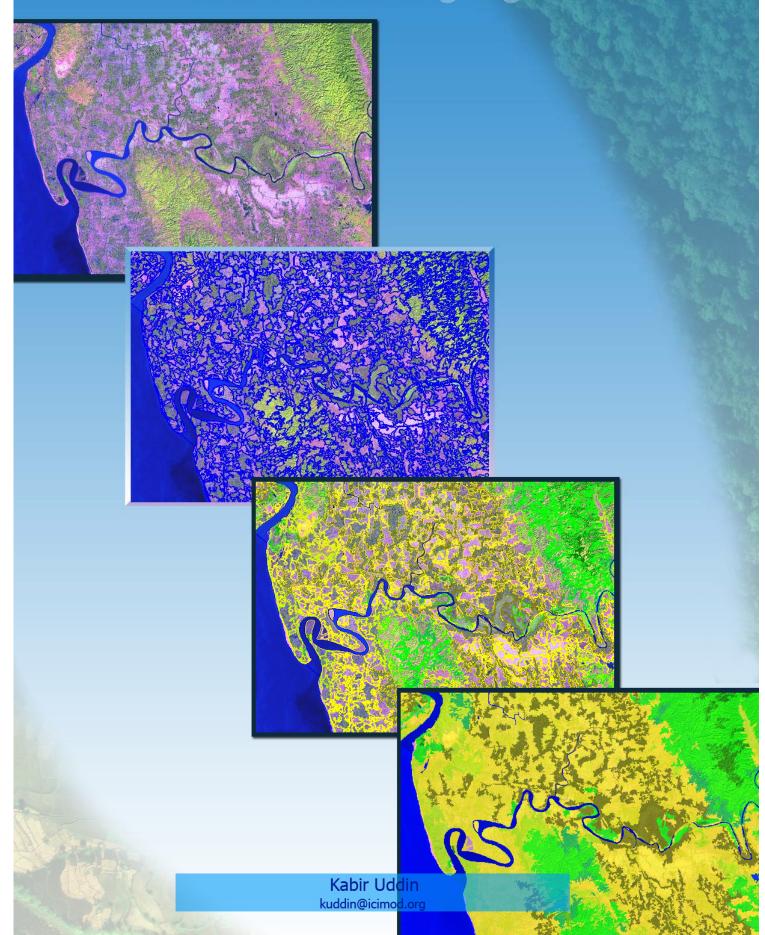
## Image Classification



# Hands on exercise using eCognition

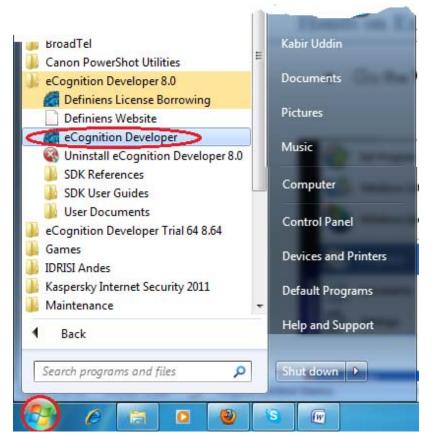


#### Hands on Exercise Using eCognition Developer

#### 2

## Hands on Exercise Using eCognition Developer

• Go the Windows Start menu and Click Start > All Programs> eCognition Developer 8.0> eCognition Developer



Upon launching Definiens eCognition Developer 8, the following dialog appears:



Figure: eCognition 8 launch screen

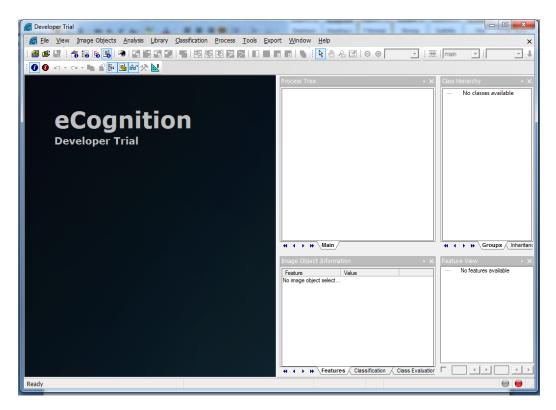
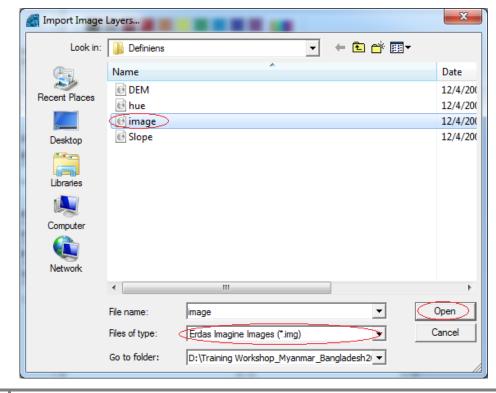


Figure : The default display eCognition 8

- 1. Create a New Project
- To Create New Project do the following:
  - Choose File > New Project on the main menu bar.



- Navigate the folder C:\GISRS\_Trn\Definiens
- Select Image.img > Open (Here is image file Landsat ETM+, R136/P44)
- Then select from the **appropriate file** in the files type.

To open some specific file formats or structures, you have to proceed as follows:

• First select the correct driver in the **Files of type** drop-down list box

• Double-Click on Image Layer Alias Rename the all layers name

- Click> OK
- Click> Insert > Select DEM.img and Slope> Open



M	odify Project		? <mark>×</mark>
I	mage Layers Them	atic Layers Metadata Maps	
	Project Name test		
	Map main	•	Subset Selection
	Coordinate System Resolution (Meters) Pixel Size Project Size Geocoding (Lower Le Geocoding (Upper Rig		Clear Subset Resolution (m/pxl) 28.5 Use geocoding Pixel size (unit) 28.5 Meters
/		e Location Training Workshop Myanmar Bangladesh2009\GISRS Tm\ ayer Properties	▲ <u>Insert</u> ▼ Remo <u>v</u> e Edit
	Layer 4 (Near IR) D Layer 5 (Mid-IR) D Layer 7 (Mid-IR) D Layer 8 (DEM) D:	Loyer Alias	<u>N</u> o Data ■ Enforce fitting
	Laver 8 (Slope) D:V	Geocoding Lower left≾ 389281.5	
	٠ III	Lower left Y 2286213	
	Thematic Layer Alias	Pixel <u>s</u> ize 28.5 . <u>G</u> eocoding 🗹	≜ Inser <u>t</u>
		Multidimensional Map Parameters	<u> </u>
		Number of slices     1     Calc       Slice distance     1	<u> </u>
	Metadata Name	Slice start 0	▲ Inser <u>t</u>
		Number of frames 1 Calc	▼ R <u>e</u> move
		Frame distance	<u>E</u> dit
		Frame start 0	Preview
		<u> </u>	C <u>a</u> ncel

