

What's new in eCognition Developer 8?

# Analysis of Area of Interest - combine Regions and Maps

New OBIA dimensions

DEEPER INSIGHTS  
FASTER RESULTS  
BETTER DECISIONS

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## Imprint and Version

Document Version

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# Introduction to this Module

This Module gives you an introduction how to combine both new concepts, Maps and Regions to classify Areas of interest in a fast and efficient way. You should have gone through the Modules 'Working with Regions' and Working with Maps' before.

This Module has two Lessons:

Lesson 1 Introduction to the analysis workflow

Lesson 2 Classifying Regions of interest via a Map with lower resolution

Lesson 3 Detail analysis of water bodies using a detail Map

Lesson 4 The complete classification

## Symbols at the side of the document

The symbols at the side of the document shall guide you through the exercises and help you to identify whether to read something or an action is needed or whether the screenshot is meant to be compared with settings in the software.

Introduction

Information



**Action!**

If the side is hachured and 'Introduction' is added, this indicates that a text is giving a general introduction or methodology about the following chapter, method or exercise.

If the side is hachured and 'Information' is added, this indicates that a text is giving information about the following exercise.

If this symbol is shown, you have to follow the numbered items in the text. If you just want to work through the exercises without reading the theory part, follow only this sign.



**Settings Check**

If this symbol is shown, compare the settings shown in the screenshot with the settings in the according dialog box in the software.



**Rule Set Check**

If this symbol is shown check the screenshot of the Process Tree with the content of the Process Tree in the software.



**Result Check**

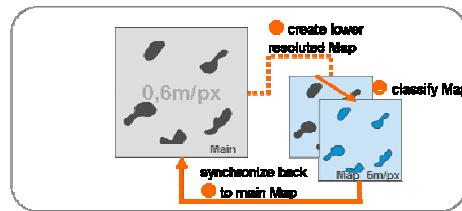
If this symbol is shown check the screenshot aside with the result in the software. It should look similar.

# Lesson 1 Introduction to the analysis workflow

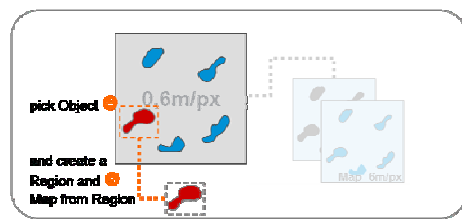
This Module gives you an introduction how to combine both new concepts, Maps and Regions to classify Areas of interest in a fast and efficient way. The analysis on this example is a continuing interplay between Maps, its classification and the synchronization of results.

The general set up of the Analysis routine:

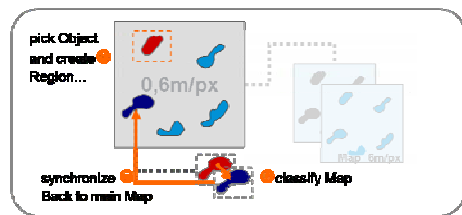
- A Map with **lower resolution** ① is created. The water bodies are **classified** ② roughly on that down-sampled Map. The result is **synchronized** ③ back to the main Map.



- One water body Object is picked out ④. From this Object, a **Region** is created and from this region a **Map is created** ⑤ in the same resolution.



- This detail Map is **classified** ⑥. The Map is **synchronized** ⑦ back to the main Map. **The next** ④ water body Object is picked, the Process starts all over again with creating Region from this Object.



Introduction

## Lesson 2 Classifying Regions of interest via a Map with lower resolution

*This Lesson has the following chapters*

- *The Process settings to create a Map*
- *Classifying the Map*
- *Synchronizing the result back to the main Map*

### Introduction

In the first part of the Rule Set, a Map with a lower scale is created **1** and the water bodies are classified roughly **2** in this Map. The result is then synchronized back **3** to the main Map.

The advantage of this approach is that through the down-sampling the segmentation and classification is **faster**, then running the classification on the original scene. For very large areas, it can be possible, that the number of created Objects is getting too high, so that the processing is cancelled. This can be avoided by using the approach explained in this Module.

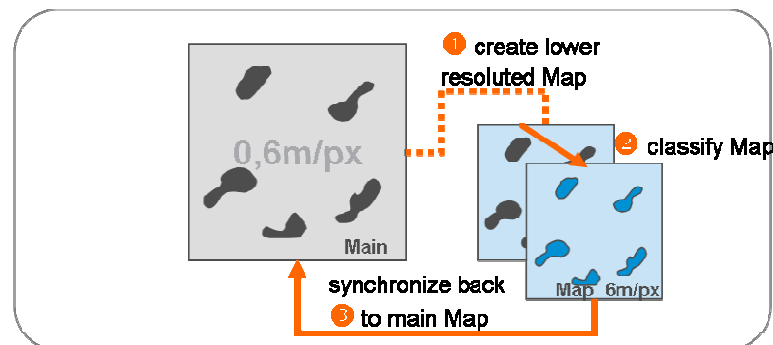


Figure 1: Schematic Graph showing the workflow to create a Map, classify it and synchronize it back.

## 2.1 The Process settings to create a Map with lower resolution

The Project to be loaded contains **a sets of multispectral and panchromatic image layers** from a subset of a Quickbird scene. A Process is loaded to the Project, but not executed.

Information

### Preparation

1. Start Definiens eCognition Developer in 'Rule Set' mode.
2. Switch to predefined view setting number 4 'Develop rulesets'



Action!



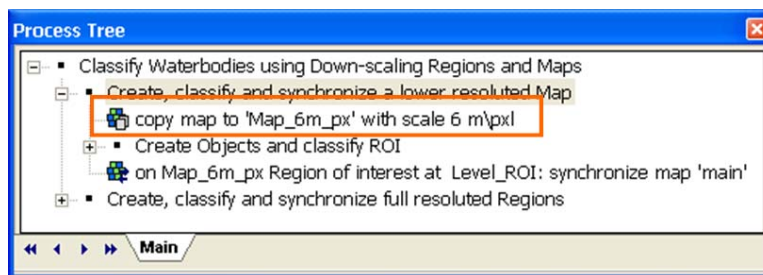
3. In the main menu 'File' choose '**Open Project**' or click on the 'Open Project' button in the toolbar.
4. Open the project '**Maps\_Resampling\_Regions.dpr**' in the folder '**...\WhatsNew\_eCog8\Projects\Maps\_Resampling\_Regions**' at the location where the training data is stored.

### 2.1.1 Evaluate the Process settings

1. Expand the Process section '**Classify Waterbodies using Down-scaling Regions and Maps**' and '**Create, classify and synchronize a lower resolutud Map**'.
2. Double-click on the first Child Process '**copy map to 'Map\_6m\_px' with scale 6 m\pxl**' to open it.



Action!



Rule Set Check

Figure 2: Process settings to create a Map with lower resolution.



