In the area Symbol layers click on Simple fill; on the right, pick up a new color for Border (choose a color that is easy to distinguish from the raster background, e.g., black) and change the Fill style to No brush. To end editing colors and styles in this layer, click the button [OK]. When you are done, your map should look like this:







Now that you have two layers, note that a layer can be selected and dragged up or down in the legend to change the z-ordering. Z-ordering means that layers listed nearer the top of the legend are drawn over layers listed lower down in the legend.

It is now time to save your project. Go to menu Project →  Save or find the same options on the toolbar. From now on, save your project from time to time.

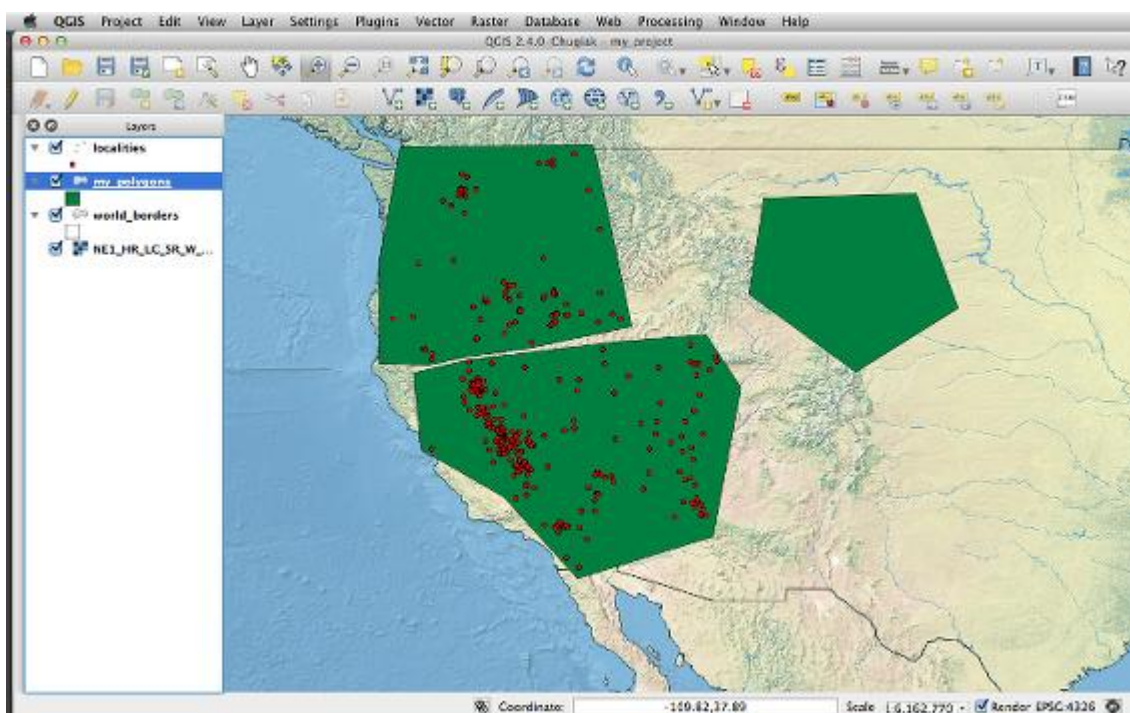
## 4. Drawing your own polygons




First, zoom in to the area where your points are (or the area of interest, if you are not using your species distribution data). Choose New →  New Shapefile Layer from the Layer menu (or the same button on the toolbar). The New Vector Layer dialog will be displayed. Choose the type of layer "polygon". On the Attributes list, select "id", and click the button [**Remove attribute**].