• Double-Click on Layer Alias Rename the all the layers name Layer 1 (Blue), Layer 2 (Green), Layer 3 (Red), Layer 4 (Near IR), Layer 5 (Mid-IR), Layer 7 (Mid-IR), Layer 8 (DEM), Layer 8 (Slope)

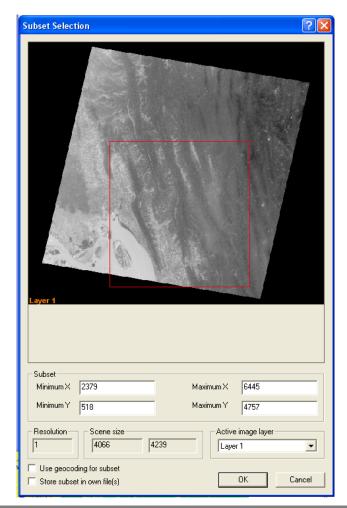
• Click > File> Save Project > Test.dpr

#### 1.1 Subset Selection

Normally, image files are large in size and difficult to process. So we will be working with a smaller area to manage easily, which will take less memory and time. You can crop your image on the fly in the viewer by using Subset option without changing your original image file. You can create a "subset selection" when you start a project or during modification.

#### To open the Subset Selection dialog box, do the following:

- After importing image layers press the **Subset Selection** button.
  - Click on the image and Drag to select a subset area in the image viewer.
  - Alternatively, you may enter the subset coordinates. You can modify the coordinates by typing.



- Confirm with **OK** to return to the superordinate dialog box.
- You can clear the subset selection by **Clicking Clear Subset** in the superordinate dialog box.

#### 1.2 Insert Thematic Layer

Geographic representations are organized in a series of data themes, which are known as thematic layers. During the image classification with eCognition, you can insert shape file as a thematic layer and you can also use it in the process of image classification (if required).

During the new project creating or modifying time, Shape files or other vector files can be inserted to viewer. To insert a thematic layer, do the followings:

- Click the Insert button
- Choose *Thematic Layers > Insert* on the menu bar of the dialog box.
- **Right-Click** inside the thematic layer list and choose **Insert** from the context menu.

The Import Thematic Layer dialog box opens, which is similar to the Import Image Layers dialog box.

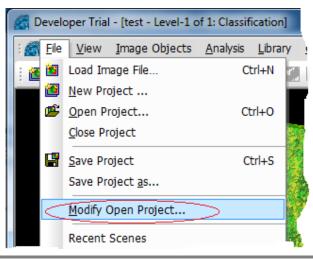
#### 1.2.1 Modify a Project

Using Modify a Project you can add/remove more image or thematic layer or you can rename project. Modify a selected project by exchanging or renaming image layers or through other operations.

#### To modify a project, do the following

Open a project and choose File > Modify Open Project on the main menu bar.

• The Modify Project dialog box opens.



- Modify the necessary things
- Click OK to modify the project
- Save a Project

Save the currently open project to a project file (extension .dpr).

To save a project, do the following:

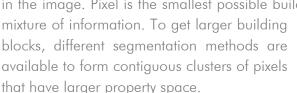
• Choose File > Save Project on the main menu bar.

• Choose File > Save Project As... on the main menu bar. The Save Project dialog box opens. Select a folder and enter a name for the project file (.*dpr*). Click the Save button to store the file.

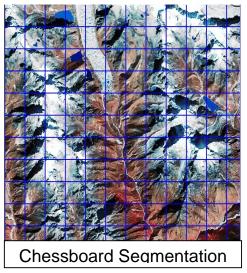
#### 2. Image Objects by Segmentation

The fundamental step of any **eCognition** image analysis is to do segmentation of a scene— representing an image—into image object primitives. Thus, initial segmentation is the subdivision of an image into separated regions represented by basic unclassified image objects called image object primitives.

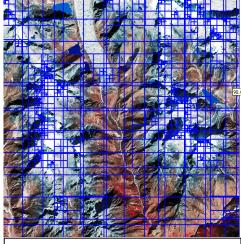
For successful and accurate image analysis, defining object primitives of suitable size and shape is of utmost importance. As a rule of thumb, good object primitives are as large as possible, yet small enough to be used as building blocks for the objects to be detected



Commonly, in image processing, segmentation is the subdivision of a digital image into smaller partitions according to given criteria. Different to this, within the **eCognition** technology, each operation that creates new image objects is called segmentation, no matter if the change is achieved by subdividing or by merging existing objects. Different segmentation



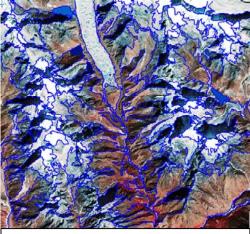
in the image. Pixel is the smallest possible building block of an image, however it has



**Quad Tree Based Segmentations** 

algorithms provide several methods of creating of image object primitives.

The new image objects created bv segmentation are stored in a new image object level. Each image object is defined by a contiguous set of pixels, where each pixel belongs to exactly one image object. Each of the subsequent image object related operations like classification, re-segmentation, reshaping, and information extraction is done within an image object level. Simply said, image object levels serve as internal working areas of the image analysis.



Multiresolution Segmentations

## 1.3 Classification of Land Cover Using Landsat ETM+ Image

Image Classification is a process of sorting pixels into a number of data categories based on their data file values and reducing images to information classes. Similar features will have similar spectral responses. The spectral response of a feature is unique with respect to all other features of interest. If we quantify the spectral response of a known feature in an image, we can use this information to find all occurrences of that feature throughout the image.