**Settings Check**

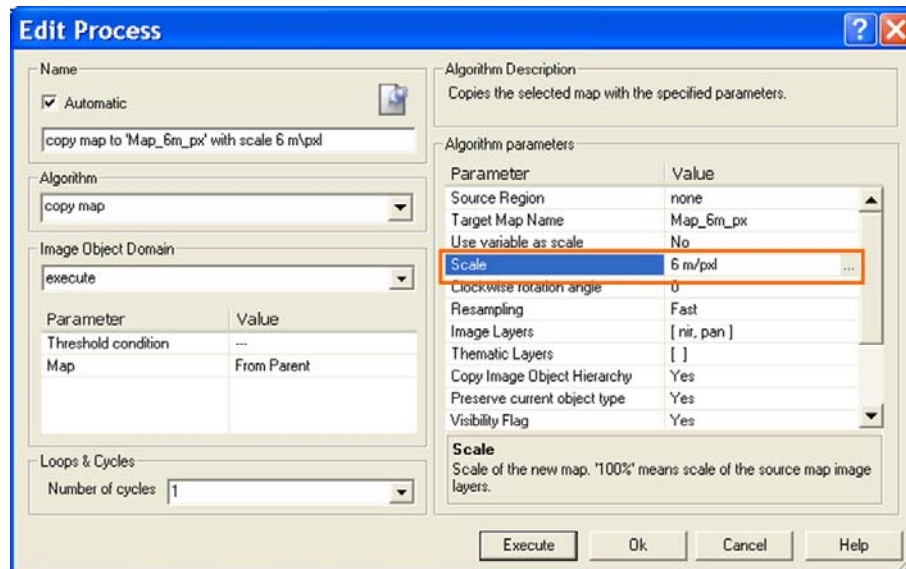


Figure 3: Process settings to create a down-scaled 'Map\_6m\_px'.

- In the Algorithm Parameters the name. '**Map\_6m\_px**' is defined.
- In the field '**Image Layers**' the Layers 'nir' and 'pan' are selected to be part of the new, downscaled Map.
- In the field '**Scale**' the resolution of the new Map can be changed.



**Action!**



**Settings Check**

**Setting the scale**

3. Click on the '...' next to the 'Scale' field, to open the '**Select Scale**' dialog box.

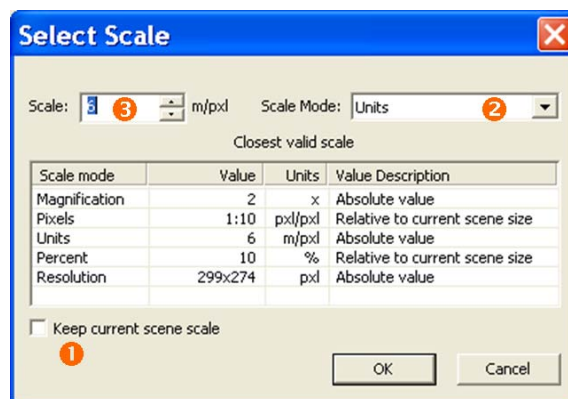


Figure 4: The 'Select Scale' dialog box with settings to create a 6 m/px Map.

The change the scale from 0,6 m/px to 6 m/px,

- '**Keep current scene scales**' ① must be deselected.
  - As 'Scale Mode' '**Unit**' ③ is chosen. Other scale modes are : Magnification, percent and pixel.
  - As '**Scale**' ③ the value 6 is defined.
4. Click on the '**Cancel**' button to close the dialog box.



**Action!**



## 2.1.2 Execute the first Process, display and explore the new created a Map

1. **Execute** the Process.
2. Open a **second viewer**, display in the new created Map and select 'Side by side view'.
3. Display for both Views the Layer '**pan**' only.



**Action!**

The new created Map contains the **panchromatic and near infrared** image layers only and has a lower resolution of **6 m/px**.



**Result  
Check**

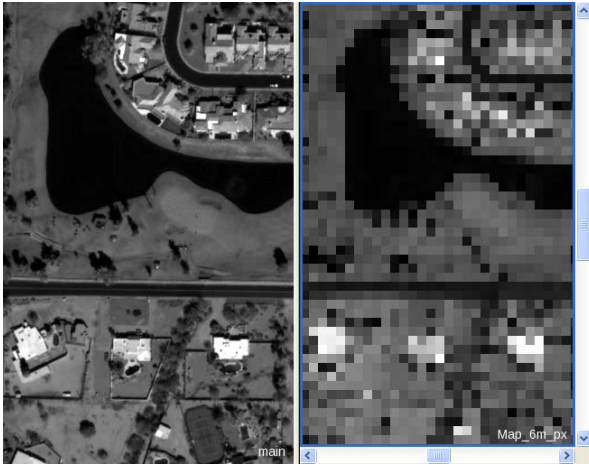


Figure 5: Left: main Map in full resolution; Right: new map with lower resolution 6 m/px.



**Action!**

## 2.2 Classifying the Map

1. Expand the Process section '**Create Objects and classify ROI**'.
  - In Parent Process '**Create Objects and classify ROI**' it is specified, that all subsequent Child Processes are applied only to '**Map\_6m\_px**'.
  - A quadtree **segmentation** is executed.
  - All Objects with mean of '**pan**' **lower than 210** are classified to the class 'Region of interest' (ROI).
  - Those 'Region of interest Objects with **mean of 'nir' of more than 160** are de-classified again.
  - The 'Region of interest' Objects are **merged**
  - The 'Region of interest' Objects with a **smaller area than 30pixel** are de-classified
  - All unclassified are **merged**.
  - All 'Region of interest' Objects are **grown by two pixels**.



**Rule Set Check**

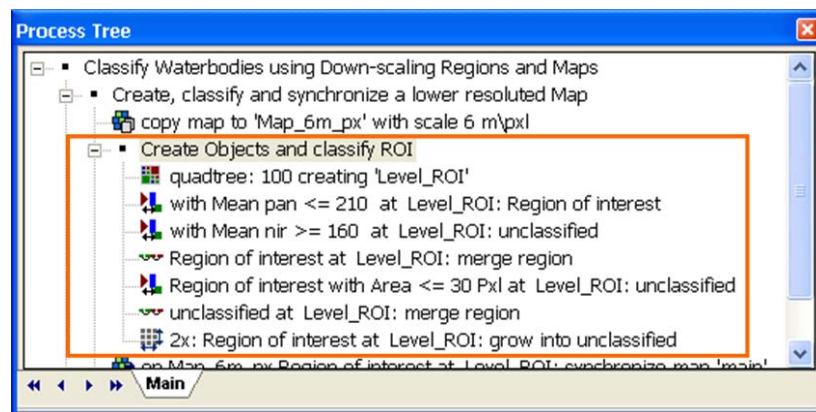


Figure 6: Process Tree with Process sequence highlighted to classify the 'Map\_6m\_px'.



**Action!**

2. Execute the Process sequence '**Create Objects and classify ROI**'.



**Result Check**

All water bodies are classified as "Region of interest", a buffer of two pixels is added to every Object.