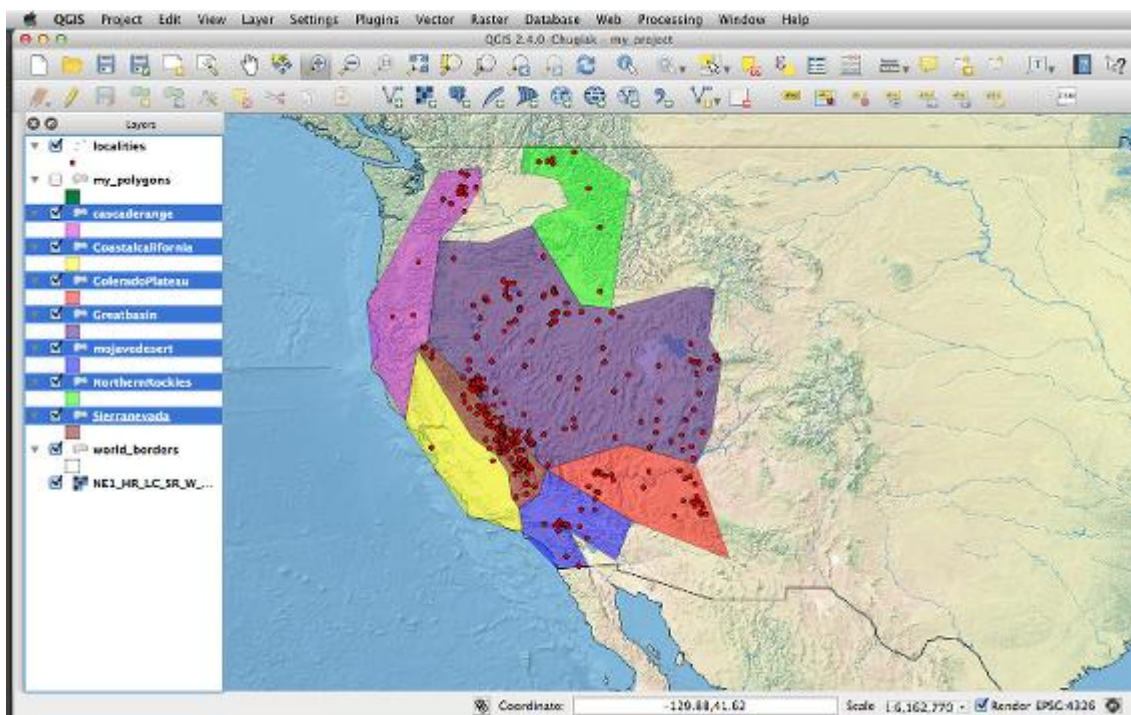
Under New attribute, type a name (e.g., "Forest"), click on **[Add to attribute list]**, and then click **[OK]**. You will be prompted to the Save as dialog. Type the file name ("Forest") and click **[Save]**. You will be able to see the new layer in the Layers list.

Click on the layer name to select the layer you have just created. All editing sessions start by choosing the  Toggle editing option (either on the toolbar or under the Layer menu). Select this option and note that the little pencil symbol will show up beside the name of the layer, indicating that the layer is now editable. Now, click on the  Add Feature icon (or select Edit →  Add Feature). When you do this, the cursor will look different (not an arrow head). Left-click on the map area to create the first point of your new feature. Keep on left-clicking for each additional point you wish to include in your polygon. When you have finished adding points (i.e., the polygon represents the desired operational area), right-click anywhere on the map area to confirm you have finished entering the geometry of that feature. The attribute window will appear. Input the name you want for your polygon (e.g., "Agriculture"), and click **[OK]**. Then, click on  Save Layer Edits (either on the toolbar or under the Layer menu).


For this example, create three polygons in the same layer: one encompassing the points at the North, another polygon in the Southern area, and one polygon that does not encompass the species points/distribution, like this, for example:



You can edit the shape of a polygon with the  Node tool. First, click on the  icon on the toolbar, and select "Select Single Feature". Then, click on the polygon you want to reshape; the change of color of the polygon indicates this feature is now selected. Next, on the toolbar, click on the  Node tool to make the vertices editable; then click on one of the vertices of your polygon (the vertices will become more evident). Move the vertices (one at a time) until you reach the desired shape. You can also add nodes by double-clicking the outline of the polygon. When you are done editing, unselect the Node Tool, and save your changes. Along with all the example files, we are also providing some pre-made polygons (polygons\_shapefiles folder) that represent operational areas for our example, so you can see how to draw your polygons when working with your own data set.



## 5. Extract information from your polygons

Make the layer with your polygons active by clicking on it in the layers list. Use the  tool to select the features on the source layer. For this example, choose Select features by rectangle. Click on the map and draw a rectangle, for selecting all your polygons at once. When the polygons are selected, they will become yellow.

