GTB-tools in container: Image Analysis → Distance
Task: summarize distance information

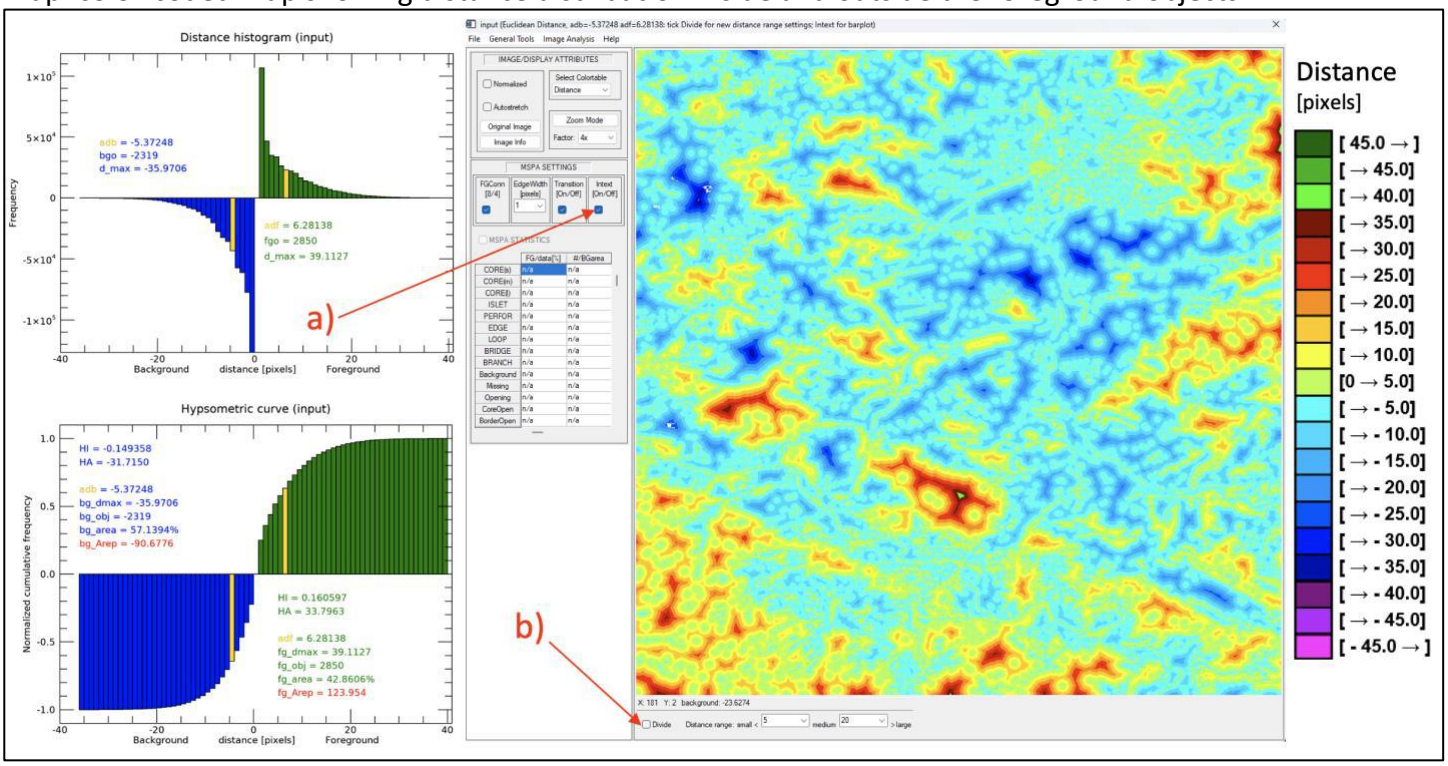
Euclidean Distance (← click for product sheet)

Question: what is the shortest distance to the foreground boundary?

For each pixel, we measure the Euclidean distance in pixels to the nearest foreground/background boundary. Pixels are color-coded in multiples of 5 pixels and displayed as a pseudo-elevation map. Positive values are associated with land (foreground), negative values with sea (background) and a value of zero corresponds to the coastline (foreground/background boundary). Red/brown/dark-green colored pixels indicate pixels that are deep inside a foreground patch while purple-colored pixels show areas which are far away from foreground patches.

How: load a map with foreground objects (2 byte) and run the analysis.

Result:
Statistics: histogram (frequency distribution of distance values, average distance – color-coded in yellow, number of objects, maximum distance value) and the hypsometric curve (normalized, cumulative frequency distribution).
Map: color-coded map showing distance distribution inside and outside the foreground objects.



The chart above shows the Euclidean distance map. Click on Intext (a) to show the histogram and hypsometric curve summary or click the Divide box (b) to color-code foreground and background into user-selected distance range classes of small, medium, and large.