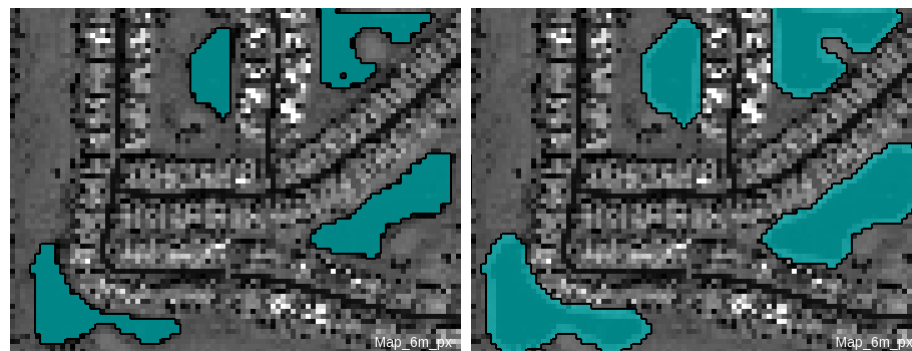


Figure 7: Classification before and after executing the growing Process.

## 2.3 Synchronizing the result back to the main Map

The next step is to copy the result of the classification of 'Map\_6m\_px' to the main Map. This classification will be then the basis for the creation of the Regions and Maps for detail analysis.

1. Collapse the Process section '**Create Objects and classify ROI**'.
2. Double-click on the first Child Process on '**Map\_6m\_px Region of interest at Level\_ROI: synchronize map 'main'**' to open it.

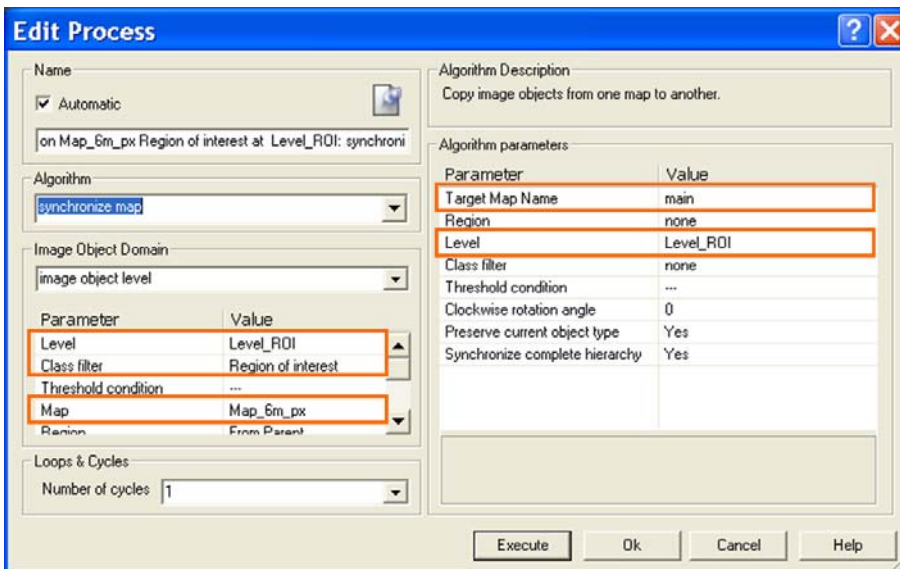


Figure 8: Process settings to synchronize the content of the 'Map\_6m\_px' to the main Map.

- In the **Image Object Domain** it is specified, that only the '**Region of interest objects**' of 'Map\_6m\_px' are copied.
  - In the Algorithm Parameters it is specified that the new created Level in the **main Map** is named '**Level\_ROI**', same as in the Map with lower resolution.
3. **Execute** the Process.

The main Map contains now a 'Level\_ROI' with the 'Region of interest' Objects.

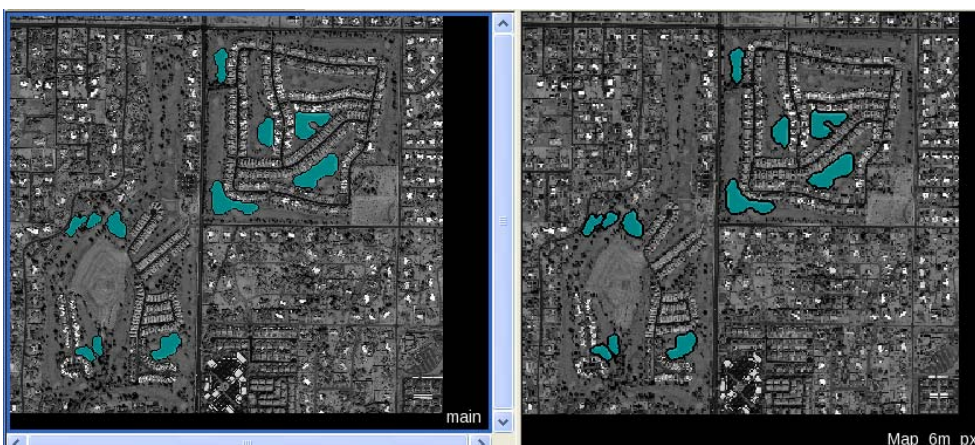


Figure 9: Left: main Map with synchronized content of the 'Map\_6m\_px'; Right: content of 'Map\_6m\_px'.

Information



Action!



Settings Check



Action!



Result Check

## Lesson 3 Detail analysis of water bodies using a detail Map with full resolution

*This Lesson has the following chapters*

- *The overall looping Processes*
- *Picking out one Object and Creating a Region and a Map*

→ *Processing on 'Map Detail' and synchronize*

Information

In this section the 'Region of interest' Objects are **picked** one after the other. From the picked Object a **Region is created** ④ and from this Region **a new Map** ⑤ with full resolution. A detailed **segmentation and classification** ⑥ is then applied to the detail Map only. Additionally a **reshaping** of the Objects is applied to ensure smooth outlines. In a final step the detail Map is **copied back** ⑦ in the main Map and the **procedure continues** with the next Object ④, until all are analyzed in detail.

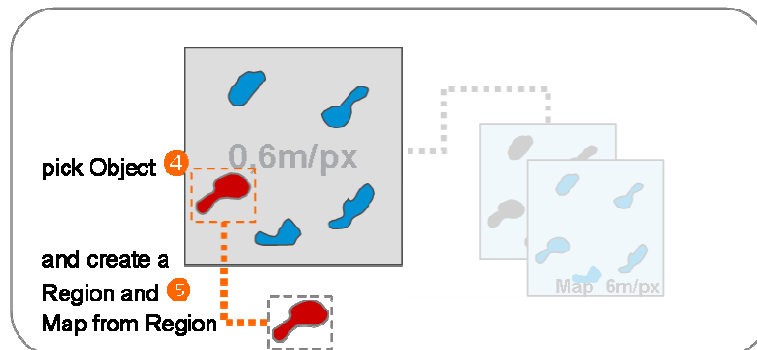


Figure 10: Schematic graph, showing the workflow to pick an Object and create a Region and a Map from it.

