GuidosToolbox Workshop

Part 4: Hands-on examples

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The workshop will address the following topics:

GWS1: Introduction/motivation for new ways of image analysis

GWS2: Pattern Analysis (M)SPA

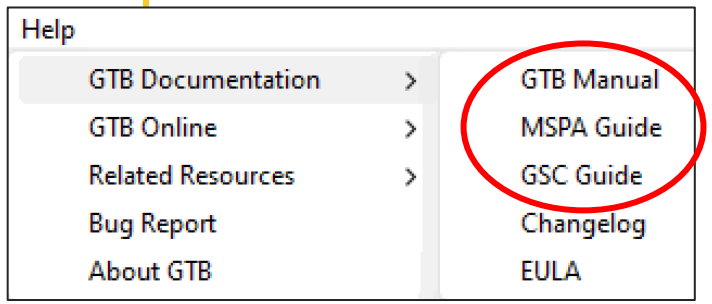
GWS3: GuidosToolbox: program features and processing options

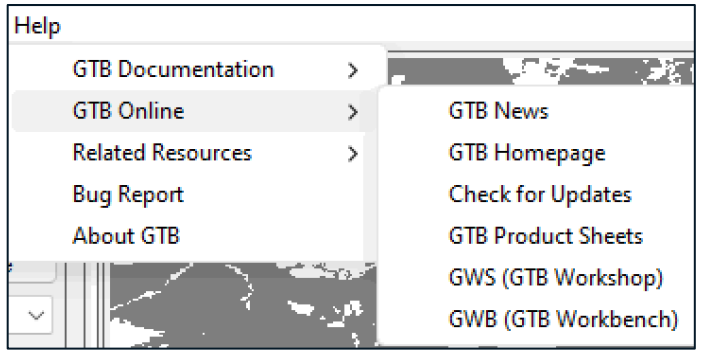
GWS4: Hands-on examples using training data:

a) Data preparation, MSPA, Google Earth overlays, batch process

b) Distance, fragmentation, network, restoration, change, …

Click for additional information: GTB, GWB, MSPA, GWS, GSC

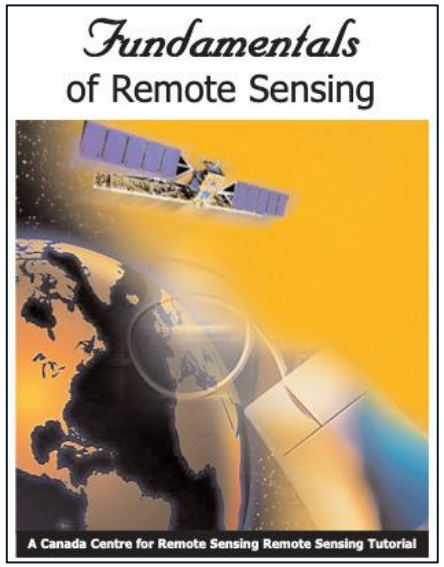




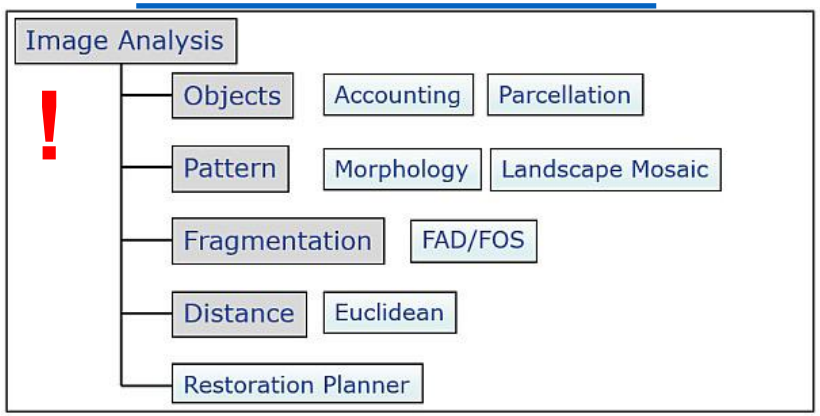
GTB: start any application from the self-contained directory related papers, GE-overlays: **C:\GuidosToolbox\publications**

Interesting: CCRS Remote Sensing Tutorial

GIS Introduction



The GTB Product Sheets:



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4) Hands-on Examples

4 A) Data Preparation & Processing

4 B) Image Analysis

The basics: Learn how to use GuidosToolbox

A1: Object properties, SPA and MSPA (see MSPA-Guide)

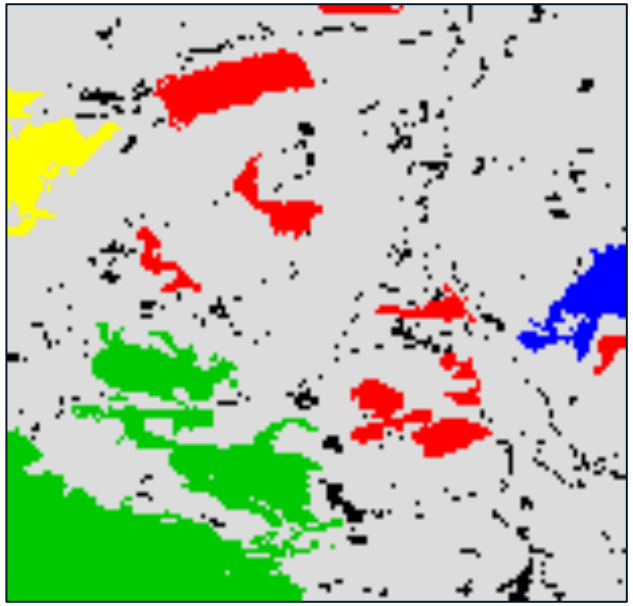
A2: Setup MSPA-compliant image

A3: Cut image and build binary mask

A4: Reproject, MSPA, save and display as kml (Google Earth)

A5: Batch-process (MSPA (-tiling), Moving Window, Recode, Fragmentation, etc.)

A1: Object Properties



File → Read Image → GeoTiff: input.tif

a) Browse through the image with the mouse pointer and check the information panel below the display

b) Play with: **Autostretch**, **Normalized**, **Zoom Mode**, **Image Info**

c) Restore original: **Original Image**

d) Test **Image Analysis → Objects → Accounting** ; use defaults.

e) Restore original, Accounting: 8-conn; pixres: 10; Area:[100 1000 5000 10000 50000]

- What is the % and how many patches are in class 4: [5000-10000]ha?
- Make a 3-class using: 4; 10; Area:[10000, 10000, 10000; 10000; 50000]

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A1: SPA

File → Read Image → GeoTiff: input.tif

a) Test **Image Analysis → Pattern → Morphological → SPA3** and check the information panel below the display

b) Save **File → Save Image → GeoTiff: input_spa3.tif** and check the output files

c) Restore original: **Original Image**

d) Test **Image Analysis → Pattern → Morphological → SPA5 then Restore and run SPA6**

SPA5 statistics

File

```
Image Area = FG + (Core-Opening + other BG) + Missing
   --- More details after saving the result! ---
==========================================
     Category      Area [pixels]   Count [#]:
==========================================
Core-Opening:          5603          707
        Core:        321767         1196
        Edge:         58008          870
  Perforation:         9124          422
      Margin:         39591         6839
  Contiguous:        388899          847
==========================================
     Category     Proportion [%]:
==========================================
CoreOp/Data:        0.56
     Core/FG:       75.09
     Edge/FG:       13.54
    Perf./FG:        2.13
   Margin/FG:        9.24
   Contig/FG:       90.76
     Porosity:       1.42
==========================================
```

- Which SPAx is needed to detect isolated small objects?
- How much forest is Core forest? What is the #/area of the holes?
- Why are the numbers for Margin different in SPA5 and SPA6?

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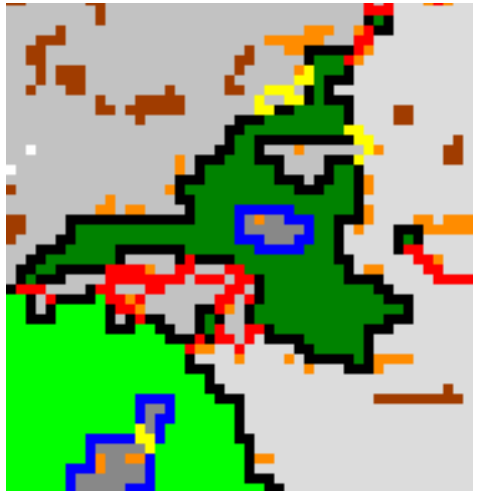
A1: MSPA

File → Read Image → GeoTiff: input.tif



a) Test **Image Analysis → Pattern → Morphological → MSPA**
and check the information panel below the display

b) Below the viewport, click *Divide* & test Core grouping thresholds

c) Test/change MSPA parameters and activate *MSPA statistics*

- Using the default settings: How much of the forest are Islets?
- How many habitat connectors do we have?
- How many Openings do we have and how intact is the forest?
- How to simulate a 100m EdgeWidth if the pixel resolution is 25m?

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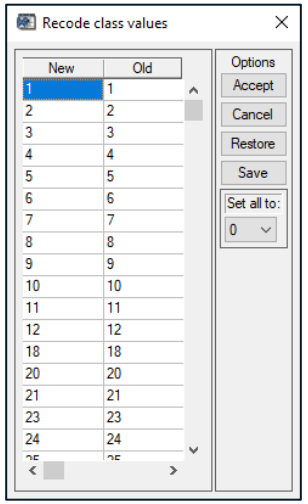
A2: Setup a MSPA-compliant input image



File → Read Image → GeoTiff: clc.tif

a) Autostretch, **Image Info**, try doing MSPA

b) Recode: 0(Missing) ←1-11, 1(BG) ←12-21/26-41, 2(FG) ←23-25

General Tools → Preprocessing → Recode Classes, then Restore the file: **GTrecode_CLC2fmap.sav** and click on Accept to obtain the forest mask

c) **Image Analysis → Pattern → Morphological → MSPA**

d) **File → Save Image → GeoTiff: clc_8_1_1_1.tif**

e) **General Tools → GIS SW → GTB Terminal** : **gdalinfo -noct -mm -stats clc_8_1_1_1.tif**

and compare with: **Image Info**

Use **Recode Classes** to setup binary maps, input for the Landscape Mosaic, …

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A3: Cut image and build a binary mask

File → Read Image → GeoTiff: il3.tif

a) **Image Info**

b) Cut central data area: start GTB Terminal

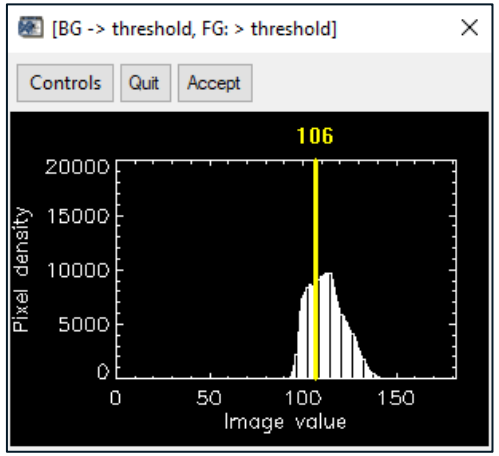
General Tools → GIS SW → GTB Terminal and enter:

gdal_translate -srcwin 3000 4000 1000 1000 -co COMPRESS=LZW il3.tif il3sub.tif

(gdal_translate -srcwin xoff yoff xsize ysize -co COMPRESS=LZW input.tif output.tif)

