

Image J instructions for finding polygon centroids

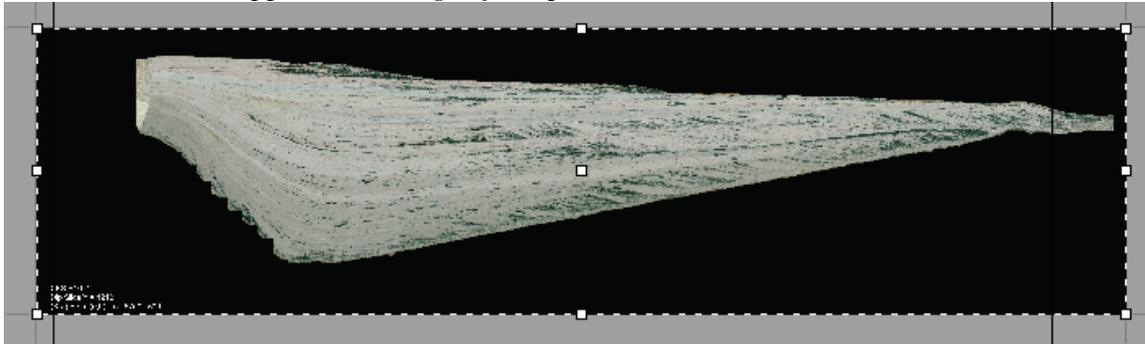
The first portion of this document describes how to export images for analysis and the second part explains how to calculate centroids. The first part also contains some additional Illustrator tips for making sublayers. These are not necessary, so skip them if you wish.

I. Prepare stratal maps for analysis:

You'll need to export .tif images of your stratal package polygons to analyze in ImageJ. We want to make sure that each exported image is exactly the same size so we can appropriately scale centroid measurements.

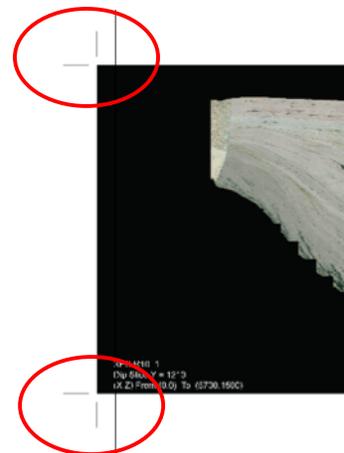
First, hide all layers except the background image and select that layer (make sure it's

highlighted). Then select the **crop area tool**  (shift+o). Double-click on the background photo with the crop area tool. This should “snap” a dashed box around the edge of the photo (below). *(FYI, you can also click and drag and area with the crop area tool and change its shape by clicking and dragging on the white boxes. We want to be sure our area is snapped to the edge of the photo, so use the double click method.)*



Next, choose another tool from the toolbar (e.g., the direct select tool – it doesn't matter what you choose, it's just for the purpose of “dropping” the crop tool). Verify that the crop area looks reasonable with the little gray guides now visible at each corner (right).

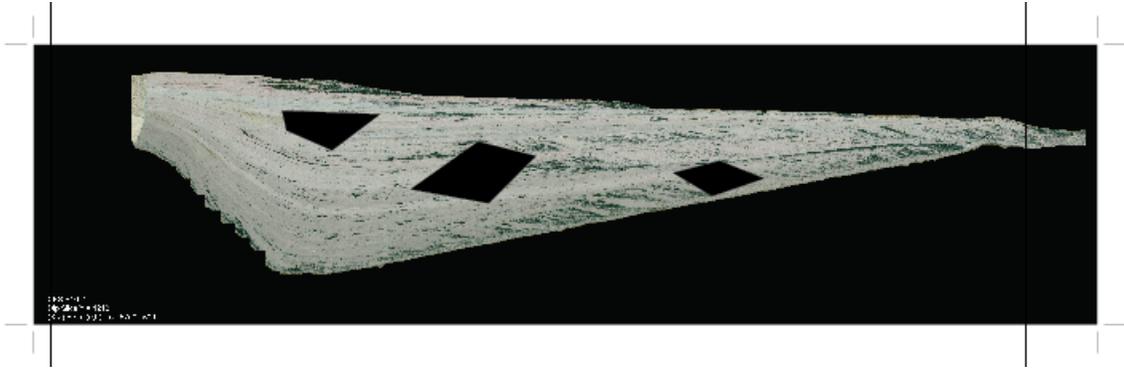
(note: the black vertical lines, right, are from the outline of the “page” in Illustrator project and don't matter for this; they would, however, matter for printing)