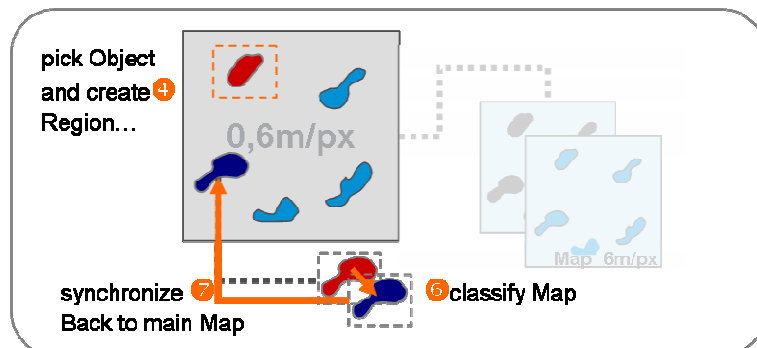


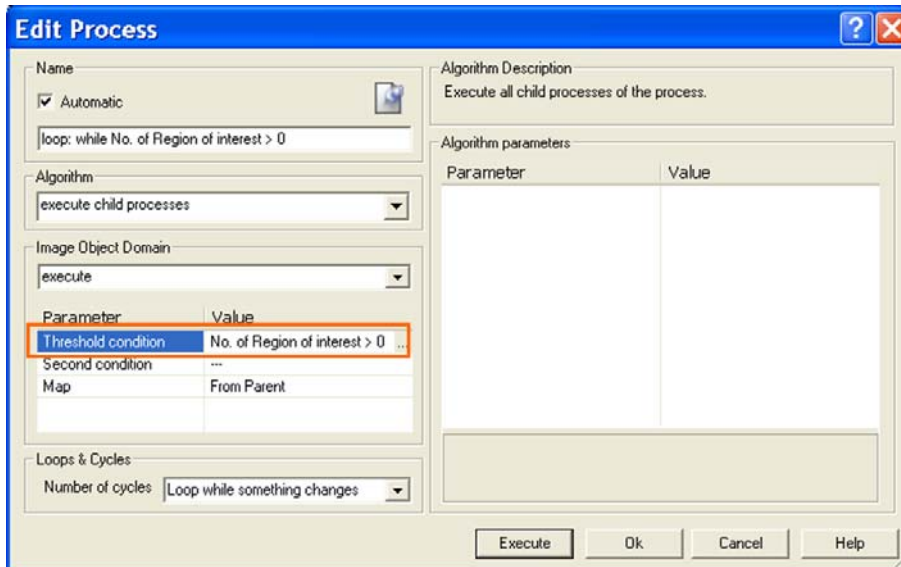
Figure 11: Schematic graph, showing the classification of the new Map and the synchronization.

## 3.1 The overall looping Processes

1. Collapse 'Create, classify and synchronize a lower resolved Map' and expand '**Create, classify and synchronize full resolved Regions**'.
2. Double-click on the first Child Process on '**loop: while No. of Region of interest > 0**' to open it.



**Action!**



**Settings Check**

Figure 12: Process settings to execute the Child Processes, as long as the Threshold condition is fulfilled.

- In the Image Object Domain of the Parent Process a Threshold condition is set. The feature used is a Class-Related Scene feature 'Number of classified objects'. The condition is that **the Number of 'Region of interest' Objects must be more than 0**. This means at least one has to exist, otherwise the Process (and all Child Processes) are not executed.
  - The 'Loops and Cycles' is set to '**Loop while something is changes**'. As long as the Threshold condition is **fulfilled**, the Process will be re-executed. Only if all 'Region of interest' Objects are classified as 'Water' the processing **stops automatically**.
3. Close the 'Edit Process' dialog box by pressing the 'Cancel' button.



**Action!**

**Tip:**

If you **per accident executed** the whole sequence, **delete** the Image Object Level and **re-execute** the synchronization Process 'on Map\_6m\_px Region of interest at Level\_ROI: synchronize map 'main'' in the 'Create, classify and synchronize a lower resoled Map'.

## 3.2 Picking out one Object and Creating a Region and a Map

Information

In this routine one Object is picked out (the one with the minimum in X), a Region is created around this Object and a detailed Map is created from this region.

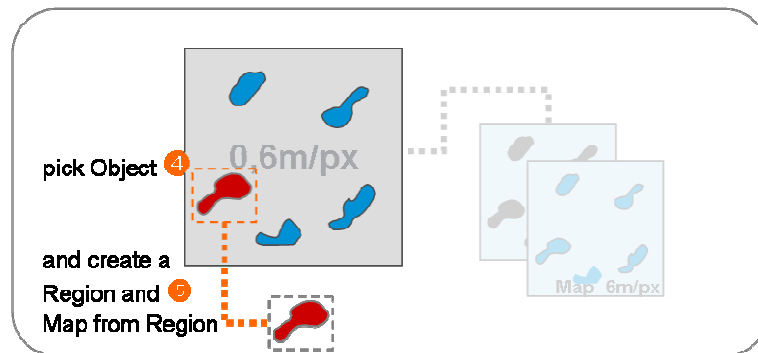


Figure 13: Schematic graph, showing the workflow to pick an Object and create a Region and a Map from it.

### 3.2.1 Picking out one Object

Information

The Objects are picked out **randomly**, the Object with the minimum value for X is classified to a class '\_active'. It is also possible to use other features, e.g. standard deviation or size. But it is important that the Process is not classifying two Objects at once to the '\_active' class.



1. Expand '**loop: while No. of Region of interest > 0**' and expand '**Pick out one 'Region of interest' Object**'.

**Action!**



**Rule Set Check**

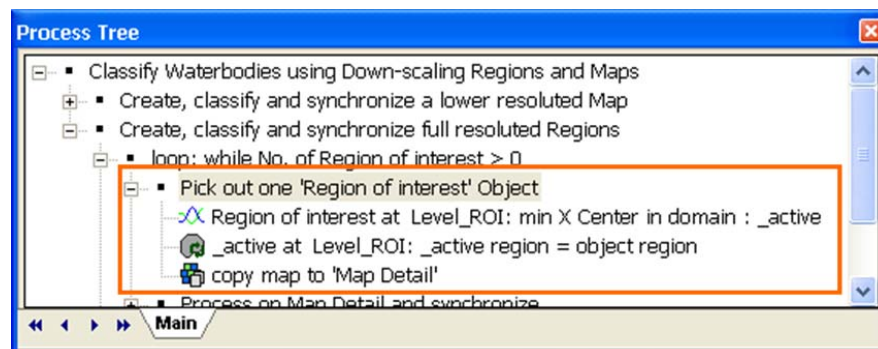


Figure 14: Process Tree with Process sequence highlighted to pick out one 'Regions of interest' Object, create a region from it and to create a Map from this Region.

In the Parent Process 'Pick out one 'Region of interest' Object' the main Map is specified as domain. All Child Processes refer to this setting.

2. Double-click on the first Child Process on '**Region of interest at Level\_ROI: min X Center in domain : \_active**' to open it.
  - The algorithm 'find domain extrema' is used to pick out one Object.
  - In the Image Object Domain it is defined that only the 'Region of interest' Objects are analyzed with the algorithm.