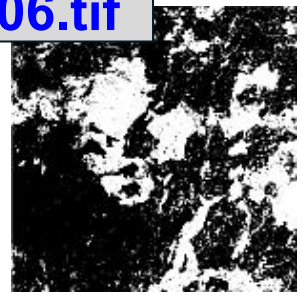
c) **File → Read Image → GeoTiff: il3sub.tif** , **Image Info**

d) Binary: **General Tools → Preprocessing → Threshold FG/BG: 106**



e) Swap BG/FG: **General Tools → Preprocessing → Invert → FG/BG**

f) Save the result: **File → Save Image → GeoTiff: il3sub_106.tif**



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A4: Reproject to WGS84, MSPA, save as GE overlay

File → Read Image → GeoTiff: il3sub_106.tif

a) Reproject to WGS84 (GE-EPSG 4326, EPSG, EPSG-codes):

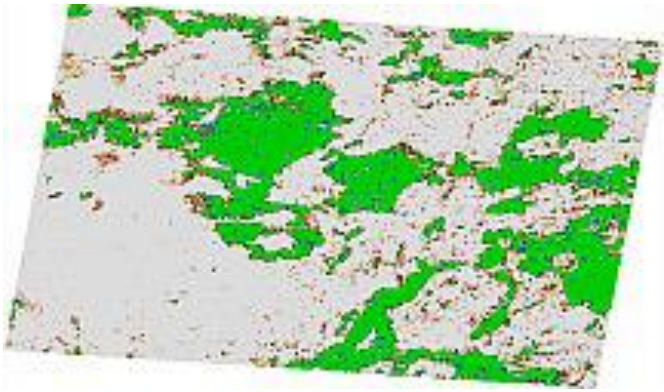
- use **General Tools → Preprocessing → Reproject for GoogleEarth** or
- GTB Terminal: find out EPSG-code: **gdalinfo -noct il3sub_106.tif**

gdalwarp -t_srs EPSG:4326 il3sub_106.tif il3sub_106_EPSG4326.tif

b) **File → Read Image → GeoTiff: il3sub_106_EPSG4326.tif**

c) **Image Analysis → Pattern → Morphological → MSPA**

d) **File → Save Image → KML** (save as Google Earth overlay)



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A4: Open and load the GE overlay

e) Open directory **C:\GuidosToolbox\data**

Do not double-click but right-click and fully extract:

il3sub_106_EPSG4326_8_1_1_1_kml.zip

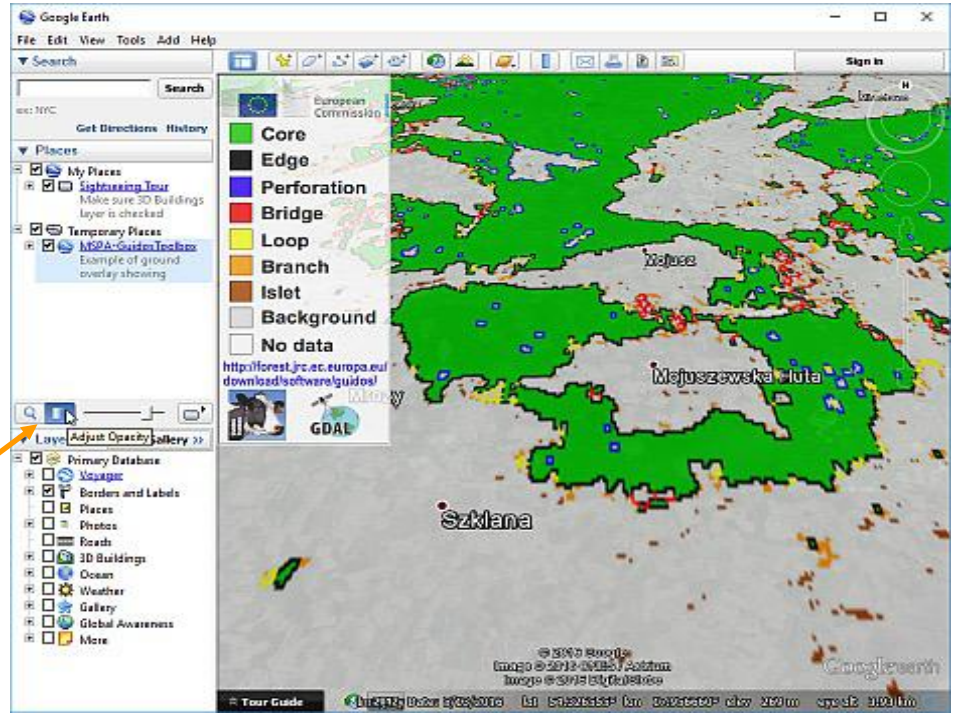
f) Open the new directory:

il3sub_106_EPSG4326_8_1_1_1_kml

g) Double-click the file: **MSPA_GTB.kml**

or drag & drop this file in GoogleEarth.

Adjust overlay transparency via slider



- Who would be interested in a kml data provision?
- What is the benefit of showing the background?

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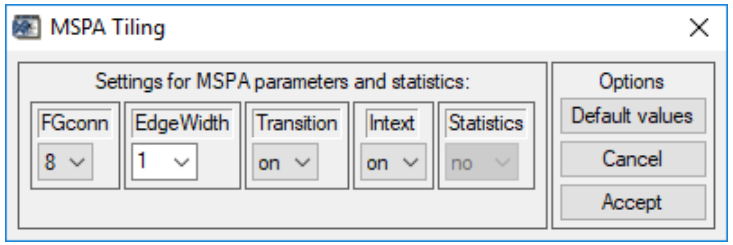
A5: Batch-process (image analysis and MSPA-tiling)

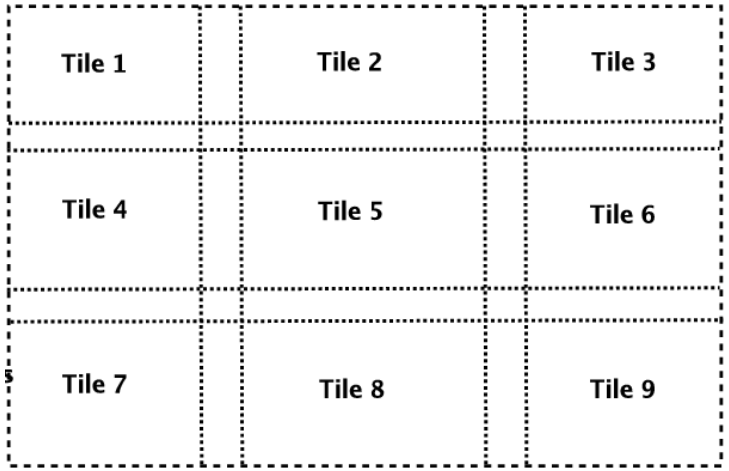
a) Start GuidosToolbox: **File → Batch Process → Pattern → Morph. → MSPA**
b) Browse to directory **batch/MSPA/** and select all images
c) Process with default MSPA settings (+ statistics)
d) **File → Batch Process → Fragmentation/Recode etc** **+ batch/<option>**
and test different kernel for moving window, fragmentation, recode setting, Conefor input, …

a) **File → Read Image → GeoTiff: largeWin.tif** , **Image Info**

b) **Image Analysis → Pattern → Morphological → MSPA Tiling**

c) set MSPA parameters





- Why should tiling be avoided?
- Which alternative could bypass tiling?

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Learn about specific topics

B1: Object Analysis
(Parcellation, Contortion)

B2: Fragmentation Analysis
(Contagion, FOS, Landscape Mosaic)

B3: Network Analysis
(Components, Node/Link Importance)

B4: Distance Analysis
(Euclidean, Influence Zones, Proximity)

B5: Restoration Planner
(Cost Map AB, Reconnect)

B6: Change Analysis
(Gain/loss, FAD)

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B1:
OBJECT ANALYSIS

B1: Objects – Parcellation

! Start GTB: **File → Set Data Directory: Yes** and select: **data/batch/Fragmentation** !

File → Read Image → GeoTiff: clc.tif

a) **Image Analysis → Objects → Parcellation** Check title bar info & save result

b) **General Tools → Prepr. → Recode Classes** restore: **GTrecode_CLC2LM.sav** and do Parcellation

c) **General Tools → Prepr. → Recode Classes** 2-class image: **1** ← **2** and do Parcellation

d) **General Tools → Prepr. → Recode Classes** 1-class image: **0** ← **1** and do Parcellation

e) **File → Read Image → Generic: rand50_12.tif** **Image Info** do Parcellation, invert FGconn

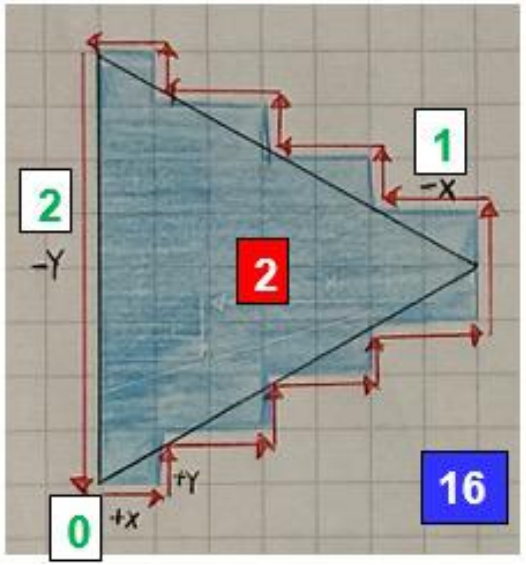
f) **File → Read Image → Generic: rand_mult.png**

- What does a high value of relative Parcellation mean?
- Is Parcellation more sensitive to *land use* or to *land cover*?

Class	Value	Count	Area[pixe	APS	AWAPS	AWAPS/c	DIVISION	PARC[%]
1	1	2	2792	1396	1998.36	1.39485	0.284256	2.42071
2	2	201	432930	2153.88	24287.2	2628.66	0.9439	20.8507
3	3	35	56446	1612.74	3655.94	51.5909	0.935231	19.8106
4	4	5	6131	1226.2	1335.9	2.04761	0.782107	11.0293
5	5	1	418	418	418	0.043681	0	0
6	6	2	14708	7354	7779.05	28.6036	0.471101	4.61045
7	7	14	10134	723.857	783.597	1.98524	0.922677	18.5281
8	8	3	1779	593	701.821	0.312135	0.605497	6.7325
9	9	6	6687	1114.5	1979.03	3.30844	0.704049	8.81299
10	10	15	25139	1675.93	4503.9	28.3059	0.82084	12.446
11	11	28	36026	1286.64	1773.84	15.9761	0.950762	21.795
12	12	61	2.01E+06	33000.1	875187	440439	0.565234	6.02907
13	18	139	278701	2005.04	7531.44	524.753	0.972977	26.1377
14	20	48	80188	1670.58	2995.84	60.0575	0.96264	23.7932
15	21	53	77036	1453.51	2042.68	39.3399	0.973484	26.2749

B1: Objects – Contortion

! Start GTB: **File → Set Data Directory: No** to restore default directory!