#### 1.3.1 Display the Image or Edit the Image Layer Mixing

**Display the Image** or **Edit the Image Layer Mixing** is one kind of band combination process. Often an image contains valuable information about vegetation or land features that is not easily visible until viewed in the right way. For this reason, in eCognition, you have to use **Display the Image** or **Edit the Image Layer Mixing**. The most fundamental of these techniques is to change the arrangement of the bands of light used to make the image display. In order to *display an image* in eCognition, assigns one or RGB color to each of up to three bands of reflected visible or non-visible light.

You have the possibility to change the display of the loaded data using the 'Edit Layer Mixing' dialog box. This enables you to display the individual channels of a combination.

- To open the 'Edit Image Layer Mixing', do one of the following:
- From the View menu, select Image Layer Mixing



9

• Click View > Image Layer Mixing on the main menu bar.

Or Click on the Edit Image Layer Mixing button in the View Settings toolbar.

Edit Image Layer Mixing	?		x	J
Image Layer	R	G	ß	
Layer 1 (Blue)	1		$\overline{}$	
Layer 2 (Green)	1		0	
Layer 3 (Red)		0		
Layer 4 (Near IR)	0			
Layer 5 (Mid-IR)				
Layer 7 (Mid-IR)	$\backslash$		_/	
Layer 8 (DEM)	$\setminus$		7	
Layer 9 (Slope)	$\sim$			
Equalizing Linear (1.00%)  Parameter		nift	<b>~</b>	
<ul> <li>✓ Auto update</li> <li>✓ No layer weights</li> </ul>	<u>C</u> a	ance	I	

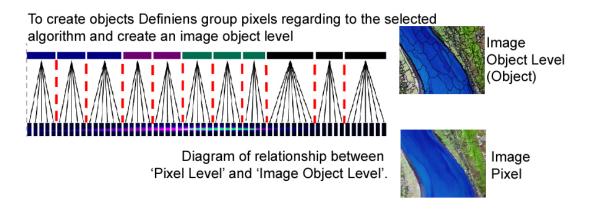
Figure: **Edit Image Layer Mixing** dialog box. Changing the layer mixing and equalizing options affects the display of the image only

Choose a layer mixing preset:

- (Clear): All assignments and weighting are removed from the Image Layer table
- One Layer Gray displays one image layer in grayscale mode with the red, green and blue together
- False Color (Hot Metal) is recommended for single image layers with large intensity ranges to display in a color range from black over red to white. Use this preset for image data created with positron emission tomography (PET)
- False Color (Rainbow) is recommended for single image layers to display a visualization in rainbow colors. Here, the regular color range is converted to a color range between blue for darker pixel intensity values and red for brighter pixel intensity values
- Three Layer Mix displays layer one in the red channel, layer two in green and layer three in blue
- Six Layer Mix displays additional layers.
- For current exercise change the band combinations (B7, B2, and B1) and Equalizing Histrogram any others
- Click> OK

## 1.4 Create Image Objects

The fundamental step of any eCognition image analysis is a segmentation of a scene—representing an image—into image objects. Thus, initial segmentation is the subdivision of an image into separated regions represented by basic unclassified image objects called 'Image Object Primitives'.



#### 1.5 View Settings Toolbar



The View Settings Toolbar buttons, numbered from one to four, allow you to switch between the four window layouts. These are Load and Manage Data, Configure Analysis, Review Results and Develop Rule Sets. As much of the User Guide centers around writing rule sets – which organize and modify image analysis algorithms – the view activated by button number four, Develop Rule Sets, is most commonly used

In the 'View Settings' toolbar there are **4 predefined View Setting**s available, specific to the different phases of a Rule Set development workflow.

View Settings toolbar with the 4 predefined View Setting buttons: Load and Manage Data, Configure Analysis, Review Results, Develop Rule Sets.

Select the predefined View Setting number 4 '**Develop Rulesets**' from the 'View Settings' toolbar.

For the 'Develop Rulesets' view, per default one viewer window for the image data is open, as well as the '**Process Tree**' and the '**Image Object Information**' window, the '**Feature View**' and the '**Class Hierarchy** 

#### 1.6 Insert Rule for Object Creation

This is the first step of image classification in eCognition. This is a kind of assigning condition/s. Based on this, it will create image objects or segments. Within the rule sets, you can use variables in different ways. While developing rule sets, you commonly use scene and object variables for storing your dedicated fine-tuning tools for reuse within similar projects.

#### 1.6.1 Insert a Process

#### 1.6.1.1 Insert a Parent Process

A **parent process** is used for grouping child processes together in a hierarchy level. The **typical algorithm** of the parent process is "*Execute child process*".

• To open the Process Tree window Click Process > Process Tree



• Go to the **Process Tree** window, which might be empty since you did not put any process yet.

#### 1.6.1.2 Insert a Segmentation Parent Process



• **Right-Click** in the '**Process Tree**' window and select '**Append New'** from the context menu.

Edit Process	
Name Automatic	
Segmentation	
Algorithm	

New Dialog box (Edit Process) will be appeared.

In the 'Name' field enter the name 'Segmentation' and confirm with 'OK'. It will be your Parents of Segmentation.



#### 1.6.1.2.1 Insert a Child Process (Multiresolution Segmentation)

The **child processes algorithm** in conjunction with the **no image object domain** to structure to your process tree. A process with this setting serves as a container for a sequence of function related processes.

The first crucial decision you have to make is which algorithm to be used for creating objects. The initial objects you create will be the basis for all further analysis. **Multiresolution Segmentation** creates groups of areas of similar pixel values into objects. Consequently, homogeneous areas result in larger objects, heterogeneous areas in smaller ones.

# • Select the inserted **Segmentation Process** and **Right-Click** on it. Choose '*Insert Child*' form the context menu.