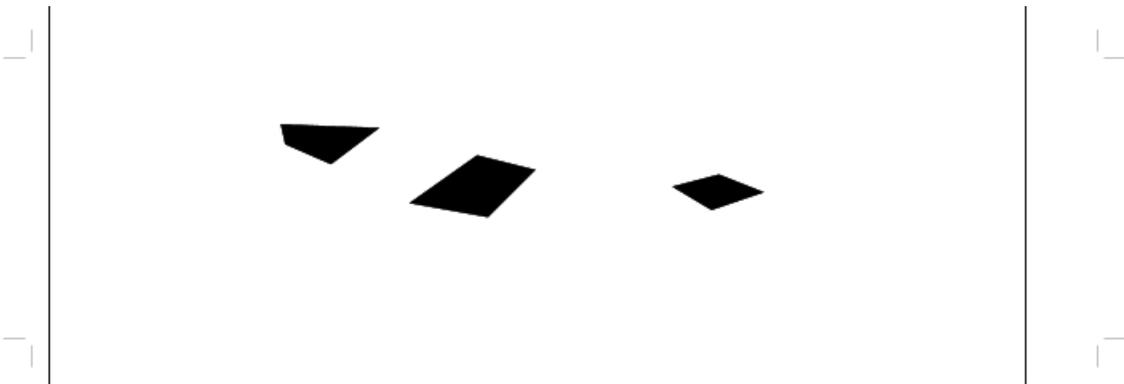
This box defines the extent of the image that will be exported. Don't change it.

Now you can export .tif images that contain only your mapped stratal package polygons.

I recommend turning your polygons black for the export (this makes the analysis in ImageJ straightforward).



Next hide the background image so only your polygons are visible. (Again, the vertical black lines visible here are the page outline and won't appear in the exported image).



Any layers visible in the cropped area will be included in the exported image. *Note: this is a good way to export a series of photos of the exact same area highlighting different aspects of your project (e.g., you could set the crop area zoomed in on an example of marine onlap and export first the image with no interpretation, then turn your stratal contact arrows and/or your marine onlap layers “on” and export the exact same photo with interpretations overlain.)*

When the display in the crop area is what you want, go to **FILE → EXPORT** and choose **TIF** format, change color to **GRAYSCALE** (or Black/White if it is an option), and select **HIGH** resolution and no compression. (The actual resolution doesn't matter very much – high will give us more precision in the centroid locations. Just make sure you use the same resolution for all your exports to ensure each image has the same number of pixels.)

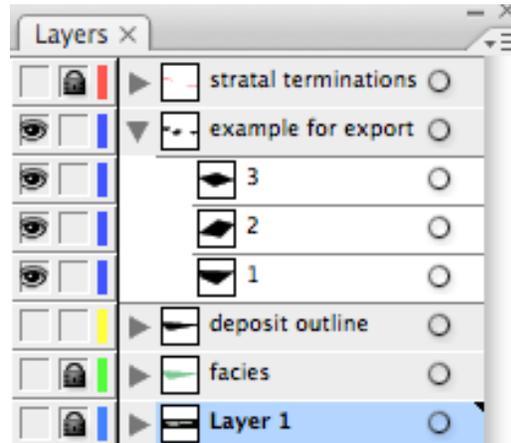
You may want to separate your polygons into different groups (e.g., lowstand deposits in one sublayer and transgressive deposits in another) so you don't have too many displayed in any given exported image.