File → Read Image → Generic: input_small.tif

Image Analysis → Objects → Contortion

a) Activate and play with Range division

b) Omitted objects? Reprocess larger core-object sizes

changing MSPA parameter 2 *EdgeWidth* (area) to 10

c) Zoom in and check Contortion value of smaller objects

- How could you quantify the influence of human activity?
- What is the Contortion value of a small circular irrigation plot?
- How much will Contortion increase when we have a large circle?
- How will Contortion and Corner Count change when a rectangular shaped agricultural field is rotated by 45º?

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B2:
FRAGMENTATION ANALYSIS

B2: Fragmentation – legacy and FOS

File → Read Image → Generic: inputzz.tif

Difference to **input.tif**?

a) **IA → Fragmentation → Legacy → Map → Entropy**

b) **IA → Fragmentation → Legacy → Map → Contagion**

Activate Fragmentation range, change thresholds

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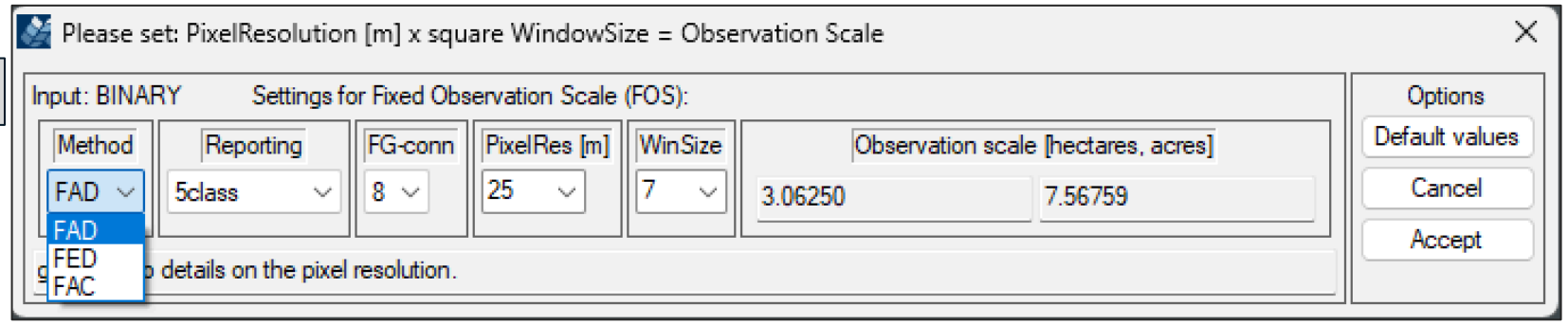
c) Restore:

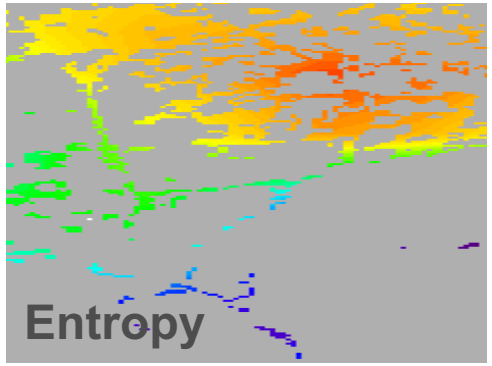
Original Image

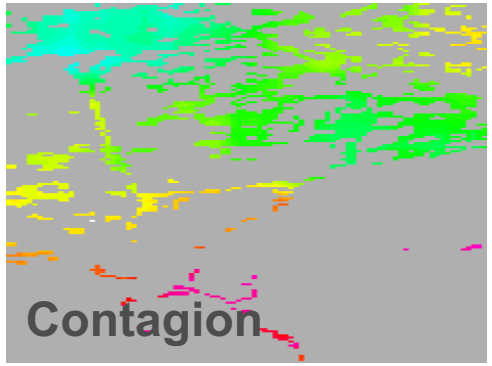


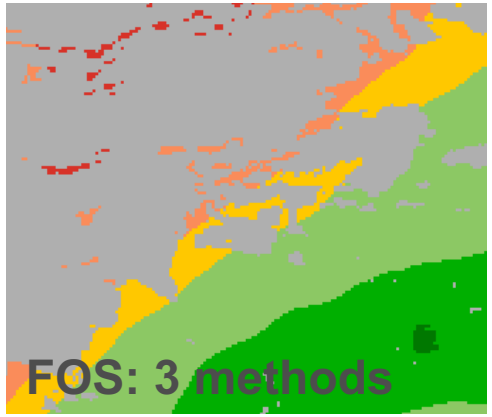
IA → Fragmentation → FOS (FAD 5class, Winsize: 27)

IA → Fragmentation → FOS (FAD APP_2class (Winsize: 27)

- Which method better describes forest fragmentation?
- Which to choose to highlight isolation, heterogeneity, compactness?
- FAD/FED/FAC: Fragmentation product sheet, page 12







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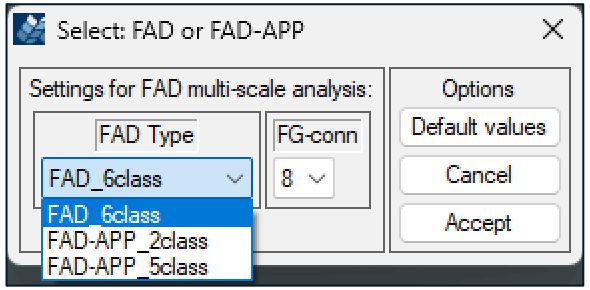
B2: Fragmentation – Multiscale FAD

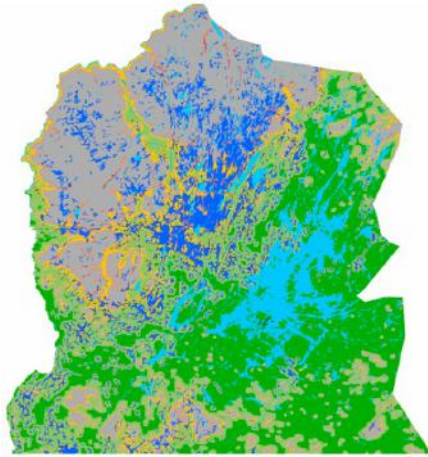
File → Read Image → GeoTiff: NFinland_A.tif

Fragmentation class	Color	FAD range
1 - Rare		FAD < 10%
2 - Patchy		10% ≤ FAD < 40%
3 - Transitional		40% ≤ FAD < 60%
4 - Dominant		60% ≤ FAD < 90%
5 - Interior		90% ≤ FAD < 100%
6 - Intact		FAD = 100%

a) **Image Analysis → Fragmentation → MultiScale → FAD-MS**



Pointer in viewport shows FAD classes over scales



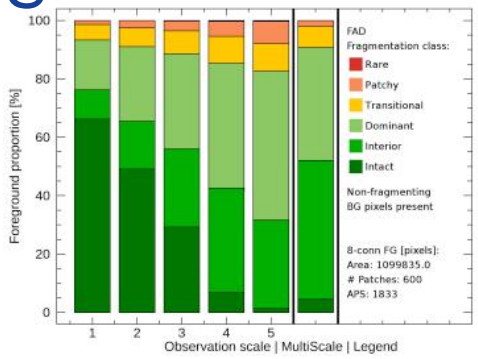
Wetlands (fragmenting)

Water bodies (non-fragm.)

b) **File → Save Image → GeoTiff**

Open folder **NFinland_A_FAD** to see all final files

c) **File → Read Image → GeoTiff: NFinland_B/C.tif** process for FAD-MS



d) Open folder **NFinland_B/C_FAD**

Compare statistics option A versus C. Which FAD-option is meaningful to investigate the transition zone from Forest to Wetland? Why would a Finnish forester most likely choose option C for reporting on forest fragmentation?

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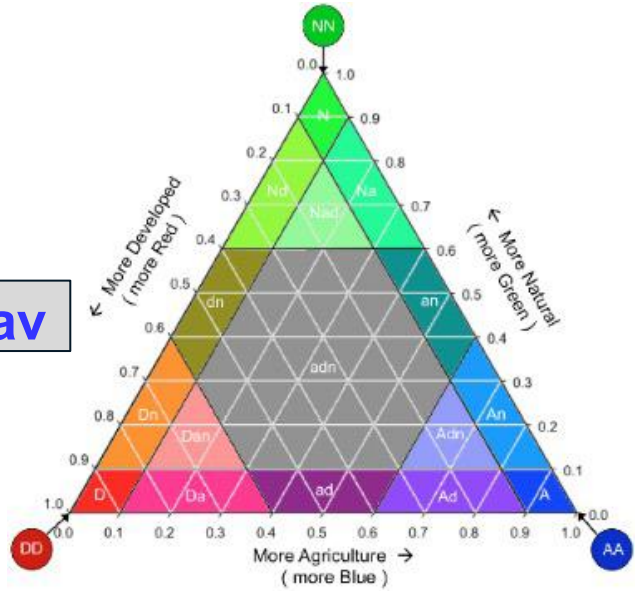
B2: Landscape Mosaic

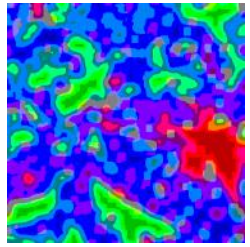
File → Read Image → GeoTiff: clc.tif

a) **General Tools → Prepr. → Recode Classes: GTrecode_CLC2LM.sav**
to **AND**: Agriculture (1b), Natural (2b), Developed (3b)
optional: other (0b); verify changes with: **Image Info**

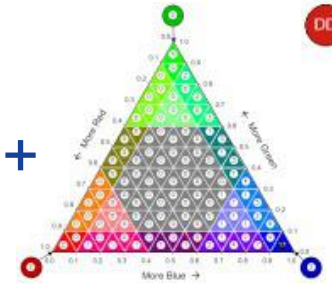


b) **File → Save Image → GeoTiff: clc4lm.tif**

c) **File → Read Image → GeoTiff: clc4lm.tif**



+



d) **Image Analysis → Pattern → Moving Window → Counting Pixels → LM**

- Test different window sizes, **Original Image** and save kdim=27 result
- Load clc4lm_lm_27_103-class image and change colortable LM_X.

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e) **File → Read Image → GeoTiff: clc4lm.tif** **IA → Fragmentation → MultiScale → Dominance**

- Which is the prevalent land cover at large observation scales?
- How to use the heatmaps for change/scale analysis?