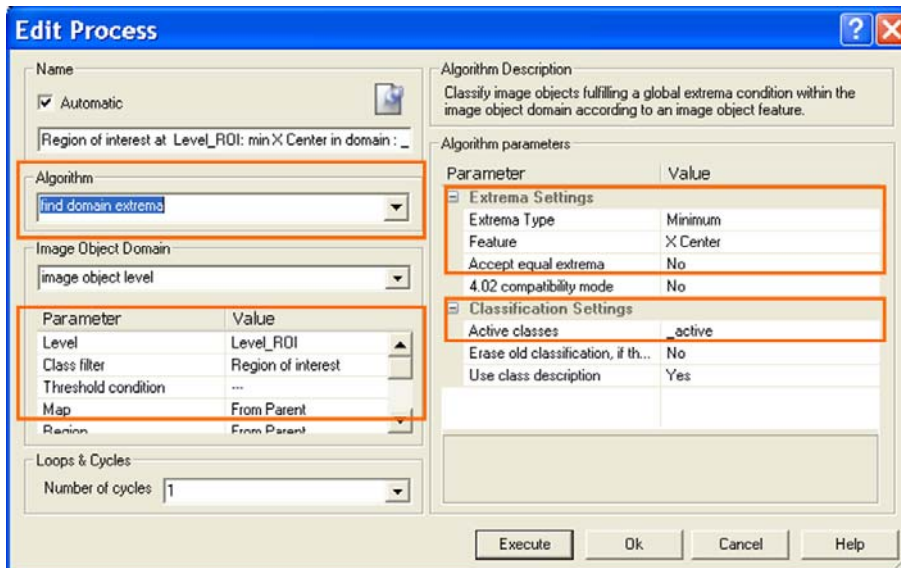
Information



Action!

## Algorithm Parameters

- The '**Extrema Type**' is set to Minimum.
- As feature '**X Center**' is chosen.
- The field '**Accept equal extrema**' is set to 'No'.
- The field '**Active class**' is set to '\_active'. The Object with the minimum X-center will be classified to this class.



Settings Check

Figure 15: Process settings to classify an '\_active' Object.

3. Execute the Process.



Action!

The first 'Region of interest' Object is picked and classified as '\_active'.



Result Check





Figure 16: Main Map with one '.\_active' Object classified.

Information

### 3.2.2 Creating a Region and a Map

The last two Processes of the sequence 'Pick out one 'Region of interest' Object' create a Region from the '.\_active' Object and from the Region a Map.

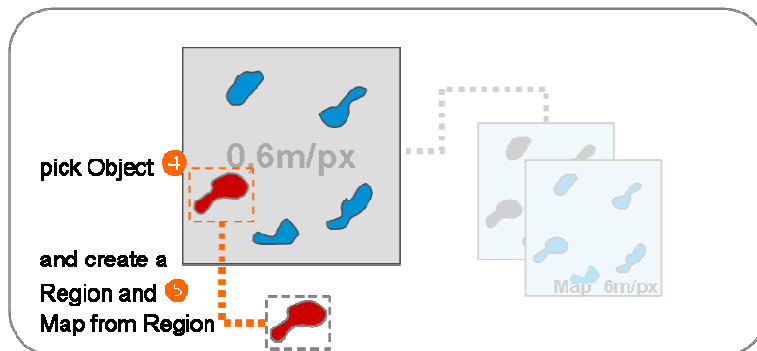


Figure 17: Schematic graph, showing the classification of the new Map and the synchronization.

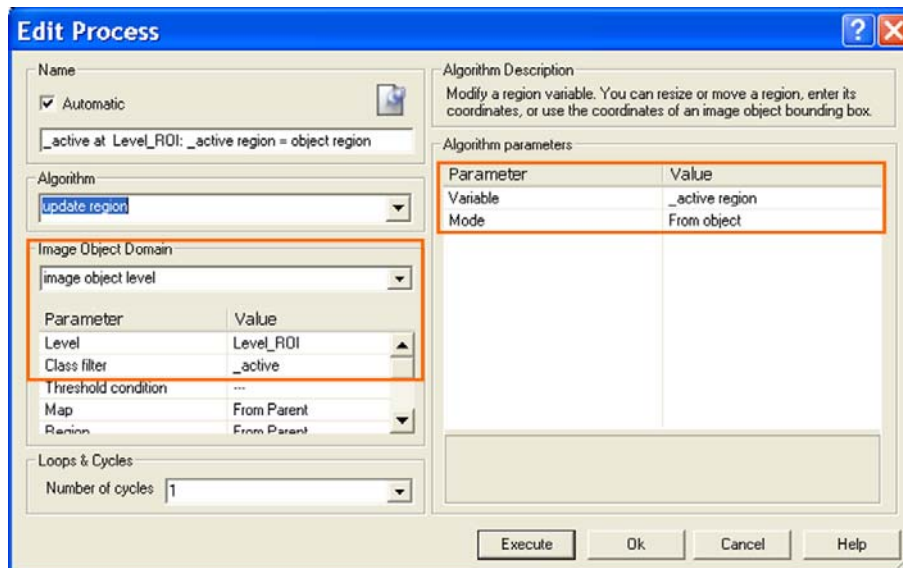


**Action!**

1. Double-click on the second Child Process on '**\_active at Level\_ROI: \_active region = object region**' to open it.



- The Image Object Domain is set to **'image object level'**. It is defined that the source for the Region extend is class **'\_active'** in the 'Level\_ROI'.
- The name of the new Region is defined as **'\_active region'**.
- The 'Mode' is set to **'From object'**. Only if this mode is set, the Image Object Domain can be used.



  
**Settings Check**

Figure 18: Process settings to create a Region **'\_active region'** from the current **'\_active'** Object.

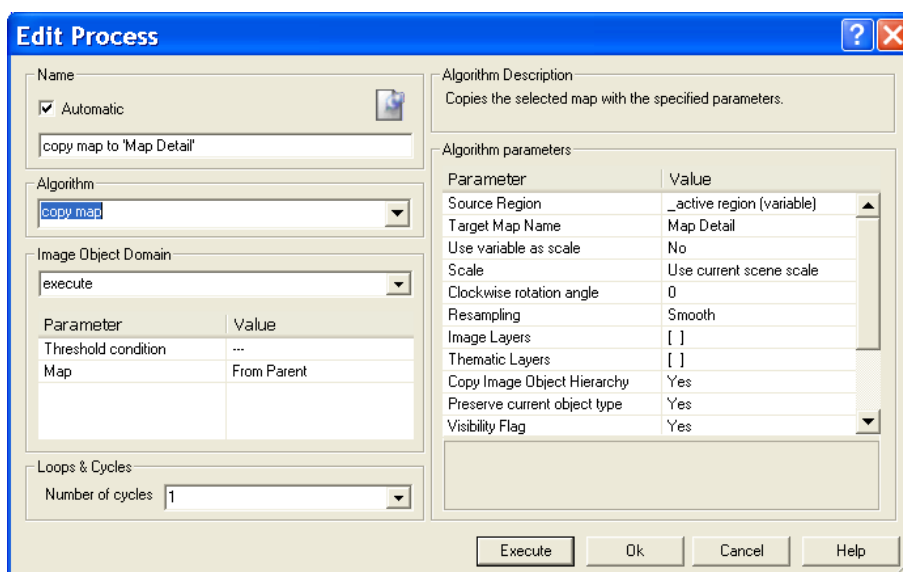
2. **Execute** the Process.
3. Double-click on the next Process on copy map to **'Map Detail'** to open it.



