Measuring

ImageJ Skill

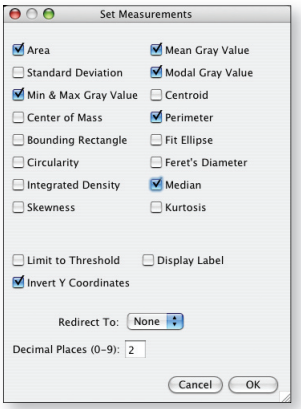
Before you begin measuring images, you may need to:

1. Calibrate the image (see the **Image Calibration** *Skill Sheet.*)
2. Choose (set) the measurements you want to make.

Setting measurements

1. Choose Analyze > Set Measurements….
2. Check the measurements you wish to make and set the number of decimal places for your measurements. See opposing page for descriptions of each measurement.
3. Click **OK**.

Measurement options

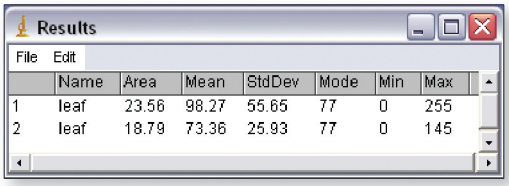


Measuring

1. You can measure the entire image or select a portion of the image using the selection tools. See the **Selecting** Skill Sheet for more information about making selections. If nothing is selected, ImageJ measures the entire image.
2. Choose Analyze > Measure, or press **M** to measure the selection.
3. After the first measurement, the **Results** window appears. The **Results** window is updated after each measurement.

The Results window

Measurement results are displayed in the **Results** window. Measurements can be saved to a text file, cut, or copied for use in other programs such as spreadsheets or graphing applications using the options available from the **Results** window menu bar. On Windows computers, the results menu bar is part of the Results window; on Macintosh computers, the results menus appear at the top of the screen when the Results window is active.



Deleting all measurements

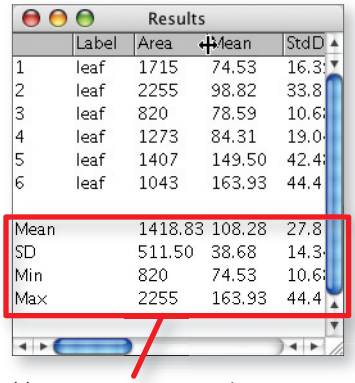
To delete all measurements, choose Analyze > Clear Results on the ImageJ menu bar or Edit > Clear Results on the **Results** window menu bar.

Summarizing measurements

To calculate basic statistics (mean, standard deviation, minimum, and maximum) for each measurement field, choose Analyze > Summarize or Edit > Summarize in the **Results** window menu bar.

Changing Results column widths

If the columns of numbers in the **Results** window overlap or are difficult to read, resize the columns by dragging the line separating column headings.

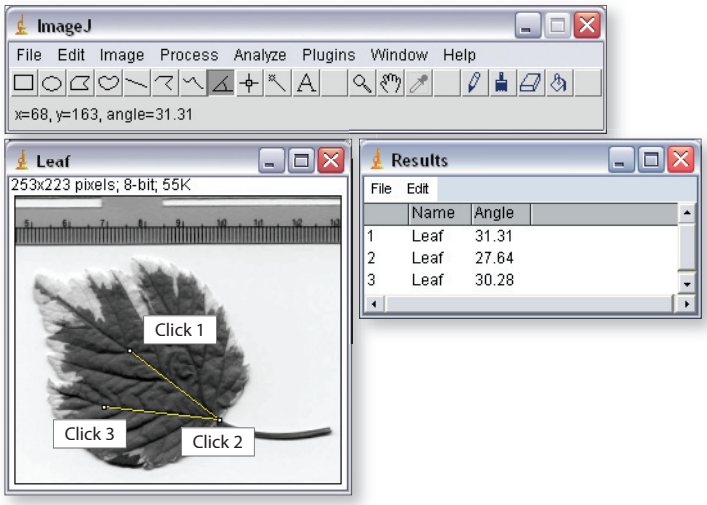


Measurement summaries appear at the bottom of the **Results** window.

Measuring angles

Use the angle tool to measure angles with three clicks as shown below. After the second click, the interior angle formed by the two rays is displayed in the ImageJ status bar as you move the cursor.

To record angle measurements, choose Analyze > Measure, or press **M**. When measuring with the angle tool, the angle measurement option is automatically enabled.



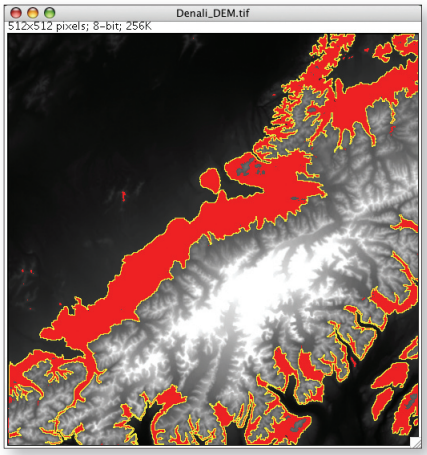
Redirecting measurements

There are times when it is necessary to use the features of one image to select areas to measure in another image.

The image at right shows elevation data for the area around Mt. Denali, Alaska. The lower image shows vegetation in the same area. To measure the vegetation within a specific elevation range:

- Open the *source* image, and select the region you want to measure.
- Open the *target* image containing the data you want to measure.
- Choose Analyze > Set Measurements… and set Redirect To: to the *target image*.
- With the source image active, press the **M** key to measure. The measurements will be made using the pixel values of the target image.

This technique is also used for measuring changes in images created at different times, or images that have to be highly processed to see the features you want to measure, where the processing changes the original pixel values.



Measurement options

Area - Area in pixels, if uncalibrated, square units if calibrated.

Mean Gray Value - Average gray value within the selection.

Standard Deviation - Standard deviation of the values used to generate the mean gray value.

Modal Gray Value - Most frequently occurring gray value within the selection.

Min & Max Gray Level - Minimum and maximum gray values within the selection.

Centroid - The center point of the selection. This is the average of the x and y coordinates of all of the pixels in the selection.

Center of Mass - The brightness-weighted average of the x and y coordinates of all pixels in the selection.

Perimeter - The length of the outside boundary of the selection.

Bounding Rectangle - Defines the smallest rectangle enclosing the selection.

Fit Ellipse - Fits an ellipse to the selection.

Circularity - A value of 1.0 indicates a perfect circle.

Feret's Diameter - The longest distance between any two points along the selection boundary.

Integrated Density - Sum of pixel values in selection (number of pixels x mean pixel value).

Median - The "middle" value of the distribution.

Skewness - Statistical measure of the symmetry of the distribution.

Kurtosis - Statistical measure of the "sharpness" or "flatness" of the distribution.

Limit to Threshold - Only thresholded pixels are included in measurement calculations.

Display Label - Lists the image name and slice number (for stacks) in the first column of the results table.

Invert Y Coordinates - If checked, the XY origin is assumed to be the lower left corner of the image window instead of the upper left corner.

Redirect To - Allows you to outline a structure on one image and measure the corresponding region in another image.

Decimal Places - This is the number of digits to the right of the decimal point in real numbers displayed in the results table.