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B3:
NETWORK ANALYSIS

B3: Network – NW-Components, Node/Link Importance

a) **File → Read Image → GeoTiff: input.tif**

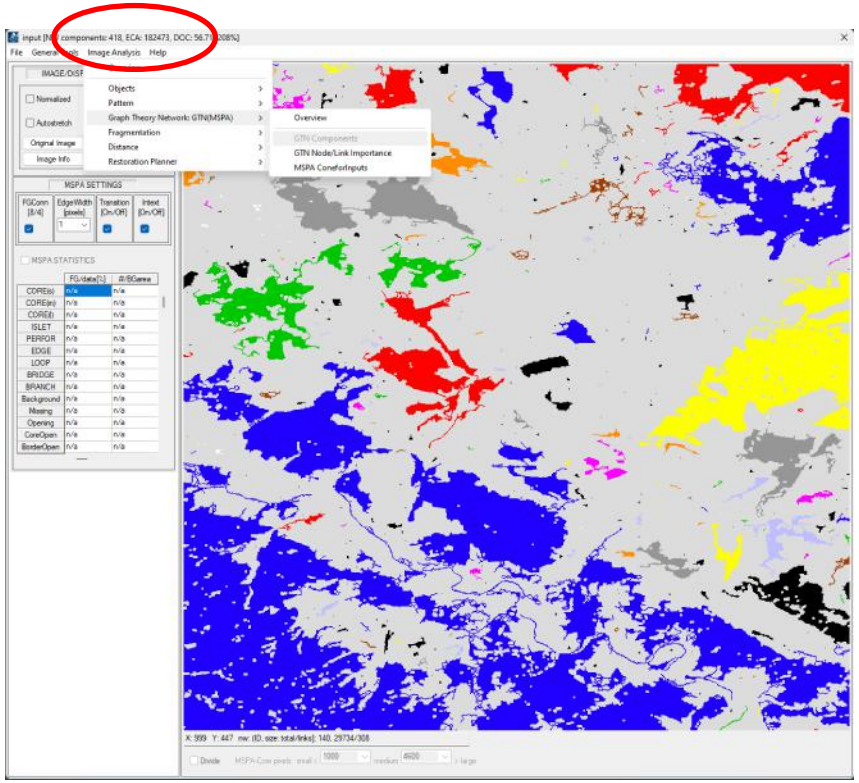
and process with default MSPA settings

b) **Image Analysis → GTN → NW Components**

Play with the Zoom mode and the zoom factors

c) **Image Analysis → GTN → Node/Link Importance**

Play with the Zoom mode and the zoom factors



d) **File → Save Image → GeoTiff**

Open the statistic file: **input_8_1_1_1_cs.txt**

There are 418 network components. Accounting told us there are 2850 objects.
What is the difference between a NW-component and an individual object?

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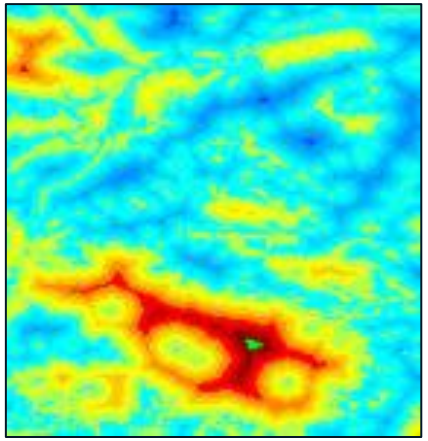
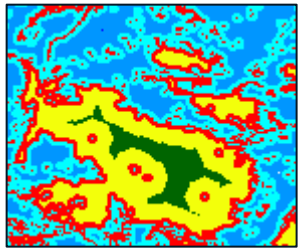
B4:
DISTANCE ANALYSIS

B4: Distance – Euclidean

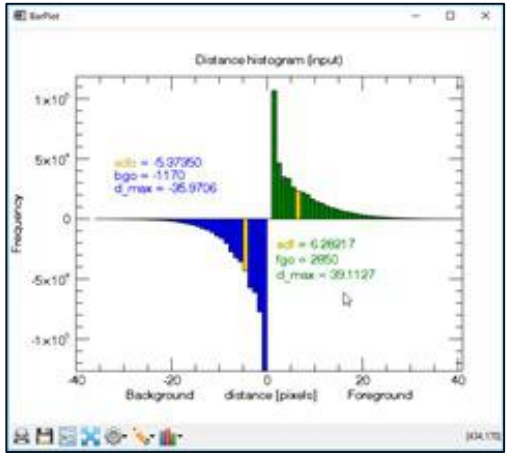
File → Read Image → GeoTiff: input.tif





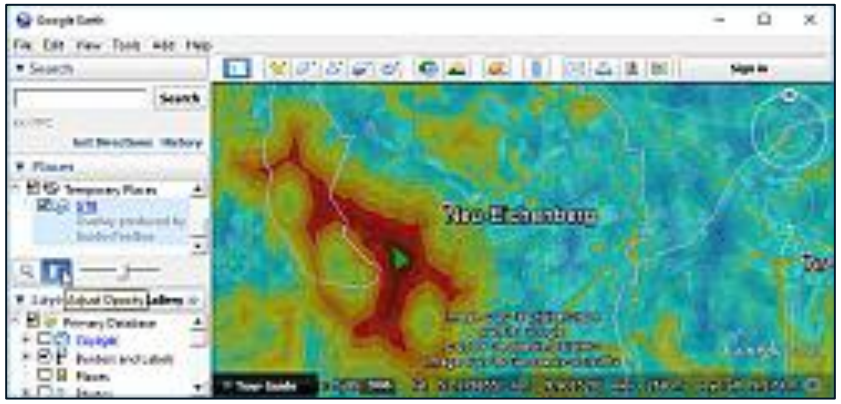
a) **Image Analysis → Distance → Euclidean Distance**

- Click *Intext* to display bar plot histogram summary
- Check GuidosToolbox Manual for distance values: *adb, adf*
- Activate distance ranges and change thresholds



b) **File → Save Image → KML**

display in Google Earth



- Assume *adf* has decreased over the past years: what does this mean?
- Which type of cover change may cause a decrease?

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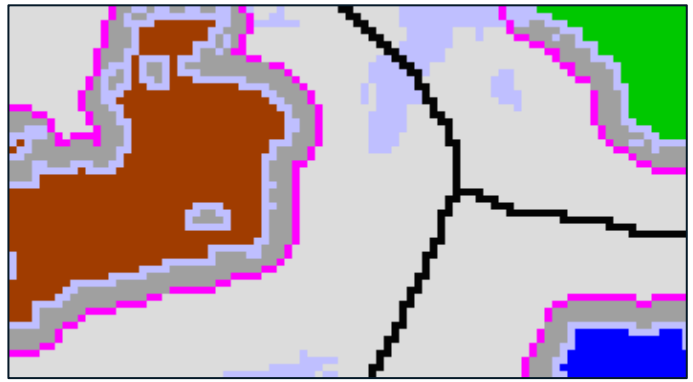
B4: Distance – Influence Zones

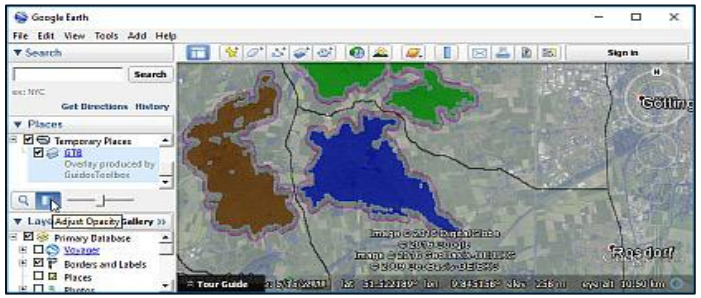
File → Read Image → GeoTiff: input.tif



a) **Image Analysis → Distance → Influence Zones**

- Change *EdgeWidth* (area) & click *Divide*
- Play with buffer zones inside/outside
- Zoom in and read out pixel values & features below the viewport and in the title bar

b) **File → Save Image → KML** display in Google Earth



- How to visualize bear/bee habitat perception?
- Assume pest infection of forest patches with insects flying a given distance. How to visualize? Which patches may get connected?
- How to visualize core-habitat network having a 10-pixel EdgeWidth?

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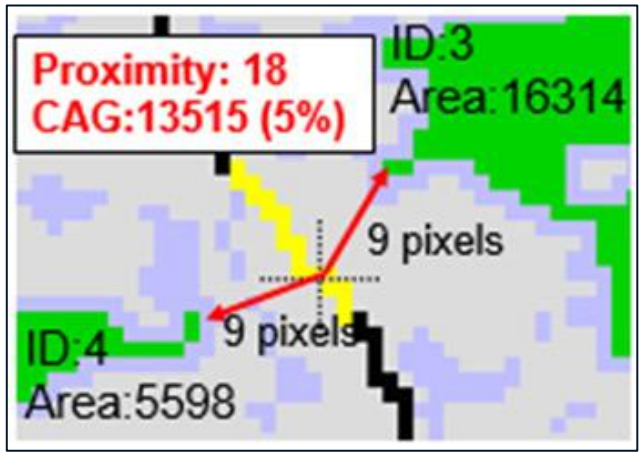
B4: Distance – Proximity



a) **File → Read Image → GeoTiff: input.tif**

- Change thresholds for *EdgeWidth* (area) & click *Divide* below the viewport
- Play with CoreZone buffer and Prox_max
- Zoom in and read out watershed pixel values, proximity, CAG, CAG_relative & summary information in the title bar

- Where are forest (habitat) patches within a given distance?
- How efficient is restoration at a given location?
- Which is the most efficient restoration location?
- Fixed restoration budget: Is it more effective to establish a large corridor at one point or small corridors at several points?

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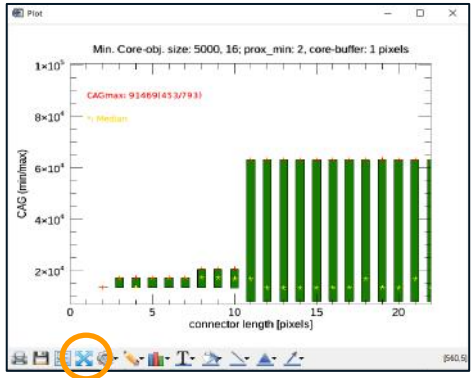
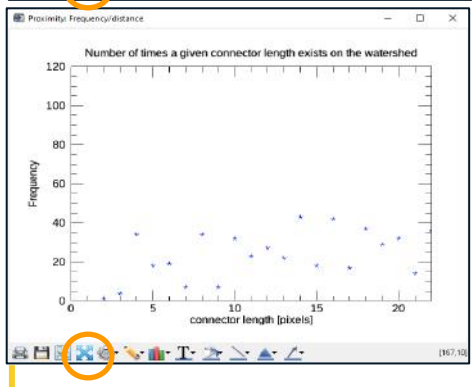
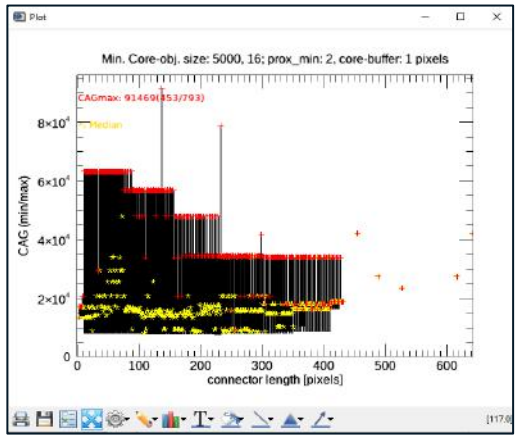
B4: Distance – Proximity