**Action!**

## Algorithm Parameters

- In the field **'Source Region'** it is defined that the **'\_active Region'**, created with the Process before, is the basis for the Map extent.
- All other parameters are set as **default**, all Image Layers are copied in the new Map and also the Image Objects with classification.



  
**Settings Check**

Figure 19: Process settings to create a **'Map Detail'** from the current **'\_active region'**.



**Action!**



**Result Check**

4. **Execute** the Process.
5. Display 'Map Detail' in the Viewer.

From the '\_Active Region' in the main Map a new Map 'Map Detail' is created, containing the Objects and classification from the main Map.

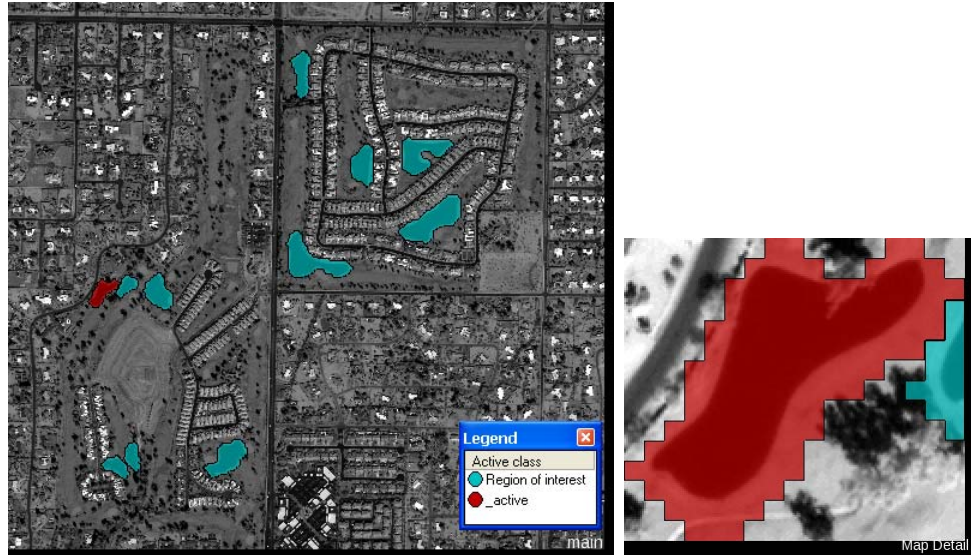


Figure 20: Left: main Map with '\_active' Object classified; Left: New created 'Map Detail'.

### 3.3 Processing on 'Map Detail' and synchronize

Information

In the sequence '**Process on Map Detail and synchronize**' the classification **6** on the 'Map Detail' is defined, as well as the synchronization **7** back to the main Map.

After this sequence is executed, the remaining '\_active' Objects in the main Map are de-classified and the processing starts again with picking **4** the next 'Region of interest' in the main Map.

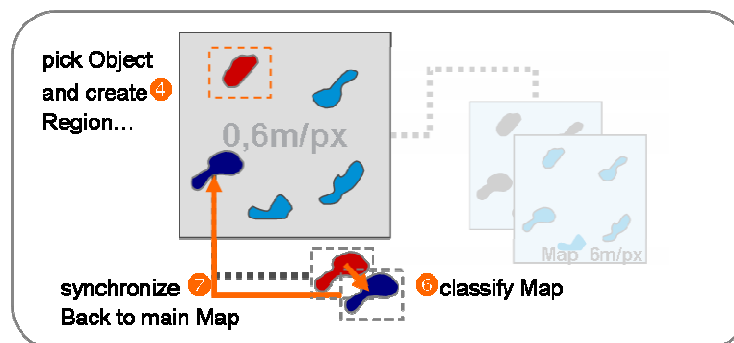
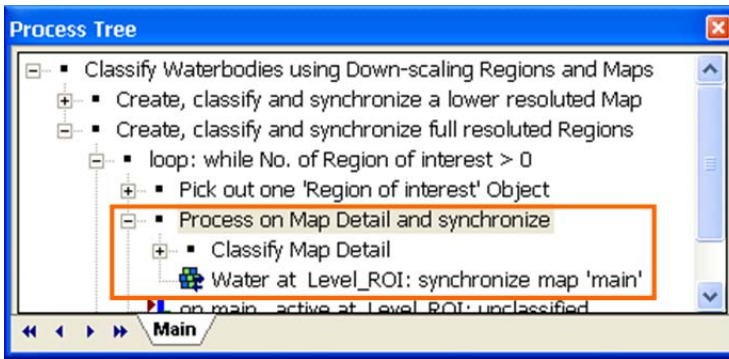


Figure 21: Schematic Graph showing the classification of the 'Map Detail' and it's synchronization to the main Map.



**Rule Set Check**

Figure 22: Process Tree with Process sequence highlighted to classify and synchronize the current 'Map Detail'.

### 3.3.1 Classifying 'Map Detail'

In this section, the content of the water body in the current Map Detail is classified.

1. Collapse 'Pick out one 'Region of interest' Object'.
2. Expand '**Process on Map Detail and synchronize**' and expand '**Classify Map Detail**'.

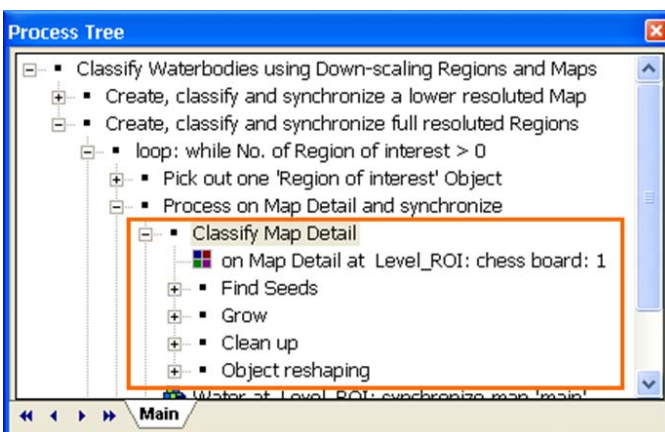
Information



**Action!**

The Process sequence '**Classify Map Detail**' has 5 sections:

- The Map is split up to pixel-sized Objects using **chessboard segmentation**.
- In the section '**Find Seeds**', first 'Water' Objects are classified by measuring and classifying the darkest values for the panchromatic layer.
- In the section '**Grow**', the first 'Water' Objects are grown by spectrally similar neighbors.
- In the section '**Clean up**', holes are filled and too small 'Water' Objects are declassified.
- In the section '**Object reshaping**' growing and shrinking Processes are applied to get smooth outlines for the 'Water' Object



**Rule Set Check**

Figure 23: Process Tree with Process sequence highlighted to classify the current 'Map Detail'.