Segmentati	<u>E</u> dit	Ctrl+En
	E <u>x</u> ecute	
	Execute on Select	ed <u>O</u> bject
	Append <u>N</u> ew	
	Insert Child	Ctr
it Process		
Name		A
Automatic		
Automatic		
Automatic	processes	
Automatic     for all Algorithm		
Automatic     for all     Algorithm     execute child     segmentation	processes	
Automatic     for all     Algorithm     execute child     segmentation     chessboard so	processes egmentation	
Automatic     for all     Algorithm     execute child     segmentation     chessboard ss     quadtree base	processes egmentation ed segmentation	
Automatic for all Algorithm execute child Segmentation chessboard so guadree base contrast splits	processes egmentation ed segmentation	

- Click Algorithm > Select Multiresolution Segmentations
  - Give the **level** name (Level-1)

<u>N</u> ame		Algorithm Description			
Automatic     Automatic     Automatic     S2 [shape:0.0 compct.:0.5] creating 'Level-1'			Apply an optimization procedure which locally minimizes the average heterogeneity of image objects for a given resolution. Algorithm parameters		
		Algorithm parameters			
Algorithm		Parameter	Value		
multiresolution segmenta	tion	E Level Settings			
		Level Name	Level-1		
Image Object Domain —		Level Usage	Use current (merge only)		
pixel level		Segmentation Setting	Segmentation Settings		
I		Image Layer weights	1, 1, 1, 1, 1, 1, 0, 0, 0		
Parameter	Value	Thematic Layer usag	je		
Мар	From Parent	Scale parameter	(32)		
Threshold condition		Composition of ho	omogeneity criterion		
		Shape	0.01		
		Compactness	0.5		
Loops & Cycles					
✓ Loop while something	g changes only				
Number of cycles 1					

- Change the image layer weights
- Change the scale parameter and etc.
- Click > OK

#### Which layers to be used for creating Objects?

The basis of creating image objects is the input-data. According to the data and the algorithm you use, objects results in different shapes. The first thing you have to evaluate, which layers contain the important information. For example, we have two types of image data, the Image and the DEM. In most Segmentation algorithms you can choose whether you want to use all data available or only specific layer. It depends on where the important information is contained. In our case, we want to use VIS and NIR band for image object creation.

#### Which Scale Parameter to be set?

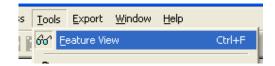
The 'Scale parameter' is an abstract term. It is the restricting parameter to stop the objects from getting too heterogenity. For the 'Scale parameter' there is no definite rule, you have to use trial and error to find out which 'Scale parameter' results in the objects is useful for your further classification.

Process Tree	- × Class Hi		
Segmentation     Segmentation			
	<u>E</u> dit		
0.003 at Level-1: unclassified	Execute		
	Execute on Selected Object		

• **Right-Click** one the process and select execute to execute the **Multiresolution Segmentation** process.

#### 1.7 Create Relational Feature

• To open the Relational Feature window, Click Tools> Feature View



Feature View will be appeared.

• Double-Click on Create new 'Arithmetic Feature', Edit Customize Feature will be appeared

• Assign the name > NDVI

Feature View ✓ > □··· ● Object features □··· ● Customized ···· ● Create new 'Arithmetic Feature' • Create new 'Relational Feature' Feature

The Normalized Difference Vegetation Index (NDVI) is a simple numerical indicator that can be used to analyze remote sensing measurements. NDVI is related to vegetation, where healthy vegetation reflects very well in the near infrared part of the spectrum. Index values can range from -1.0 to 1.0, but vegetation values typically range between 0.1 and 0.7.

Free standing water (ocean, sea, lake, river, etc.) gives a rather low reflectance in both spectral bands and thus result in very low positive or even slightly negative NDVI values.

Soils which generally exhibit a near-infrared spectral reflectance somewhat larger than the red, and thus tend to also generate rather small positive NDVI values (say 0.1 to 0.2).

NDVI = (NIR - red) / (NIR + red)

```
NDVI (ETM+) = (Band 4 - Band 3) / (Band 4 + Band 3)
```

- Double-Click on Layer Values and then Mean Layer appear
- Double-Click on Landsat ETM+ band and complete the formula for NDVI

For NDVI = ([Mean Layer 4 (Near IR)]-[Mean Layer 3 (Red)])/([Mean Layer 4 (Near IR)]+[Mean Layer 3 (Red)])

• Click > OK

Edit Customized Feature	? <mark>- x -</mark>
Arithmetic	
Feature name	Insert Text 💌
✓ Do not use units	Calculation Unit: No Unit
([Mean Layer 4 (Near IR)]-[Mean Layer 3 (Red)])/([M	lean Layer 4 (Near IR)]+[Mean Layer 3 (Red)])
Calculate     Del       Image: Constraint of the second sec	Mean Create new 'Mean' Brightness Layer 1 (Blue) Layer 2 (Green) Layer 3 (Red) Layer 3 (Red) Layer 5 (Mid-IR) Layer 7 (Mid-IR) Layer 8 (DEM) Layer 8 (Slope) Layer 9 (Slope) Max. diff. Image: Standard deviation
<automatic></automatic>	Edit
ОК	Cancel Apply Help

#### Land & Water Mask (LWM)

Land and Water Mask index is a very useful tool to differentiate between land and water. This is very important variable to classify all type of waterbodies. Index values can range from 0 to 255, but water values typically range between 0 and 50.

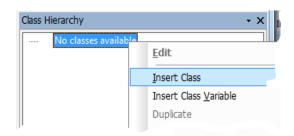
#### Water Mask = (MIR) / (Green) \* 100

• Assign the Feature name > Land & Water Mask

Land & Water Mask (LWM) = [Mean Layer 5 (Mid-IR)]/([Mean Layer 2 (Green)])\*100

• Click > OK

#### 1.8 Insert the Class/Class Hierarchy



New Dialog box will be appear

• On the **Class Hierarchy Right-Click** and Choose '*Insert Class*' form the context menu and **Class description** dialog Box will be appeared,

• On the Class description, give the class name Deep To Medium Deep Perennial Natural Waterbodies and Click > OK

Class Description	? ×
Name I o Medium Deep Perennial Natural Waterbo	dies Always
Parent class for display Deep To Medium Deep Perennial Nal ▼	Modifiers <u>Shared</u> <u>Abstract</u> Inactive <u>Use parent class color</u>
All Contained No. Inherited	
	<u> </u>

1.9 Insert a Classification Parent Process

• **Right-Click** in the '**Process Tree'** window and select '**Append New'** from the context menu.

Proces	is Tree	🗸 🗙 Class
	Edit	Ctrl+Enter
	Execute	F5
	Execute on Selected Object	
	Append New	
	Insert Child	Ctrl+I
	⊆opy	
	Paste	

New Dialog box will be appeared.