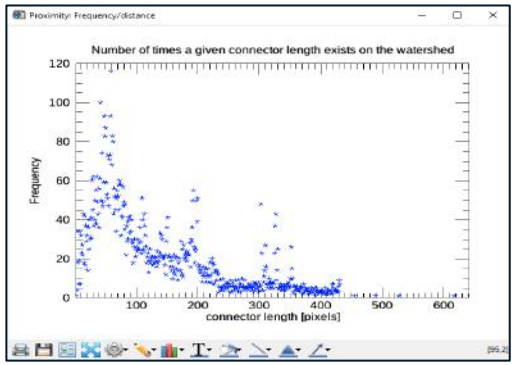
b) Assume we are interested in areas of minimum 5000 pixels and we have money to pay for a maximum of 20 restoration pixels:
Set: Area 5000, CoreZone 1, Prox_max 20, click *Divide*. Click *Intext*

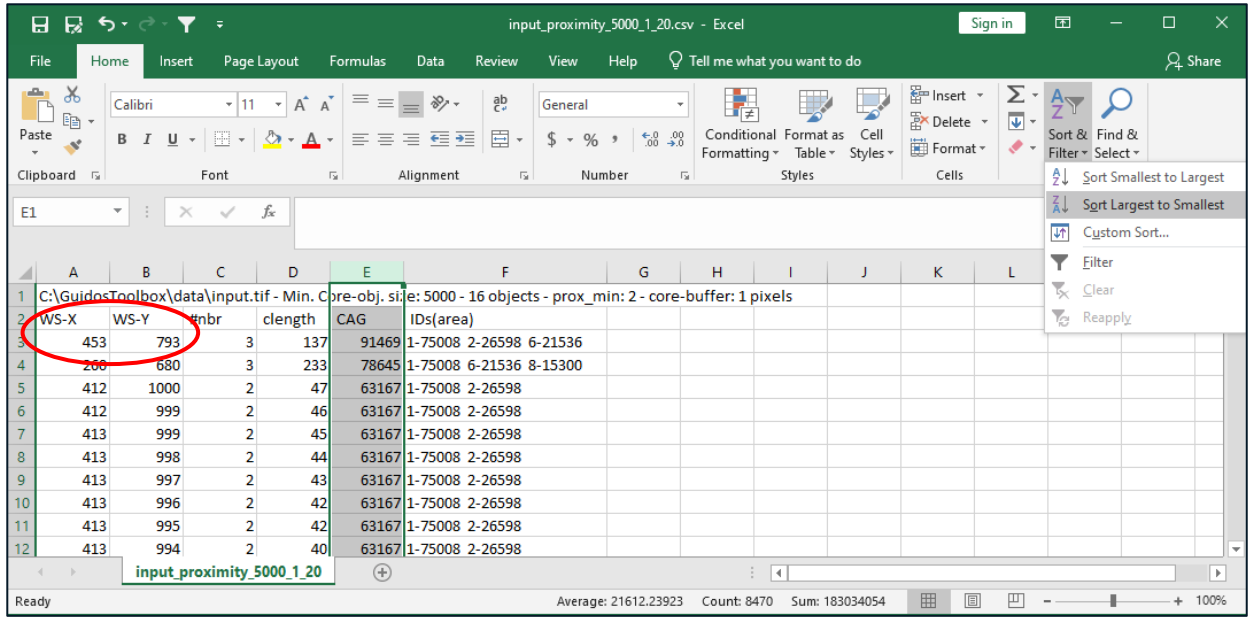
- Check connector length/frequency statistics (to expand)
- Import csv-file and sort columns for largest CAG











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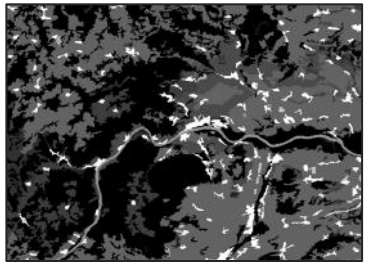
B5:
RESTORATION PLANNER

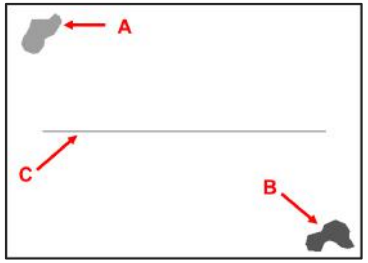
1. Travel Time Analysis
2. Setup the resistance map
3. Planning Tools and Evaluation
4. Restoration Status/Change Summary

B5: RP – Assessment – Isochrone Map

1. Travel Time Analysis: Resistance map + Marker map



+



a) File → Read Image → Generic: resist_marker0.tif Image Info

b) File → Read Image → Generic: resist.tif Image Info

c) Isochrone Map A: IA → RP → Assessment → Isochrone Map A: resist_marker0.tif

d) Restore original: Original Image

e) Isochrone Map AB: IA → RP → Assessment → Isochrone Map AB: resist_marker0.tif

Play with Zoom mode, cost ranges, mouse pointer

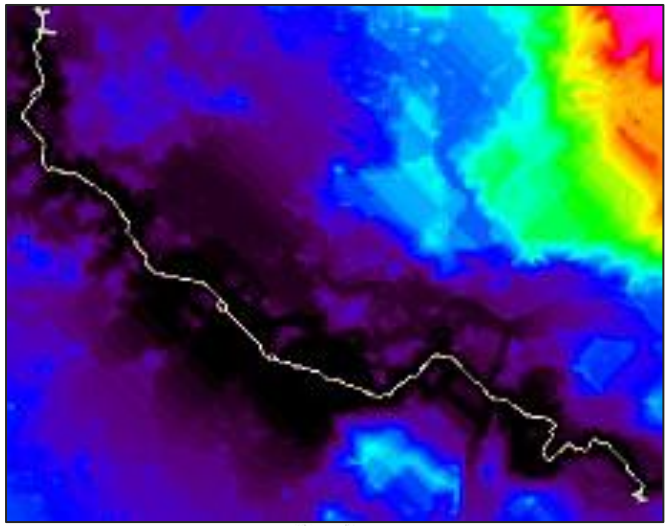
f) Restore original: Original Image

g) Isochrone map AB with river as a barrier:

IA → RP → Ass. → Isochrone Map AB: resist_marker_river.tif

h) Repeat with isochrone map A:

IA → RP → Ass. → Isochrone Map A: resist_marker_river.tif



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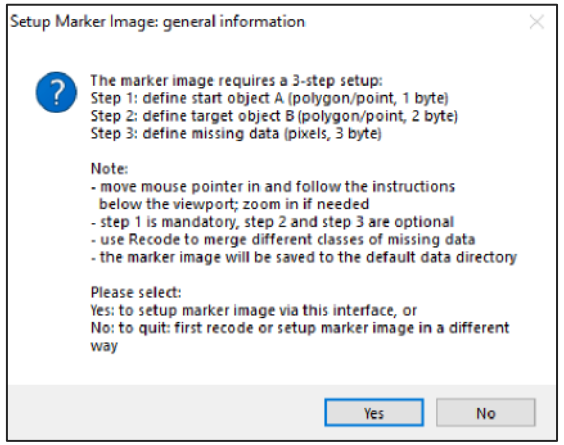
B5: RP – Setup Tools – Isochrone Marker



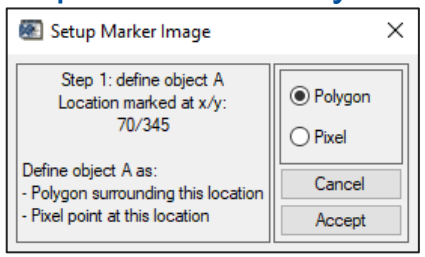
1. Travel Time Analysis: How to setup a marker map?

a) **File → Read Image → Generic: resist.tif** **Image Info**

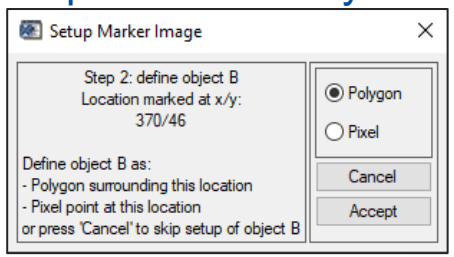
b) **IA → RP → Setup Tools → Isochrone Map Marker Image**

Define: A: [70, 345], B: [370, 46], Missing: [270, 185] (Zoom in, click on object and press Enter key or space bar; i.e.: Select two smaller gray objects & set white as missing)

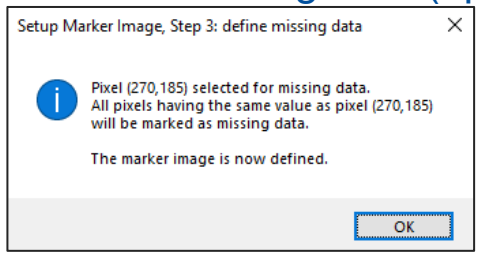
1) Click Start Object & press Enter key:



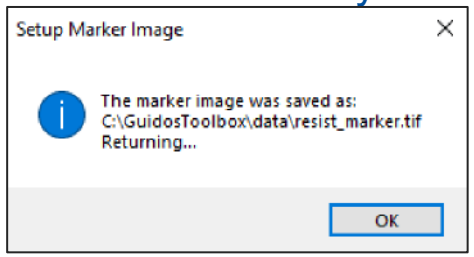
2) Click Target Object & press Enter key:



3) Click specific pixel & press Enter key to define missing data (optional):



4) Marker Image is saved for travel time analysis:



c) Apply new Marker: **IA → RP → Assessment → Isochrone Map AB: resist_marker.tif**

(optional: verify new Marker: **File → Read Image → Generic: resist_marker.tif** **Image Info**)

Note: use **General Tools → Prepr. → Recode Classes** on your original image to assign different resistance values and/or merge several classes into one class for Missing

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B5: RP – Setup Tools

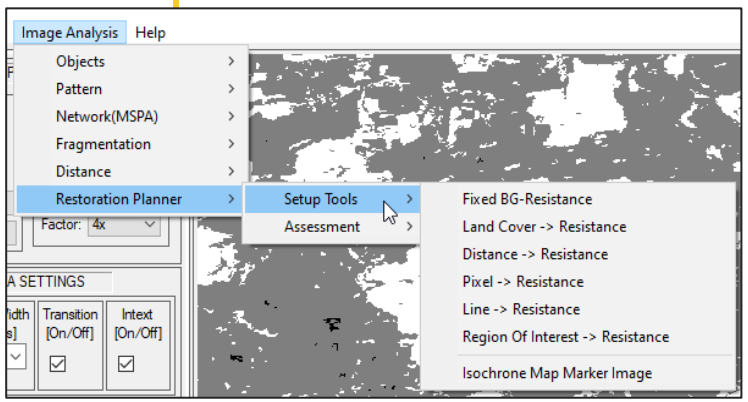
2. How to setup a resistance map?