3. Execute '**Classify Map Detail**'.



**Action!**



**Result Check**

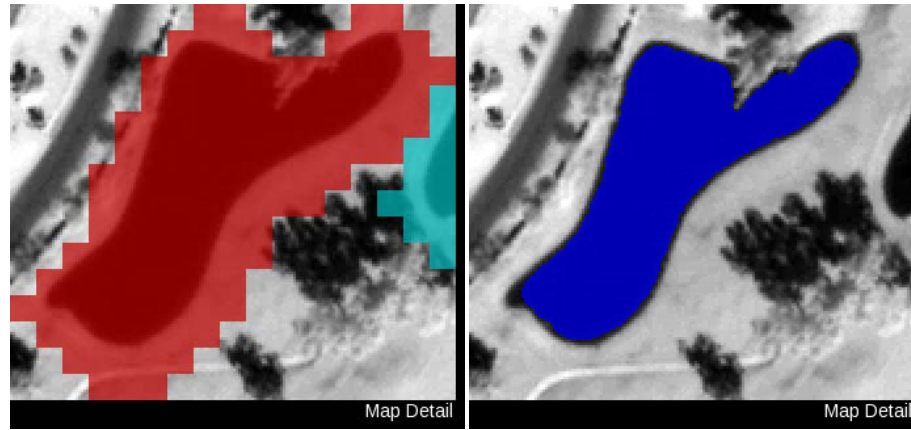


Figure 24: 'Map Detail' before and after classification.

### 3.3.2 Synchronize the result back to main Map

Information



**Action!**



**Rule Set Check**

The last Process in the 'Process on Map Detail and synchronize' section of the Rule Set is the synchronization of the 'Map Detail' with the main Map.

1. Collapse 'Classify Map Detail'.
2. Double-click on the Process '**Water at Level\_ROI: synchronize map 'main'**' to open it.

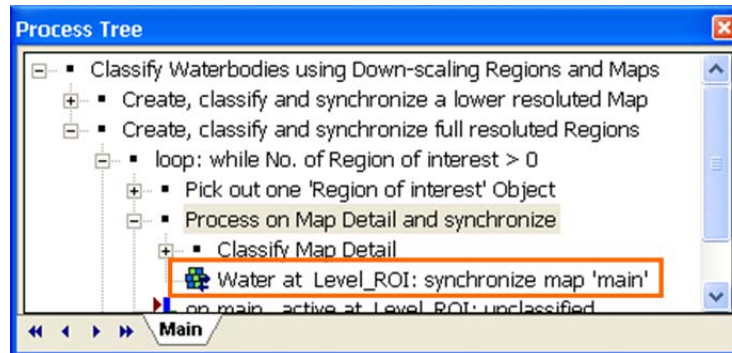


Figure 25: Process Tree with Process highlighted to synchronize the 'Water' Objects of 'Map Detail' to the main Map.



**Settings Check**

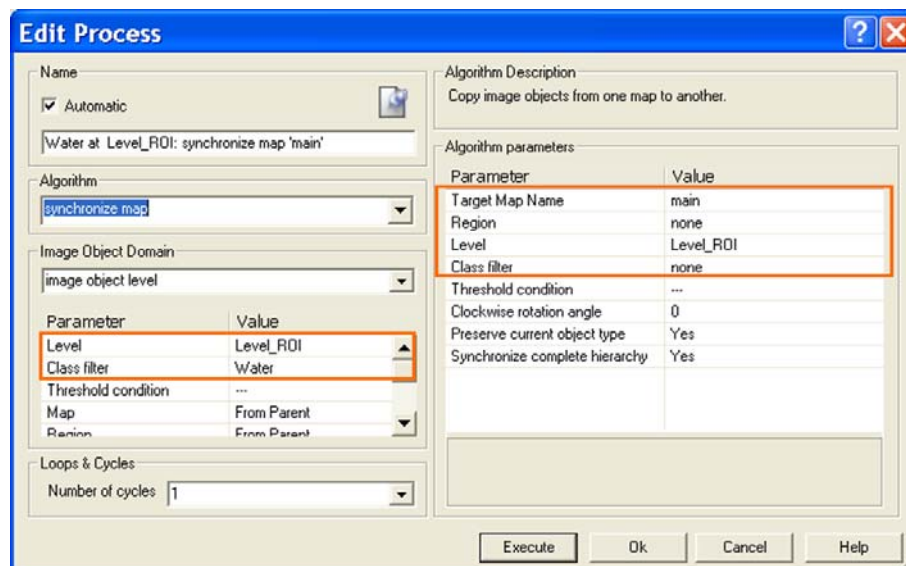


Figure 26: Process settings to synchronize the 'Map Detail' with the main Map.

- In the Image Object Domain it is specified, that the '**Water**' Objects are the Objects to be synchronized.
  - In the Algorithm Parameters it is specified, that **main Map** is the target of synchronization and the Objects shall be synchronized in 'Level\_ROI'.
3. **Execute** the Process.
  4. Open a **second Viewer** and display in one Viewer the 'Detail Map' in the other the main Map. **Zoom** to the synchronized 'Water' Object.



**Action!**

The classification of the 'Water' Object in the 'Map Detail' as been copied in the main Map.



**Result Check**

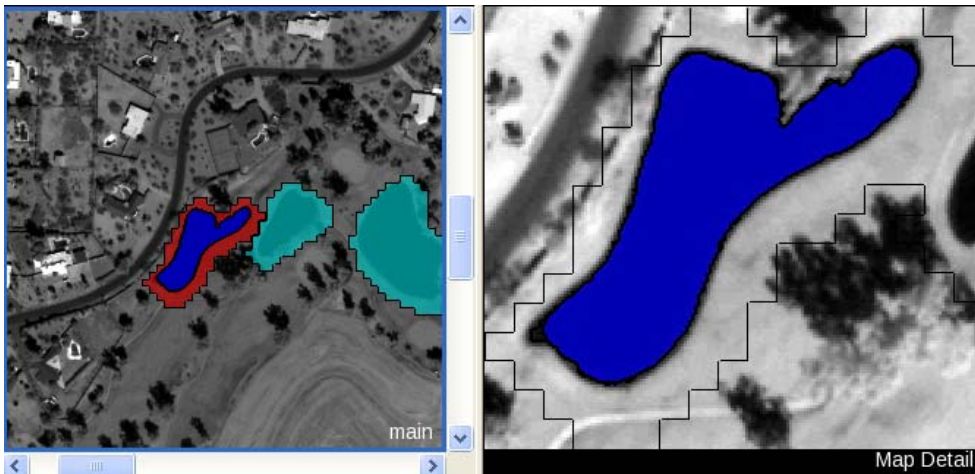


Figure 27: Left: the 'Water' Object is synchronized in the main Map; Right: 'Map Detail' with 'Water' classified.