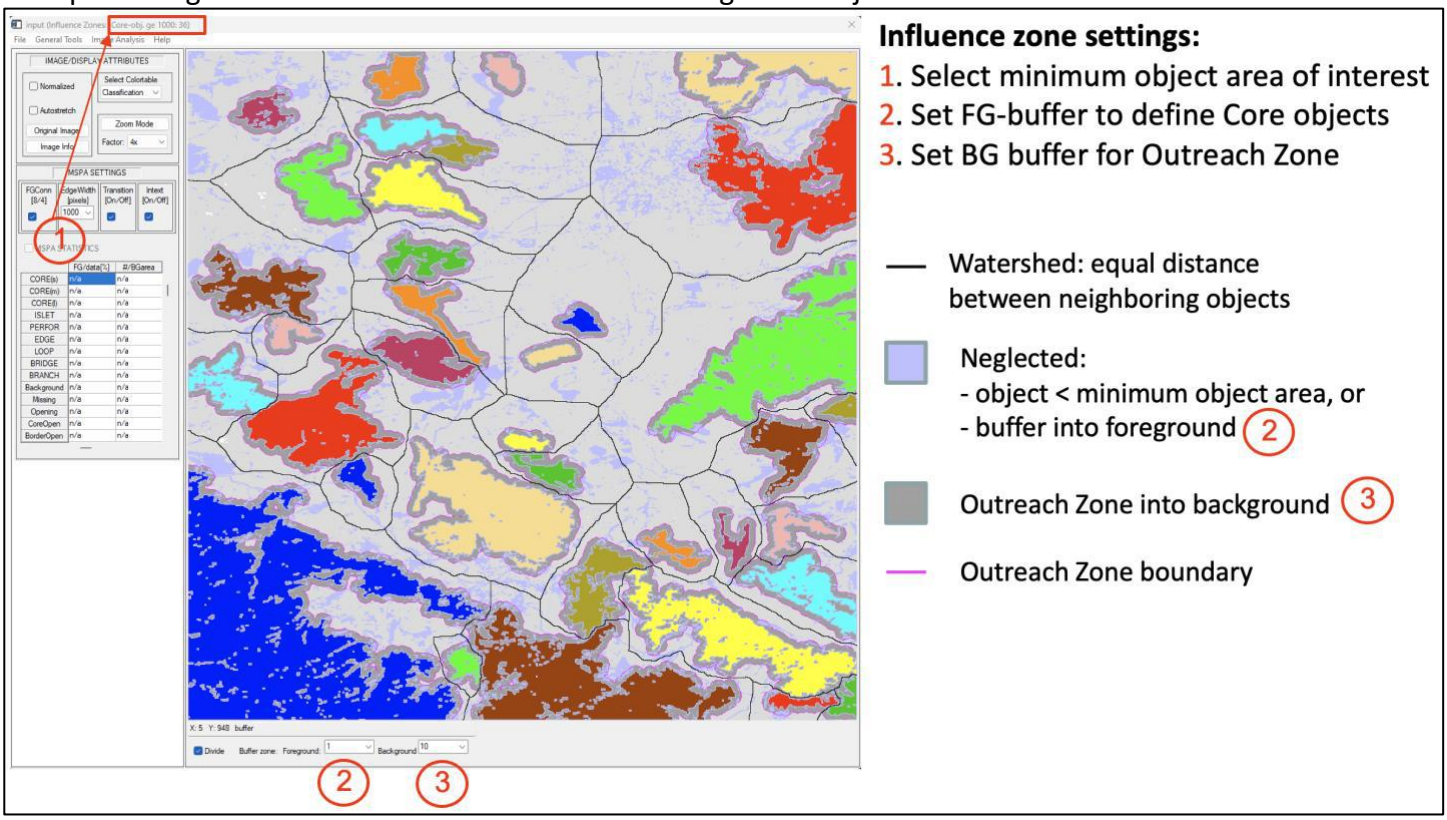
Influence Zones

Question: where is the equidistant border between neighboring foreground objects?

A watershed segmentation of the background delineates the influence zones of all foreground objects (2 byte) having the minimum user-selected size.

How: load a map with foreground objects (2 byte) and run the analysis. Use settings 1, 2, 3 for fine-tuning.

Result:
A map showing the influence zones of color-coded foreground objects.



The chart above shows the influence zones of foreground objects. The minimum foreground object size to be considered is set via the EdgeWidth menu (1), here set to 1000 pixels. The title bar shows how many foreground objects fulfill this setting, here 36, these objects are color-coded while smaller objects are neglected and shown in pale blue color. Optionally, a core object can be defined by setting a buffer zone from the foreground border into the foreground object (2), and similarly an outreach zone by setting a buffer zone from the foreground border into the background (3). The black watershed line delineates the influence zones, defined as equidistant boundary between neighboring foreground objects of interest.