Resistance ~ difficulty to traverse a pixel

0: impossible to traverse

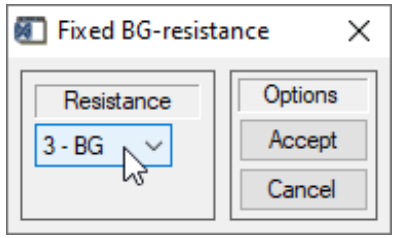
2: min: fixed for all pixels inside FG-objects

3-100: > min for pixels outside FG-objects



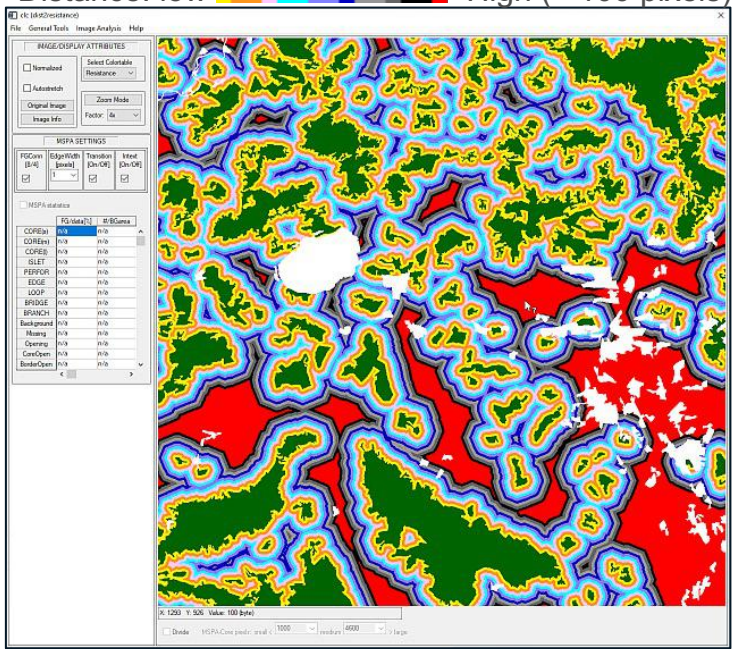
Fixed BG-Resistance: assign a constant resistance value to all background pixels:

File → Read Image → GeoTiff: input.tif



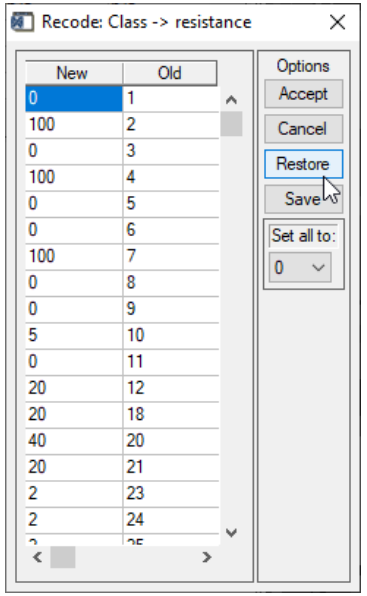
Distance → Resistance: ~ distance from FG-objects (birds/flying insects):

Distance: low High (≥ 100 pixels)

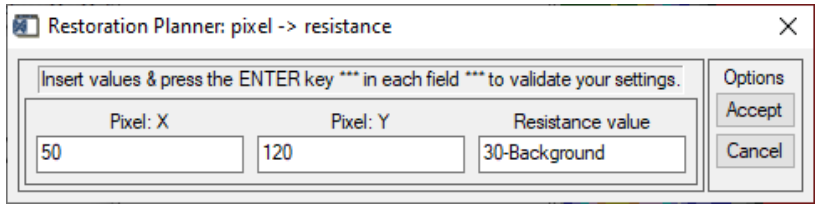


Land Cover → Resistance: assign or reclassify land cover class-specific resistance values:

File → Read Image → GeoTiff: clc.tif



Pixel → Resistance: assign custom resistance value to a given pixel:



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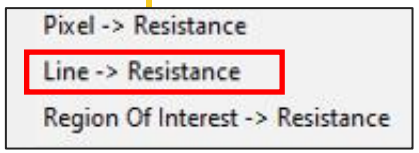
B5: RP – Setup Tools

2. How to setup a resistance map?



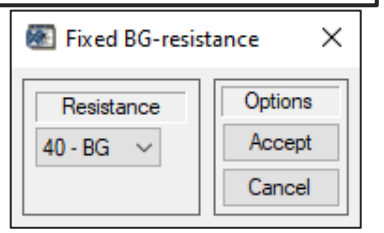
Add a line shape

Resistance ~ difficulty to traverse a pixel

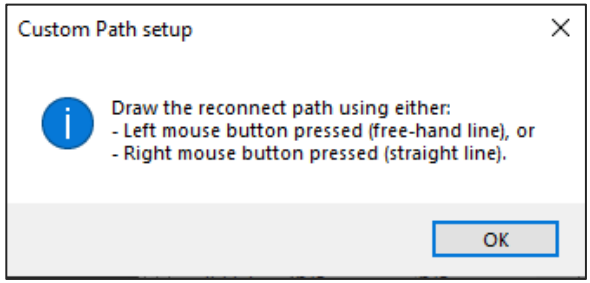
0: impossible to traverse
2: fixed for all pixels inside FG-objects
3-100: pixels outside FG-objects

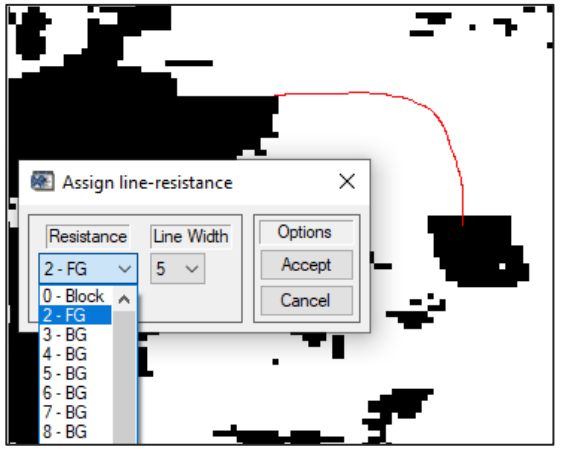
a) **File → Read Image → GeoTiff: input.tif**

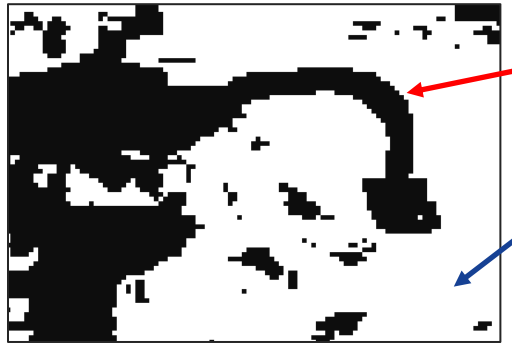
b) **IA → RP → Setup Tools → Fixed BG-Resistance** Set BG-resistance, i.e. 40%:



c) **IA → RP → Setup Tools → Line→Resistance** Click on *FGConn*, then draw a freehand or straight line, set line width and resistance:

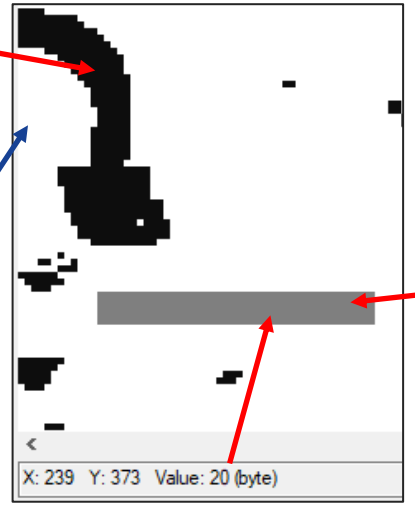






Freehand line:
FG (2), width: 5

BG-resist (40)



Or add a straight line:
BG-resist (20), width: 5

Add *any* line-shaped element and define its function setting the Resistance to: blocking (0), FG (2), or BG-resistance (3-100)

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B5: RP – Setup Tools

2. How to setup a resistance map?

Pixel -> Resistance
Line -> Resistance
Region Of Interest -> Resistance

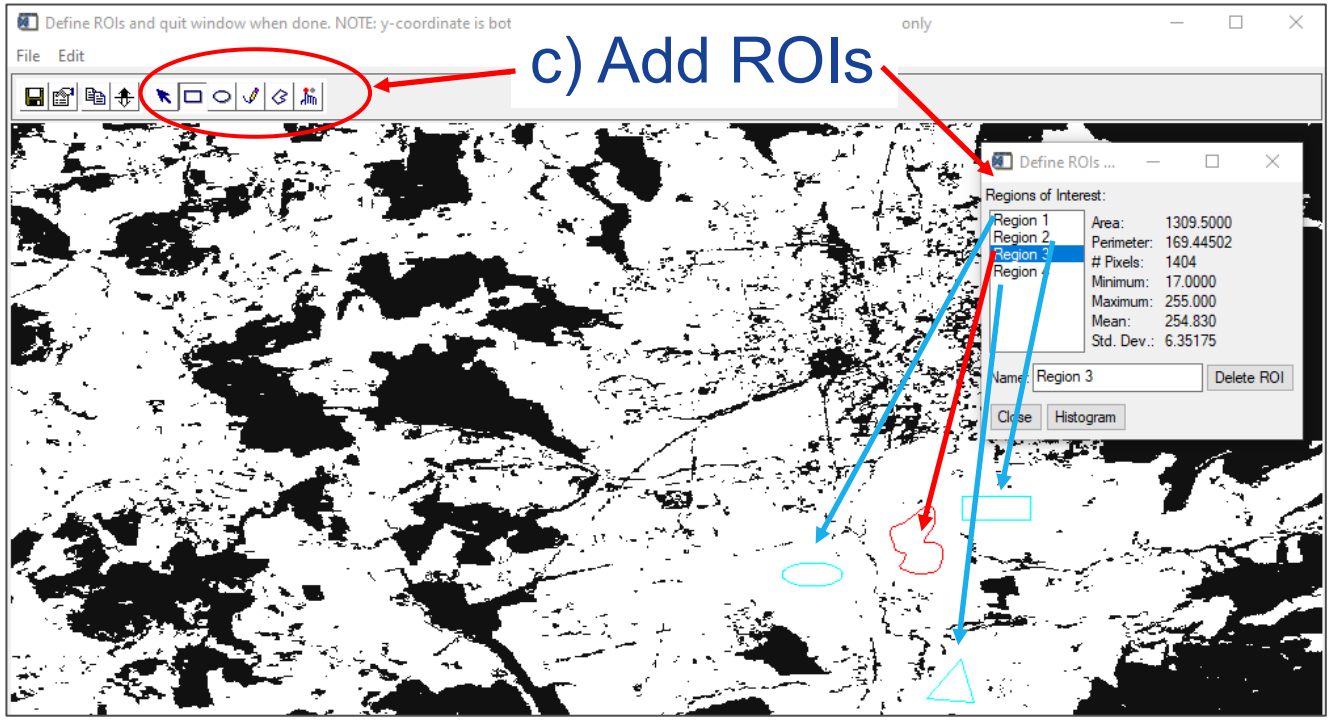
Add or modify a ROI

Resistance ~ difficulty to traverse a pixel

0: impossible to traverse
2: fixed for all pixels inside FG-objects
3-100: pixels outside FG-objects