OPTIONAL: MAKING SUBLAYERS

A good way to further organize your interpretations is to make sublayers.

Do this by selecting (highlighting) a parent layer and then click on the layer menu (upper right corner of layer panel) and choose NEW SUBLAYER. You could make a sublayer for all your lowstand polygons and another for your highstand polygons, for example.

Anything you draw on a layer gets its own entry in the layers panel. You can see these by clicking the little gray arrow next to any layer (right). You can rename these (double click), and also move them to different layers or sublayers by clicking and dragging. If you're not sure which polygon/line/object corresponds to which entry in the layer, you can make them visible/invisible one-by-one to figure it out.



II. Calculate centroids using ImageJ

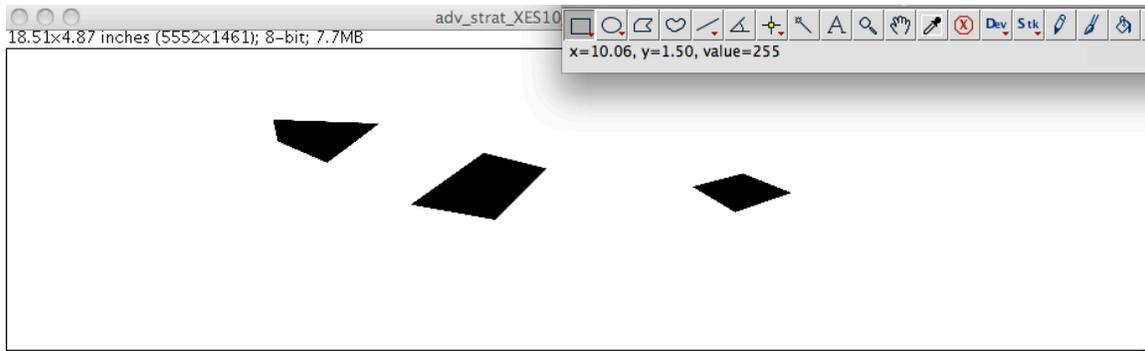
Download and install ImageJ software:
<http://rsbweb.nih.gov/ij/download.html>

ImageJ is a powerful program that can accommodate many of your image-processing needs. It's particularly good for identifying and calculating statistics of "particles" in an image (it was developed by the NIH for doing things like evaluating the condition and shape of cells). We'll only be using a few of the program's capabilities. You can find out much more here:

<http://rsbweb.nih.gov/ij/docs/index.html>

Start ImageJ. **FILE** → **OPEN** one of your exported images.

The image coordinates may be in pixels (what we want) or actual length (e.g. inches) based on your Illustrator project set up. Check this by looking in the upper left corner of the image window. Also notice that as you scroll your cursor over the image the x and y coordinates are displayed at the bottom of the toolbar. If your image is in pixels (in the example below x = [0:5552] and y = [0:1461]), you can continue to the next step. If your image is in inches, you need to remove the scaling.



Remove scaling: **ANALYZE → SET SCALE** and **CLICK TO REMOVE SCALE**. This should change the unit of measure to a pixel with aspect ratio 1.0. Click **OK**.

Note: ultimately we're going to have to rescale our measured coordinates to the actual basin dimensions (using the information in the lower right corner of the original image). You can do that through inches if you want, but pixels might be more straightforward.