In the 'Name' field enter the name 'Classification' and confirm with 'OK'. It will be your parents of Classification

Edit Process	
Name	
Classification	

• Select the inserted **Classification Process** and **Right-Click** on it. Choose '*Insert* **Child'** form the context menu.

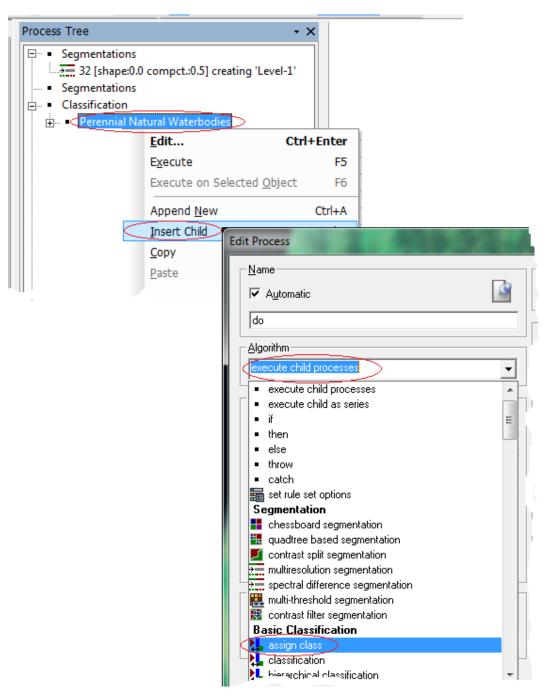
•	Process Tree		<del>,</del> ,	<	
	Segmentations     J2 [shape:0.0     Segmentations     Classification	compct.:0.5] creatir	ng 'Level-1'		
		<u>E</u> dit	Ctr	+Enter	
		E <u>x</u> ecute		F5	
		Execute on Selec	cted <u>O</u> bject	F6	
		Append <u>N</u> ew		Ctrl+A	
		Insert Child		Ctrl+I	
		<u>C</u> opy	Edit Process		1. 919.24
		Porto	Algorithm-	atic Natural Wa hild process ect Domain	ses

• In the 'Name' field, enter the name *Perennial Natural Waterbodies* and confirm with 'OK'. It will be your **Parents Class** for a particular class (in this case, for Deep to Medium Perennial Natural Waterbodies Class).

#### 1.9.1 Assign Class Algorithm

The **Assign Class** algorithm is the most simple classification algorithm. It determines by means of a threshold condition whether the image object is a member of the class or not.

This algorithm is used when one threshold condition is sufficient to assign an *Image Object* to a *Class*.



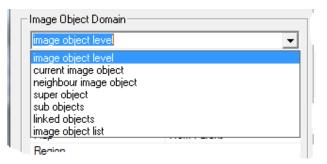
Classify the Deep To Medium Deep Perennial Natural Waterbodies

- Select the inserted Classification Process and Right-Click on it. Choose 'Insert Child' form the context menu and Assign Class Algorithm
- In the Edit Process dialog box, select assign class from the Algorithm list.

lame			Algorithm Description	
✓ Automatic		Assign all objects in the image object domain to the class specified by the Use class parameter.		
unclassified with LWM <= 30	at Level-1: Deep To	Medium	Algorithm parameters	
Jgorithm			Parameter	Value
assign class		•	Use class	Deep To Medium Deep Perennial Natural V
mage Object Domain				
image object level		•		
Parameter	Value			
Level	Level-1	<b>_</b>		
Class filter	unclassified	$> \square$		
Threshold condition	(LWM <= 30 )	-		
Second condition	-			
Мар	From Parent			
Region	From Parent			
Max. number of image obj	all	•		
oops & Cycles				
Loop while something cha	anges onlu			
· · · · · · · · · · · · · · · · · · ·	angeo entr			
Number of cycles 1		-		

• In the algorithm parameter Use class, select Deep To Medium Deep Perennial Natural Waterbodies.

• In the Image Object Domain group Click > Select image object level



• In the Image Object Domain group set the Parameter **Click on Level**> Select **Level-1** 

Edit Classification Filter
<b>₽ °</b> × <b>■</b>
<ul> <li>classes</li> <li>lounclassified</li> <li>Elood Inundation *</li> </ul>

• In the Class Filter dialog box, Select unclassified from the classification list.

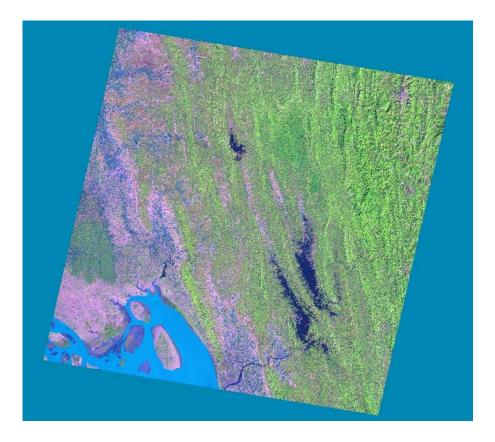
• In the Image Object Domain (Parameter) group Click the Threshold condition; it is labeled ... if condition is not selected yet.

image object level		
Parameter	Value	
Level	Level-1	
Class filter	none	
Threshold condition		
Мар	From Parent	Salast Single Easture
Region	From Parent	Select Single Feature
Max. number of image obj	all	⊡… ■ Object features ⊟… ■ Customized
Loops & Cycles		Create new 'Arithmetic Feature'
Number of cycles 1	_	Create new 'Relational Feature'     GNDVI

• From the Select Single Feature box's **Double-Click** on **Land & Water Mask** (LWM) assign the threshold <= 20 Click > OK to apply your settings

Edit threshold condition	2	×
_ <u>F</u> eature		
LL	WM	
< <= =	$\diamond$ >= >	
20	▼ No Unit ▼	
Entire range of	not limited	
Delete condition	OK Cancel	
Classification     Perennial Natural Waterbod	lies	
	Edit	Ctrl+Ente
	E <u>x</u> ecute	F
ľ	E soute on Selected Ohie	ct E

• Right-Click one the process and select execute to execute the Perennial Natural Waterbodies process or Using F5 Execute the Process.