# Lesson 4 The complete classification

*This Lesson has the following chapters*

- Prepare next looping sequence
- Execute the complete sequence step by step
- Execute the sequence with 'looping' on

Information

## 4.1 Prepare next looping sequence

To have everything cleaned up, the currently existing '\_active' Objects have to be de-classified. Then the next 'Region of interest' Object can be classified as '\_active' and analyzed in detail.



**Rule Set Check**

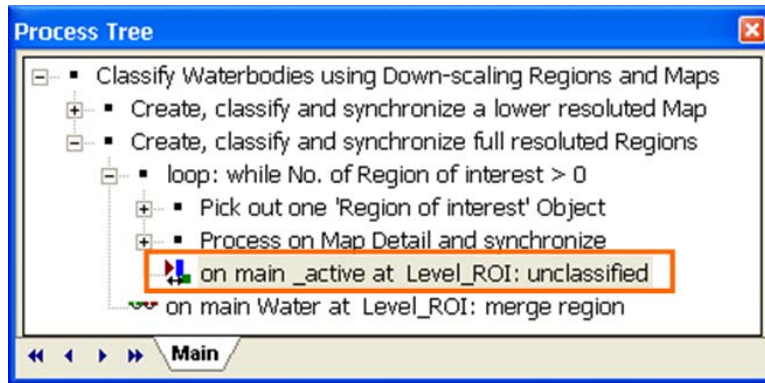


Figure 28: Process Tree with Process highlighted to de-classify the remaining '\_active' Objects in the main Map.



**Action!**

1. Collapse 'Process on Map Detail and synchronize'.
2. Select '**on main \_active at Level\_ROI: unclassified**' and **execute** the Process.



**Result Check**

The remaining '\_active' Objects are de-classified.

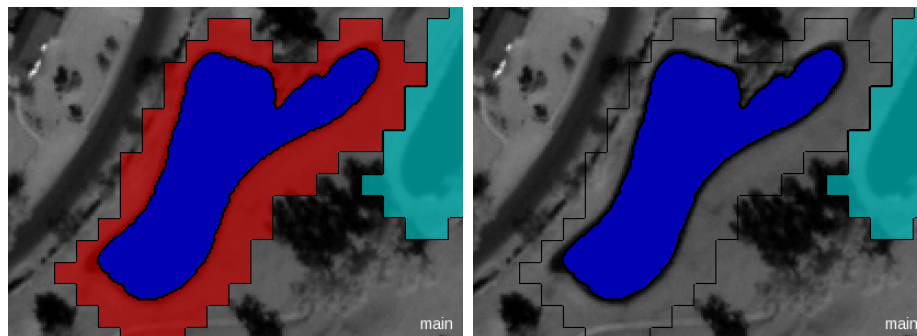


Figure 29: Before and after executing the de-classification of the remaining '\_active' Objects.

## 4.2 Execute the complete sequence step by step

1. Double-click on the Process '**loop: while No. of Region of interest > 0 'main'**' to open it.
2. In the field 'Number of cycles' insert 1.
3. Confirm the change with 'OK' button.
4. Execute the sequence '**if No. of Region of interest > 0**' several times.

After each execution another 'Map Detail' is classified and another 'Water' Object is synchronized in the main Map.

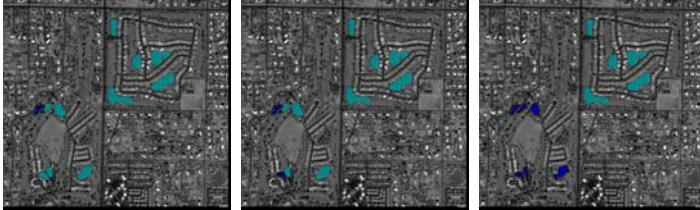


Figure 30: Stepwise one 'Region of interest' Object after the other is classified.



**Action!**



**Result  
Check**

## 4.3 Execute the sequence with 'looping' on

1. Double-click on the Process '**if No. of Region of interest > 0**' to open it.
2. In the field 'Number of cycles' choose '**Loop while something is changing**'.
3. Confirm the change with 'OK' button.
4. Execute the sequence '**loop: while No. of Region of interest > 0 'main'**'.

All 'Region of interest' Objects are analyzed in a 'Detail Map' and synchronized back in the main Map.



**Action!**

The complete classification



**Result  
Check**

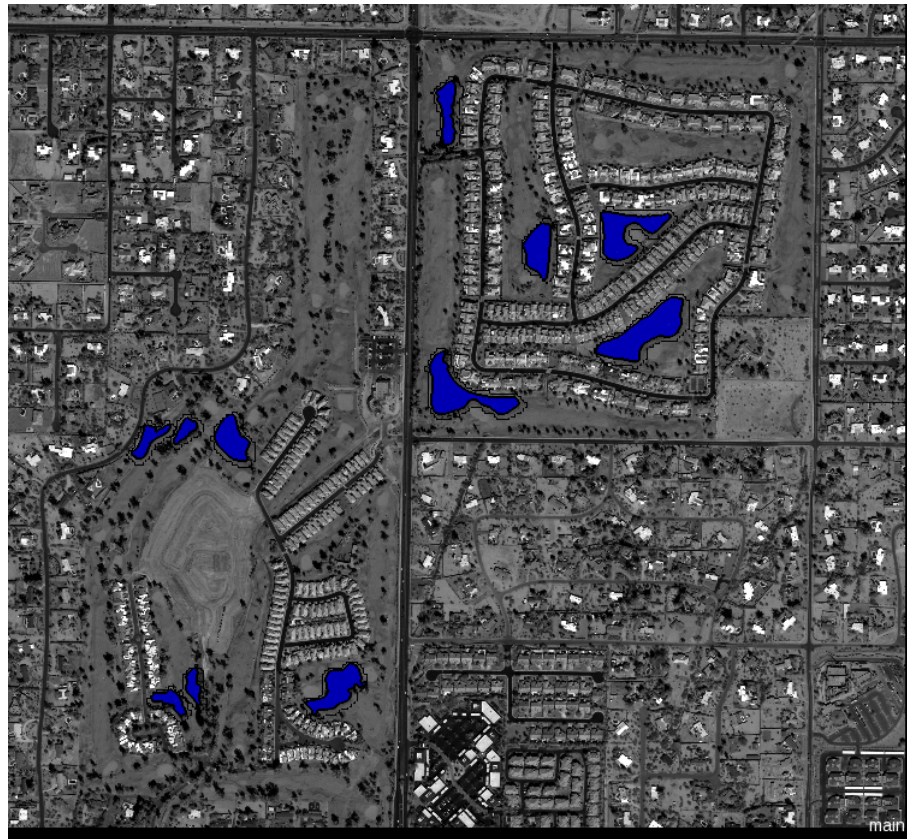


Figure 31: Classification of the main Map after executing the complete sequence with 'looping'.