Next you need to threshold the image: **IMAGE → ADJUST → THRESHOLD**

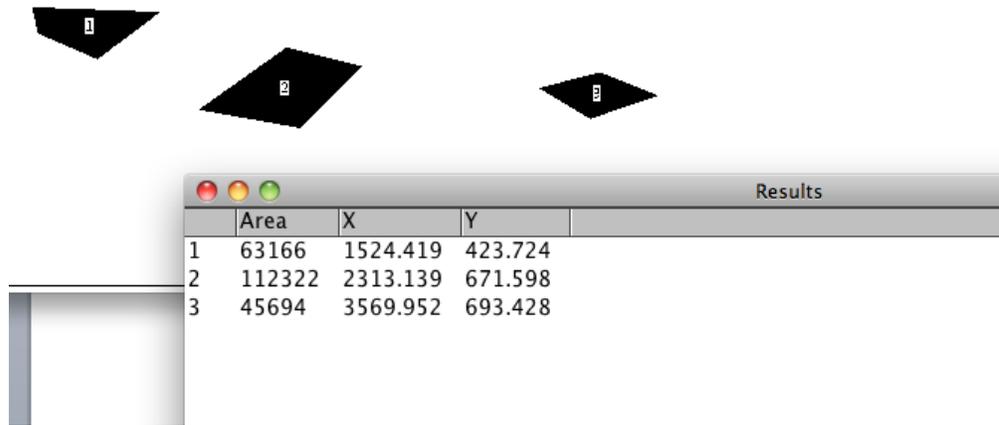
Make sure the highlighted red matches your polygon map and click **APPLY**.

Go to **ANALYZE → SET MEASUREMENTS** and make sure **AREA** and **CENTROID** are selected and click **OK**. (*Center of Mass and Centroid should be the same for our polygons, but they would differ if we were inputting polygons that had color gradients, e.g., a black spot in a gray blob would count as more "mass" in that area.*)

Next select **ANALYZE → MEASURE PARTICLES**. This will return values for each of the individual polygons in your image. The default values are fine, but be sure to select **DISPLAY RESULTS, CLEAR RESULTS**.

A table will appear that gives you a list of measured values for each polygon (or "particle").

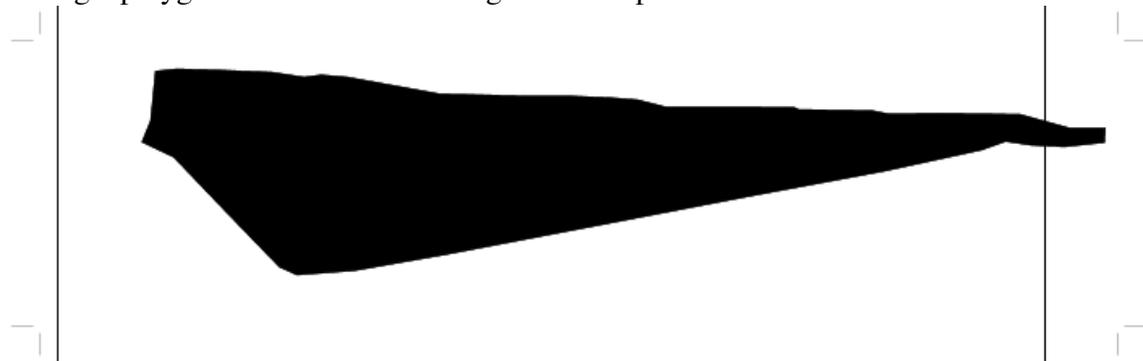
To connect each polygon with its corresponding measurement, go to **ANALYZE → LABEL**. You can also check by hovering the cursor over the approximate center of each polygon and matching the coordinates to the reported X and Y values in the table.



NOTE – if you polygons are very close together you might get screwy results. If you try and decide the results don't make sense (e.g., you have fewer entries in the results table than you thought you had polygons), try separating the too-close polygons in to different images and process each image separately.

This table can be exported. Click on the table window and go to **FILE → SAVE AS**. I believe this saves an .xls file.

The area is the total number of pixels in the polygon. You might want to use this information if your analysis. To calculate the proportion of deposit contained within each polygon area you'd need to calculate the area of the entire deposit. You can do that by tracing a polygon around the entire edge of the deposit:



Remember, for comparison with Martin et al.'s XES 02 results you'll need to convert the pixel coordinates into actual basin coordinates. The necessary info is in the lower left corner of the original photo. Coordinates are in mm and go from upper left (0 mm, 0 mm) to lower right (5700 mm, 1500 mm). (In other words the image is 5.7 m long and 1.5 m tall).