#### 2.5 Classify the Lake

• Select the inserted **Classification Process** and **Right-Click** on it. Choose 'Insert **Child'** form the context menu.

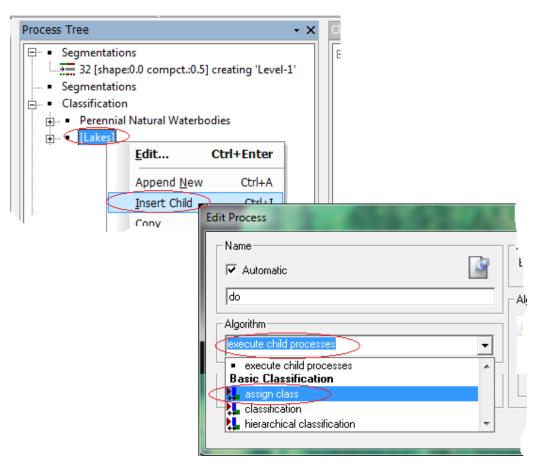
Process Tree  Segmentati  Segmentati  Classification	e:0.0 compct.:0.5	] creating 'Level-1	• X	
	<u>E</u> dit	Ctr	+Enter	
	E <u>x</u> ecute		F5	
	Execute on S	elected <u>O</u> bject	F6	
	Append <u>N</u> ew		Ctrl+A	
	Insert Child		Ctrl+I	
	<u>С</u> ору Е	dit Process	- 314	1.00
		-Name		
		🗖 Automatic		Execu
		Lakes	)	Algorith
		Algorithm execute child pr	ocesses	 Paran

• In the 'Name' field, enter the name Lake and confirm with 'OK'

#### 1.9.2 Assign Class Algorithm for Lake

The **Assign Class** algorithm is the most simple classification algorithm. It determines by means of a threshold condition whether the image object is a member of the class or not.

This algorithm is used when one threshold condition is sufficient to assign an *Image Object* to a *Class*.



Classify the Lake

• Select the inserted Classification Process and Right-Click on it. Choose 'Insert Child' form the context menu and Assign Class Algorithm

- In the Edit Process dialog box, select assign class from the Algorithm list.
  - In the algorithm parameter **Use class**, select *Lake*.
  - In the Image Object Domain group Click > Select image object level

Name		Algorithm Description			
Automatic		Assign all objects in the image parameter.	Assign all objects in the image object domain to the class specified by the Use class parameter.		
unclassified with LWM <= 52	at Level-1: Lake	Algorithm parameters			
Algorithm		Parameter	Value		
assign class		Use class	Lake		
lassas Obiest Demain					
Image Object Domain		-			
image object level	2	4			
Parameter	Value				
Level	Level-1	•			
Class filter	unclassified				
Threshold condition	LWM <= 52				
Second condition	-				
Мар	From Parent				
Region	From Parent				
Max. number of image obj	all	-			
Loops & Cycles					
Loop while something cha	anges onlu				
	anges only				
Number of cycles 1	8				

Image Object Domain		7
image object level	•	
image object level		
current image object		
neighbour image obj	ect	
super object		
sub objects		
linked objects		
image object list		
Region		

• In the Image Object Domain group set the Parameter **Click on Level**> Select **Level-1** 

Edit Classification Filter
classes     unclassified     Elood Inundation A

• In the Class Filter dialog box, Select *unclassified* from the classification list.

• In the **Image Object Domain (Parameter)** group **Click** the **Threshold condition**; it is labeled ... if condition is not selected yet.

image object level		
Parameter	Value	
Level	Level-1	
Class filter	none	
Threshold condition		
Map	From Parent	Salast Single Feature
Region	From Parent	Select Single Feature
Max. number of image obj	all	Date of the state
		□ □ ··· ■ Object features □ □ ··· ■ Customized

• From the Select Single Feature box's Double-Click on Land & Water Mask (LWM) assign the threshold <=52 Click > OK to apply your settings

Edit threshold condition	-	? ×
Feature	LWM	
Threshold settings	= 🔿 >=	>
52 Entire range of	No Unit	d
Delete condition	OK	Cancel
<ul> <li>[Lakes]</li> <li>unclassified with LWM</li> </ul>	<- 52 at Level-1+1 ake	
	<u>E</u> dit	Ctrl+Enter
	Execute	Object F6

• **Right-Click** one the process and select execute to execute the **Lake** process or Using F5 Execute the Process.

\*Note: Based on the LWM algorithm others land cover area has been classified as **Lake.** So you have to use few more conditions for refining the **Lake** area.

• In the **Edit Process** dialog box, select **merge region** from the **Algorithm** list and Fusion super objects **Yes** 

lit Process	100 100	A SHALL	8
Name	[	Algorithm Description Merge all image objects chose	n in the image object domain.
Lake at Level-1: merge re	egion	Algorithm parameters	
Algorithm		Parameter	Value
		Fusion super objects Use Thematic Layers	Yes
Image Object Domain			
Parameter Level	Value (Level-1)		
Class filter Threshold condition	Lake		
Мар	From Parent		
Region	From Parent		
Max. number of image obj	i all		
Loops & Cycles			
🔽 Loop while something	changes only		
Number of cycles 1			
		Execu	te Ok Cancel Help

- In the Image Object Domain Select Level-1 and In the Class filter Select > Lake > OK

[Lake at Level-1: merge region	1	
	<u>E</u> dit	Ctrl+Enter
	Append <u>N</u> ev	v Ctrl+A
	_	

• Using F5 Execute the algorithm

• In the **Edit Process** dialog box, select **assign class** from the **Algorithm** list and Use class **unclassified** 

Name		- 16	Algorithm Description	
Automatic		Assign all objects in the image parameter.	object domain to the class specified by the Use clas	
Lake with Area <= 36000000	at Level-1: unclassified		Algorithm parameters	
Algorithm		_	Parameter	Value
assign class		-	Use class	unclassified
1		_		
Image Object Domain				
image object level		-		
Parameter	Value			
1.2.2.1.1.2.2.2.		-		
	Level-1	-		
Class filter	Lake	- 11		
	Area <= 36000000			
Second condition	-			
Map	From Parent			
Region Manual and impact of impact o	From Parent			
Max. number of image obj	all	-		
Loops & Cycles				
✓ Loop while something cha	anges only			
Number of cycles 1		-		