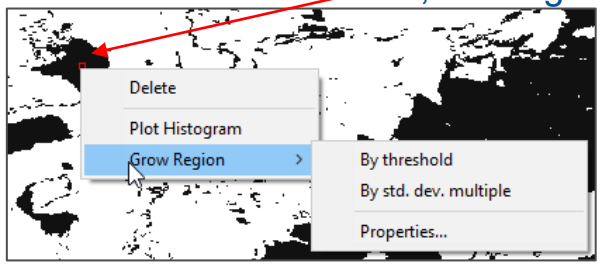
a) **File → Read Image → GeoTiff: input.tif** Set BG-resistance, i.e. 40%

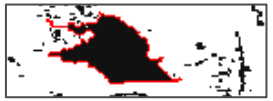
b) **IA → RP → Setup Tools → ROI→Resistance**



d) And/or select irregular shaped ROI:

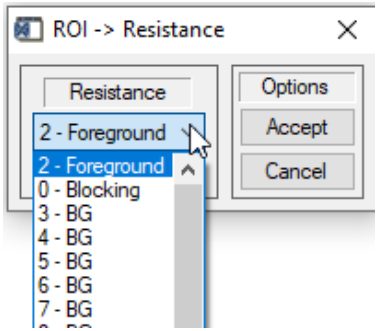
Set a small Marker, then right-click on it for region growing





object is now selected

e) Close popup window & assign resistance for all ROIs defined:



Add/modify *any* ROI and define its function via Resistance: blocking (0), FG (2), or BG-resistance (3-100)

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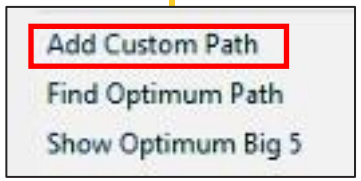
B5: RP – Assessment

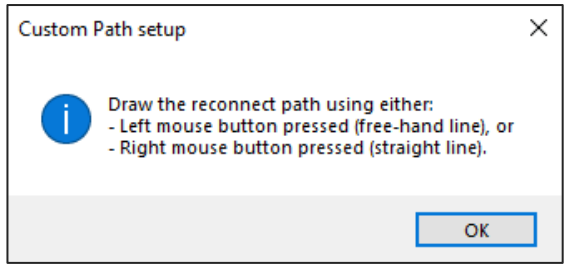
3. Restoration Planning & Evaluation



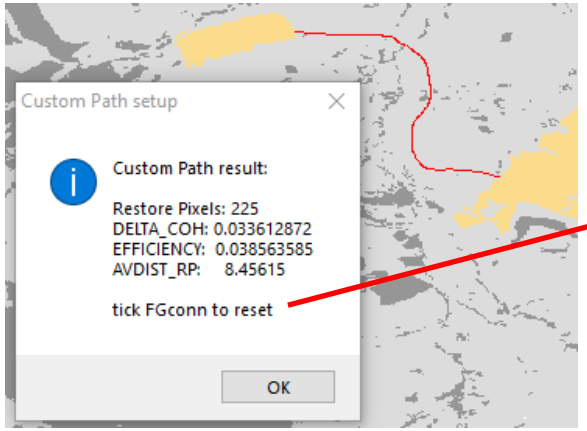
Scope: Instant evaluation of one restoration pathway on a resistance map (How efficient is a suggested restoration path?).

a) Setup a resistance map: **File → Read Image → GeoTiff: input.tif** Set BG-resistance, i.e. 40%

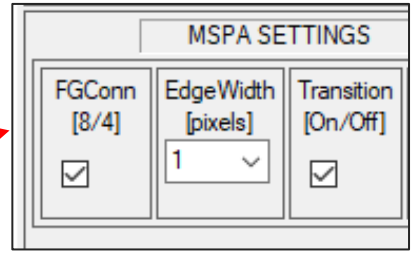
b) **IA → RP → Ass. → Add Custom Path** Click *FGConn* for path setup:



Freehand example:

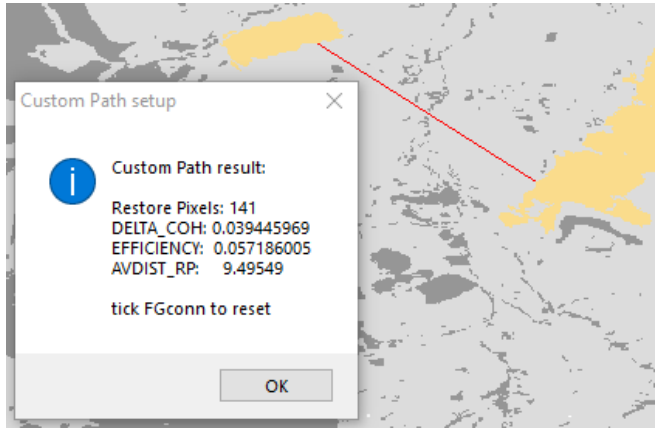


Click *FGConn* to reset



Click *FGConn* again to quickly test another path…

Straight line example:



- Check the GTB title bar for further information.
- Custom Path width is 1 pixel. Else use *RP-Setup Tools* or *Preproc-Recode Line*
- An isolated path leads to a negative ΔCOH, why is that?

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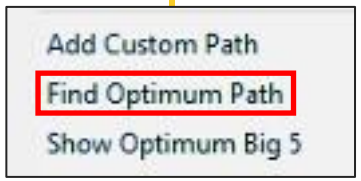
B5: RP – Assessment

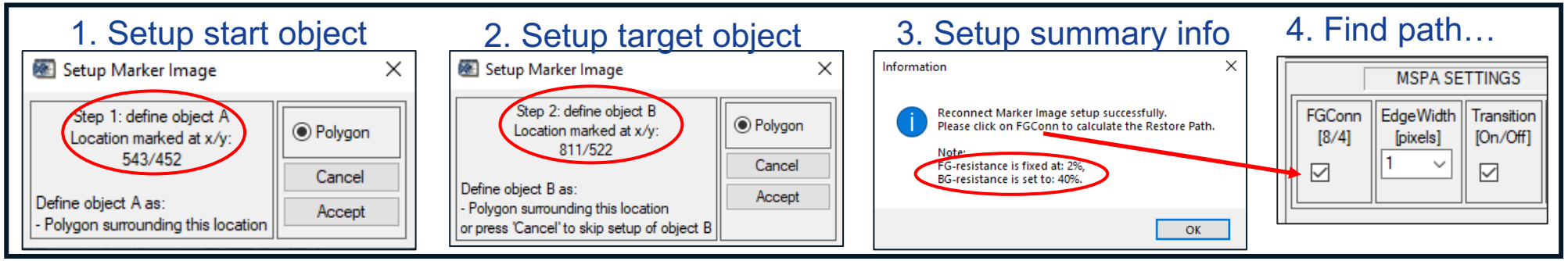
3. Restoration Planning & Evaluation

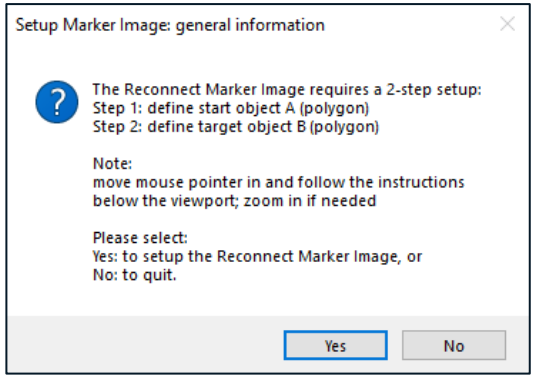


Scope: Find optimum restoration pathway between two selected objects on a resistance map (Can you find the most efficient restoration path?).

a) Setup a resistance map: **File → Read Image → GeoTiff: input.tif** Set BG-resistance, i.e. 40%

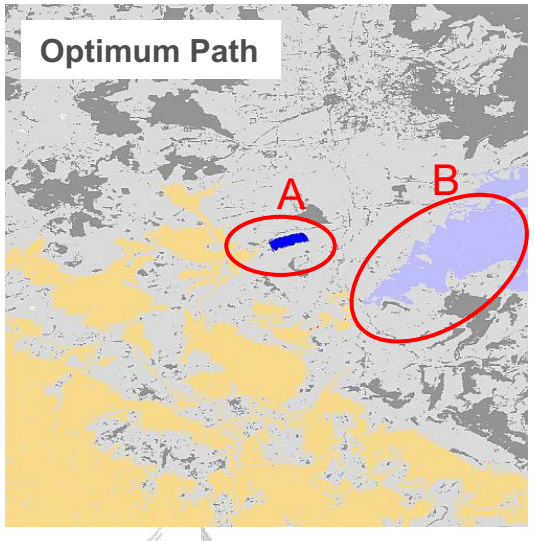
b) **IA → RP → Ass. → Find Optimum Path** Click *FGConn* for path setup:





c) Save as geotiff and open the directory: **data/input_restoration_40_AB**

	A	B	C	D	E	F	G	H	I	J	K	L
1	SIZE_A	SIZE_B	REST_PIX	AVDIST_	EXP_40	EFFIC	ECA_ORIG	ECA_NEW	DELTA_ECA	COH_ORIG	COH_NEW	DELTA_COH
2	1451	33508	65	1.80	2,600.00	18.11	221,292.76	268,387.81	47,095.06	51.64	62.63	10.98



- This example connected the same two objects A/B as shown in the previous slide. Compare: #RP, AVDIST, EFFIC, and ΔCOH. Why is the difference so large now?
- In general: which objects should be connected for most efficient restoration?

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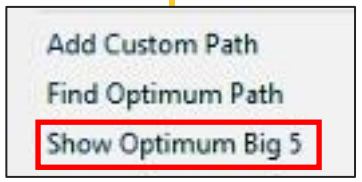
B5: RP – Assessment

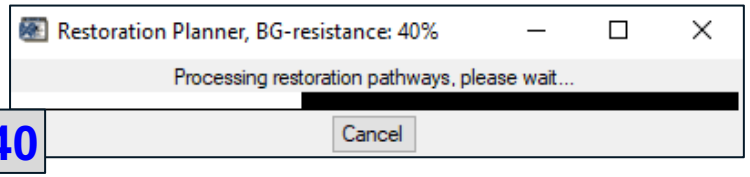
3. Restoration Planning & Evaluation



Scope: Find optimum restoration pathway between the 5 largest objects on a resistance map (Show me some very efficient restoration pathways).