Proximity

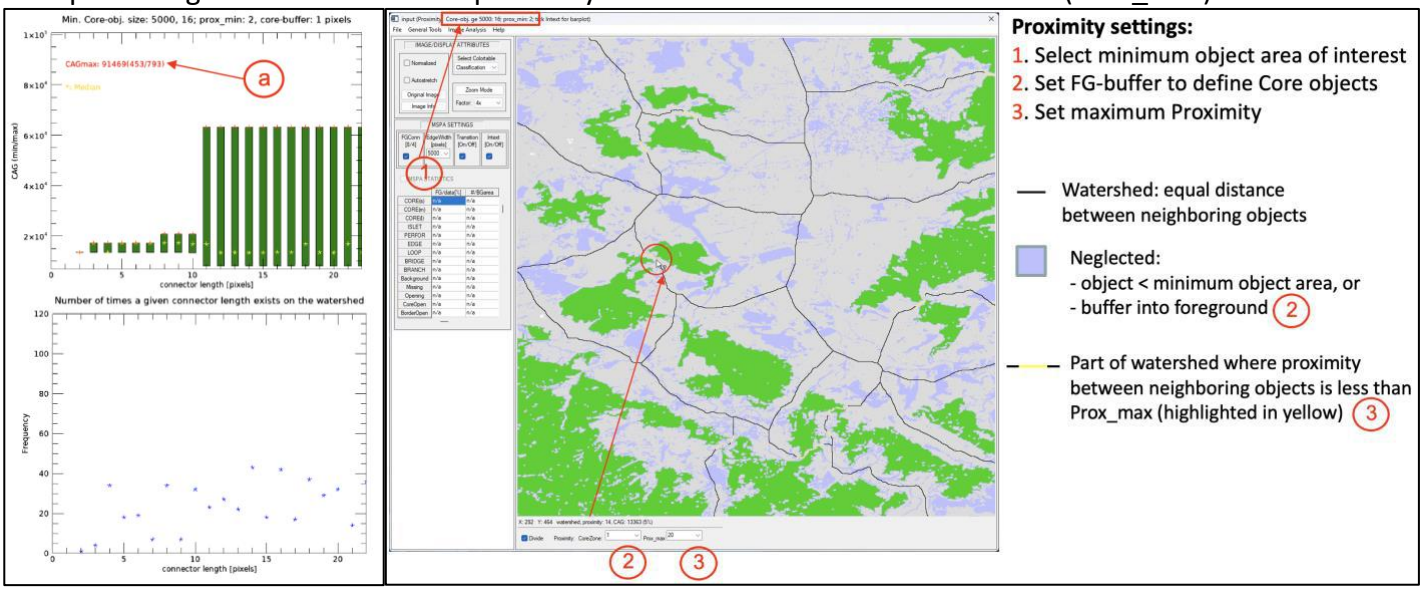
Question: which locations are within a given distance between neighboring foreground objects? How much gain in connect area do I get if I connect the two neighboring objects at that location?

We start with the influence zones of foreground objects having a minimum area of interest. Because each point of the watershed shows the pairwise distance between neighboring objects, we can highlight those locations on the watershed that are within a predefined distance. For example, such a distance may qualify for restoration

planning. The number of pixels to add for reconnecting the neighboring objects is a proxy for the restoration expense, while the then combined area of the neighboring objects provides a measure for the efficiency of restoration expressed in connected area gained (CAG).

How: load a map with foreground objects (2 byte) and run the analysis.

Result:
Statistics: histogram (frequency distribution of proximity values, connected area gain.
A map showing the locations where proximity is less than the distance of interest (Prox_max).



The chart above shows the watershed between neighboring foreground objects. The minimum foreground object size to be considered is set via the EdgeWidth menu (1), here set to 5000 pixels. The title bar shows how many foreground objects fulfill this setting, here 16, these objects are color-coded green while smaller objects are neglected and shown in pale blue color. Optionally, a core object can be defined by setting a buffer zone from the foreground border into the foreground object (2). The title bar also lists the smallest distance between neighboring foreground objects in the entire image, here 2 pixels. The box Prox_max (3) below the viewport can be used to set the maximum proximity value of interest (here set to 20 pixels). All locations on the watershed that have a pairwise distance less or equal to Prox_max are highlighted in yellow color. This feature allows to quickly determine where proximity between neighboring foreground objects is potentially of interest for restoration measures. Placing the mouse cursor on any location of the watershed will show below the viewport the actual pairwise distance and the connected area gained if a restoration path would be inserted at this location. The left panel shows the statistical summary limited to locations within Prox_max distance. The top left panel shows the Connected Area Gain (CAG) statistics for each proximity value and the x/y-location where CAG is maximum (a). From this panel we can see that an investment of 11 restoration pixels will have a much larger CAG compared to an investment of 10 or fewer restoration pixels. On the other hand, investing in 20 restoration pixels does not provide any more benefit than 10 restoration pixels. The bottom left panel shows how many times a proximity, or connector length in pixels, occurs on the watershed. Saving the image will generate an additional spreadsheet summary listing the precise x/y-coordinates, proximity, and CAG for all locations within the user-specified Prox_max distance. Additional information is available in the GTB Manual.

Note that CAG refers to the gain in connectivity that is limited to connecting the neighboring objects only. This is different to coherence, which refers to connectivity of the entire foreground object network. This topic, and restoration as such is addressed in a separate, dedicated thematic topic **Restoration Planner**.