• In the Image Object Domain select image object level and parameter Level > Level-1, Class> Lake

• In the parameter Click on Threshold condition and to apply your bellow settings

Class filter	Lake	_h.		
Threshold condition				
Мар	From Parent	Select Single Fe	ature	
Region	From Parent	Sciece Single re	store	
Max. number of image obj	all	⊡… ● Object ⊕… ● Cu ⊕… ∱ Ty		
Loops & Cycles			yer Values	
Loop while something char	nges only	⊡ ⊏o Ge		
		ė- <b>_</b>	Extent	
Number of cycles 1				
			Edit threshold condition	? ×
			Feature	
				Area
			☐ Threshold settings	
			Thieshold settings	
			< <=	$= \langle \rangle \rangle = \rangle$
			3600000	Same as project unit
			Entire range of	0 5.386552189e+010
			Delete condition	OK Cancel

Feature select **Area** and Threshold <= 3600000

• Using F5 Execute the **Lake** algorithm

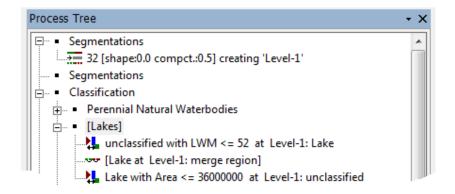




Figure Classified lake area

#### 2.6 Classify the **River**

• Select the inserted **Classification Process** and **Right-Click** on it. Choose 'Insert **Child'** form the context menu.

- • Classificatio	Edit	Ctrl+Enter	
	Execute	F5	
1	Execute on Selected	l <u>O</u> bject F6	
	Append New	Ctrl+A	
	Insert Child	Ctrl+I	
1	Rive	e Automatic	

• In the 'Name' field, enter the name River and confirm with 'OK'

#### 1.9.3 Assign Class Algorithm for River

The **Assign Class** algorithm is the most simple classification algorithm. It determines by means of a threshold condition whether the image object is a member of the class or not.

This algorithm is used when one threshold condition is sufficient to assign an *Image Object* to a *Class*.

Natural Waterbodies		
<u>E</u> dit	Ctrl+Enter	1
E <u>x</u> ecute	F5	
Execute on Selecte	d <u>O</u> bject F6	
Append <u>N</u> ew	Ctrl+A	
	Vame ✓ Automatic do Algorithm execute child processes • execute child processes	sses
	Execute on Selecte Append New Insert Child Conv	Edit       Ctrl+Enter         Execute       F5         Execute on Selected Object       F6         Append New       Ctrl+A         Insert Child       Edit Process         Name       Image: Conv         Image: Conv       Image: Conv

Classify the River

• Select the inserted Classification Process and Right-Click on it. Choose 'Insert Child' form the context menu and Assign Class Algorithm

- In the Edit Process dialog box, select assign class from the Algorithm list.
  - In the algorithm parameter Use class, select River.
  - In the Image Object Domain group Click > Select image object level

<u>N</u> ame			Algorithm Description		
<ul> <li>Automatic</li> </ul>		3	Assign all objects in the ima parameter.	ge object domain to the class specified by the	Use class
unclassified with LWM <= 36	at Level-1: River		Algorithm parameters		
Algorithm			Parameter	Value	
assign class		-	Use class	River	
mage Object Domain					
image object level		-			
Parameter	Value				
Level	Level-1	-			
Class filter	(unclassified)				
Threshold condition	(IWM <= 36)				
Second condition	-				
Мар	From Parent				
Region	From Parent				
Max. number of image obj	all	•			
_oops & Cycles					
Loop while something characteristics	anges only				
Number of cycles 1		•	-		

Image Object Domain	
image object level	•
image object level	
current image object neighbour image object super object sub objects linked objects	
image object list	

• In the Image Object Domain group set the Parameter **Click on Level**> Select **Level-1** 

Edit Classification Filter
□ classes □ unclassified □ Elood Inundation *

• In the **Class Filter** dialog box, Select *unclassified* from the classification list.

• In the **Image Object Domain (Parameter)** group **Click** the **Threshold condition**; it is labeled ... if condition is not selected yet.

image object level		
Parameter	Value	
Level	Level-1	
Class filter	none	-
Threshold condition		
Мар	From Parent	Calant Single Fasture
Region	From Parent	Select Single Feature
Max. number of image obj	all	Diject features
		📄 📄 🖷 Customized

• From the Select Single Feature box's Double-Click on Land & Water Mask (LWM) assign the threshold <= 34 Click > OK to apply your settings

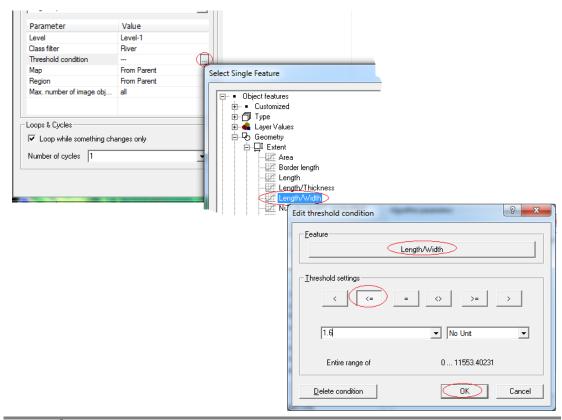
Edit threshold condition	? ×	
	LWM	
_ <u>I</u> hreshold settings		
< <= :	= 🔷 >= >	
24	▼ No Unit ▼	
Entire range of	not limited	
Delete condition	OK Cancel	
• River	11	
unclassified with LWM <=	= 36 at Level-1: River <u>E</u> dit Ctrl+En	to
	E <u>x</u> ecute	F5
][	L <u>v</u> ecuce	15

• **Right-Click** one the process and select execute to execute the **River** process or Using F5 Execute the Process.