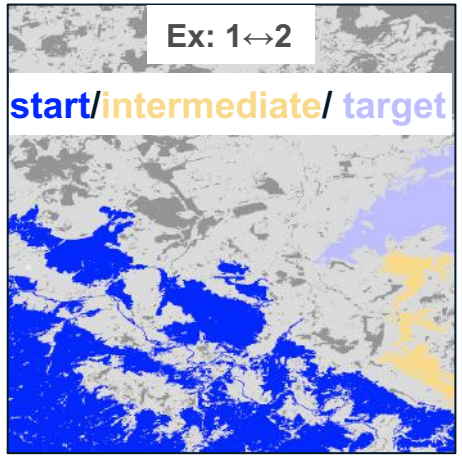
a) Setup a resistance map: **File → Read Image → GeoTiff: input.tif** Set BG-resistance, i.e. 40%

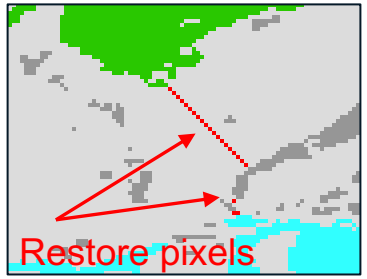
b) **IA → RP → Ass. → Show Optimum Big 5** Analyzing 10 combinations:



c) Save as geotiff and open the directory: **data/input_restoration_40**

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	RESTORE	SIZE_A	SIZE_B	REST_PIX	AVDIST_RP	EXP_40	EFFIC	ECA_ORIG	ECA_NEW	DELTA_ECA	COH_ORIG	COH_NEW	DELTA_COH
2	1 <-> 2	214,811.00	33,508.00	18.00	2.15	720	67.86	221,292.76	270,149.80	48,857.05	51.64	63.04	11.40
3	1 <-> 3	214,811.00	26,366.00	43.00	1.25	1,720	26.05	221,292.76	266,096.14	44,803.39	51.64	62.09	10.45
4	1 <-> 4	214,811.00	14,983.00	8.00	1.21	320	98.35	221,292.76	252,764.99	31,472.23	51.64	58.99	7.34
5	1 <-> 5	214,811.00	13,850.00	2.00	1.41	80	163.26	221,292.76	234,353.72	13,060.96	51.64	54.69	3.05
6	2 <-> 3	33,508.00	26,366.00	23.00	4.67	920	4.35	221,292.76	225,295.70	4,002.95	51.64	52.58	0.93
7	2 <-> 4	33,508.00	14,983.00	61.00	1.79	2,440	26.35	221,292.76	285,587.07	64,294.31	51.64	66.64	15.00
8	2 <-> 5	33,508.00	13,850.00	56.00	1.85	2,240	20.35	221,292.76	266,879.94	45,587.18	51.64	62.28	10.63
9	3 <-> 4	26,366.00	14,983.00	41.00	1.24	1,640	1.97	221,292.76	224,515.84	3,223.09	51.64	52.39	0.75
10	3 <-> 5	26,366.00	13,850.00	40.00	1.23	1,600	1.91	221,292.76	224,344.95	3,052.20	51.64	52.35	0.71
11	4 <-> 5	14,983.00	13,850.00	5.00	1.08	200	7.49	221,292.76	222,791.25	1,498.50	51.64	51.99	0.35





- Directory shows summary & 10 pairs of optimum path + travel time map
- The analysis may include alternative pathways, why? Check 1↔2
- Sort table to find best EFFIC, or best ΔCOH, or least expense, etc.
- Is connecting the two largest objects always the best option?

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4. Restoration Status Summary (RSS)

Use any binary mask (**input.tif**) and get a network summary for all FG-objects (2 byte):

Image Analysis → Restoration Planner → Assessment → Status Summary

Or, let's quickly do this for a series of images:

a) Start GTB: **File → Batch Process → Restoration status**

b) Browse to directory **batch/MSPA/** and select all images

c) Open the directory **batch/batch_rss/** and check the log and csv file

	A	B	C	D	E	F	G	H	I	J
1	REP_UNIT	AREA	RAC[%]	NR_OBJ	LARG_OBJ	APS	CNOA	ECA	COH[%]	REST_POT[%]
2	fm00.tif	304837	47.505411	3952	247536	77.134868	1188516	247829.13	81.298902	18.701098
3	fmap2000.tif	431639	67.443594	790	420432	546.37848	15986932	420436.66	97.404698	2.5953019
4	galicia.tif	533462	26.025076	32	355485	16670.688	882233	358898.55	67.277247	32.722753
5	input.tif	428490	42.860572	2850	214811	150.34737	311712	221292.76	51.644789	48.355211
6	molise.tif	131321	29.568011	266	42565	493.68797	41423	48469.757	36.909372	63.090628
7	ValGrande.tif	127191	54.801267	264	100436	481.78409	438812	101197.12	79.563112	20.436888

Key network **status** summary. What do the indicators describe?

(RP-product sheet, section 2.1)

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B5: RP – Assessment

4. Restoration Change Summary

Scope: Simulate the expense and impact of a restoration scenario. We need 2 maps:

1) A *resistance map*: the current network (FG) incl. adequate background resistance
2) A *restoration map*: resistance map including all simulated restoration measures defined via: **IA → RP → Setup Tools → Line/ROI→Resistance**

---

a) Setup a resistance map: Use **input.tif**, assign BG-resist 40%, save as: **input_40.tif**

b) On the resistance map: Setup restoration measures (lines, ROIs), save **input_40rest.tif**

c) **IA → RP → Ass. → Change Summary**

Select *resistance* & *restoration* map: **input_40.tif** + **input_40rest.tif** = **data/rss_change.csv**

	A	B	C	D	E	F	G	H	I	J
1	REST_PIX	AVDIST_RP	EXP_40	EFFIC	ECA_ORIG	ECA_NEW	DELTA_ECA	COH_ORIG	COH_NEW	DELTA_COH
2	195	6.84232	7800	3.98	221,292.76	252,374.44	31,081.69	51.64	58.87	7.23

Key network **change** summary.
What do the indicators describe?

Setup Tools: simulate *any type* of land cover change or spatial restoration scenario. The new setup can then be quantitatively evaluated via the **Assessment** menu to retrieve a new status summary or to quantify the efficiency of a simulated restoration measure.

(RP-product sheet, section 2.2)

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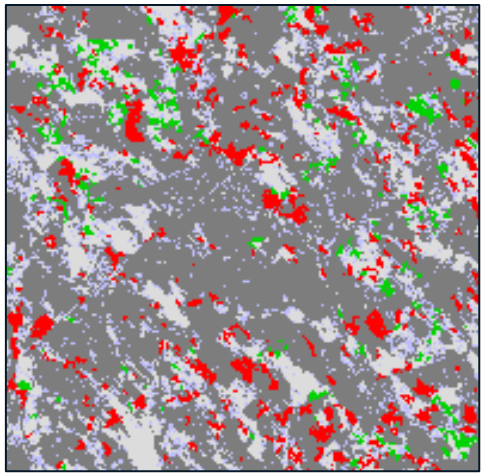
B6:
CHANGE ANALYSIS

B6: Change – Morphological Change Detection (MCD)



File → Change →

a) **Simple Change** Read images **fmap1990/2000.tif**
Output: 11 – BG/BG, 12 – BG/FG (gain), 21 – FG/BG (loss), 22 – FG/FG, 255 – missing in one image

b) **Morph. Change** Read images **fmap1990/2000.tif**
Output: 11 – BG/BG, 12 – BG/FG (gain), 21 – FG/BG (loss), 22 – FG/FG, 176 – neglected, spurious changes, 255 – missing in one image

c) **LM heatmap** Calculate delta-heatmaps, see following slide

d) **FAD** Multiscale fragmentation change analysis, see following slide

d) **FOS** Change in FOS (fragmentation at a fixed user-selected observation scale

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B6: Change – LM heatmap

! Start GTB: **File → Set Data Directory: Yes** and select: **data/batch/recode** !

a) Generate two LM images:

File → Batch Process → Recode Classes: restore **GTBrecodeCLC2LM.sav,**
click Apply, then select and recode the two CLC maps

File → Batch Process → Pattern → MovWin → LM: ..\batch_Recode*.tif **(WinSize 27)**

The LM/heatmap results are in the directory **data\batch\batch_lm_27**
Open the country-directory and check the resulting files

b) Do the LM-change analysis: **File → Change → LM heatmap: batch_lm_27\country*.sav**

The delta heatmap results are in the current default data directory: **data/batch/recode**

- Which land cover types are dominant in Slovakia / the Netherlands?
- Comparing NL vs SK: where are the main changes?
- Temporal change: which trajectory can be expected for urban sprawl?

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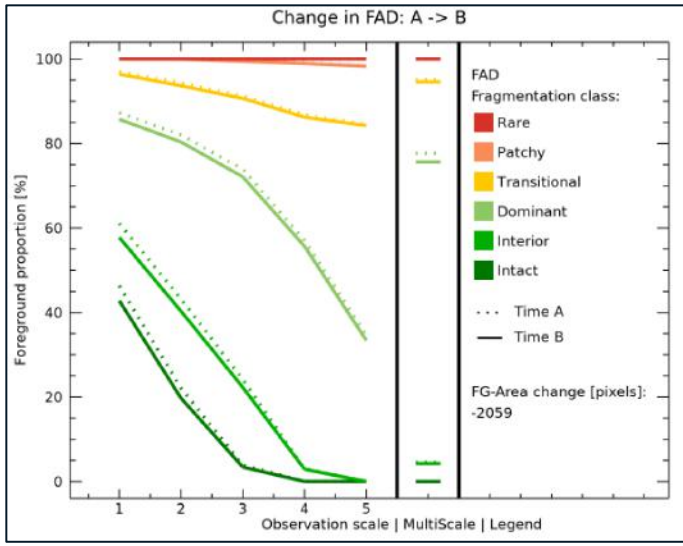
B6: Change – Fragmentation (FAD Multiscale)

! Start GTB: **File → Set Data Directory: Yes** and select: **data\batch\fragmentation/FAD** !

a) Generate two FAD Multiscale images:

File → Batch Process → Fragmentation → MultiScale → FAD-MS: SK2000.tif SK2012.tif

process with default settings. Open the resulting directory, check the log-file and the resulting files



b) Do the FAD Multiscale change analysis:

File → Change → FAD Multiscale: select the two mscale maps

..\batch_FAD\SK<year>_fad\SK<year>_fad_mscale.tif

Save the results into the suggested directory

Open **data\batch\fragmentation/FAD** and extract the archive **FADchange.zip**

c) Open the directory **FADchange** and compare the results for the five observation scales and the multi-scale statistics.

Which fragmentation class changed the most?

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B6: Change – FOS (custom method & scale)

! Start GTB: **File → Set Data Directory: Yes** and select: **data\batch\fragmentation/FAD** !

a) Generate two FOS images:

File → Read Image → GeoTIFF: SK2000.tif (SK2012.tif)

IA → Fragmentation → FOS (FAD 5class, Winsize: 27)

process with FAD 5class, 100m, winsize 31 and save the result

b) Do the FOS-change analysis:

File → Change → FOS: and select the two fos maps

SK<year>_fos-fad_5class_31\SK<year>_ fos-fad_5class_31.tif

Save the results into the suggested directory

c) Open **data\batch\fragmentation/FAD** and check the related .txt and .csv file.

Which fragmentation class changed the most?

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Workshop experience

Please provide your feedback & email your comments to: peter.vogt@ec.europa.eu

C:\GuidosToolbox\data\GWS_feedback_form.xls

Thank you

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