\*Note: Based on the LWM algorithm others land cover area has been classified as **River.** So you have to use few more conditions for refining the **River** area. • In the **Edit Process** dialog box, select **assign class** from the **Algorithm** list and Use class **unclassified** 

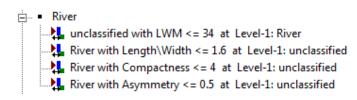
Name		70	Algorithm Description Assign all objects in the image	e object domain to the class specified by the Use class	
Automatic		100	parameter.		
River with Length\Width <= 2	2.7 at Level-1: unclassifi	ed	Algorithm parameters		
Algorithm		-	Parameter	Value	
assign class		-	Use class	unclassified	
mage Object Domain					
image object level		•			
Parameter	Value				
Level	Level-1	•			
	River				
Threshold condition	Tength/Width <= 1.6				
Second condition					
Мар	From Parent				
Region	From Parent				
Max. number of image obj	all	-			
Loops & Cycles					
Loop while something cha	anges only				
Number of cycles 1		•			
			I L		

- In the Image Object Domain select image object level and parameter Level > Level-1, Class > River
- In the parameter Click on Threshold condition and to apply your bellow settings



```
Feature select Length/Area and Threshold <= 1.6
```

Similar way add following condition for  $\mathbf{river}\,$  and  $\bullet$  Using F5 Execute the  $\mathbf{Lake}\,$  algorithm



#### 2.7 Classify the Broadleaved Tree Crop

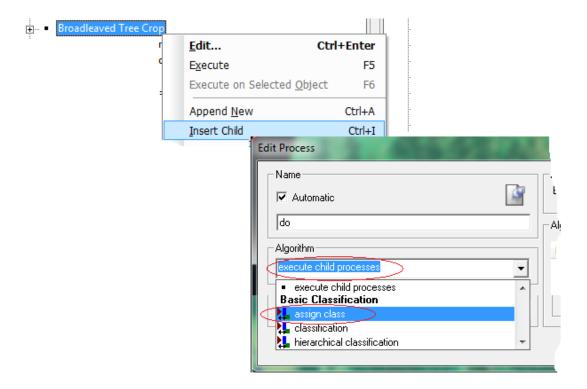
• Select the inserted Classification Process and **right-click** on it. Choose '**Insert Child**' form the context menu.

Classification	>		
	<u>E</u> dit	Ctrl+Enter	
	E <u>x</u> ecute	F5	
	Execute on Selecte	d <u>O</u> bject F6	
	Append <u>N</u> ew	Ctrl+A	
	Insert Child	Ctrl+I	
	Edi	t Process	and the strength
		Name	
		Broadleaved Tree Crop	

New Dialog box will be appear

In the 'Name' field enter the name 'Broadleaved Tree Crop' and confirm with 'OK'. It will be your parents of Classification

• In the Edit Process dialog box, select assign class from the Algorithm list.



#### Classify the Broadleaved Tree Crop

• Select the inserted Classification Process and Right-Click on it. Choose 'Insert Child' form the context menu and Assign Class Algorithm

- In the Edit Process dialog box, select assign class from the Algorithm list.
  - In the algorithm parameter Use class, select Broadleaved Tree Crop.
  - In the Image Object Domain group Click > Select image object level

Edit Process	6 26-		5 <mark>- x</mark>
<u>Name</u>		Algorithm Description	
✓ Automatic	3	Assign all objects in the image parameter.	ge object domain to the class specified by the Use class
unclassified with NDVI >= 0.3	unclassified with NDVI >= 0.35 at Level-1: Broadleaved Tr		
Algorithm		Parameter	Value
assign class	•	Use class	Broadleaved Tree Crop
image object level	<b></b>		
	<u> </u>		
Parameter	Value		
Level	Level-1		
Class filter 0	unclassified		
Threshold condition	NDVI >= 0.35		
Second condition			
Map	From Parent		
Region	From Parent		
Max. number of image obj	all		
Loops & Cycles		1	
🔽 Loop while something ch	anges only		
Number of cycles 1	<b>•</b>		
L		Euc	cute Ok Cancel Help
		<u>E</u> xe	cute Cancel

Image Object Domain—	
image object level	•
image object level	
current image object neighbour image object super object sub objects linked objects image object list	
Region	

• In the Image Object Domain group set the Parameter **Click on Level**> Select **Level-1** 

Edit Classification Filter
classes     unclassified     Flood Inundation *

• In the Class Filter dialog box, Select *unclassified* from the classification list.

• In the **Image Object Domain (Parameter)** group **Click** the **Threshold condition**; it is labeled ... if condition is not selected yet.

Parameter Value Level Level-1 Class filter none Threshold condition		
Class filter none		
Threehold condition		
Theos old condutor		
Map From Par	M Salact Single Feature	X
Region From Par	Select Single Feature	
Max. number of image obj all	Object features	
	E Customized	-
Loops & Cycles	Create new 'Arithmetic Feature'	
Number of cycles 1	Create new 'Relational Feature'	
	GNDVI	
	- EX LWM	Ξ
	NDMI	1

• From the Select Single Feature box's Double-Click on NDVI assign the threshold => 0.35 Click > OK to apply your settings

Edit threshold condition	Re parate	? ×
Feature		
	NDVI	
Threshold settings		
	=	>
0.35	▼ No Unit	•
Entire range of	not limited	
Delete condition	OK	Cancel
<ul> <li>Broadleaved Tree Crop</li> <li>unclassified with NDVI &gt; = 0.35</li> </ul>	at Lough 1, Decadlesued	Tree Cross
	<u>Edit</u>	Ctrl+Ente
	E <u>x</u> ecute	E

• **Right-Click** one the process and select execute to execute the **Broadleaved Tree Crop** process or Using F5 Execute the Process. \*Note: Based on the LWM algorithm others land cover area has been classified as Broadleaved Tree Crop. So you have to use few more conditions for refining the Broadleaved Tree Crop area.

Similar way add other condition for **Broadleaved Tree Crop** and • Using F5 Execute the **Broadleaved Tree Crop** algorithm

∎ Bro	adleaved Tree Crop
- <mark>1</mark>	unclassified with NDVI >= 0.35 at Level-1: Broadleaved Tree Crop
- <b>\</b>	Broadleaved Tree Crop with Brightness >= 90 at Level-1: unclassified
- <b>\</b>	Broadleaved Tree Crop with Mean Layer 9 (Slope) >= 15 at Level-1: unclassified
- <b>\</b>	Broadleaved Tree Crop with Max. diff. <= 1.9 at Level-1: unclassified
- <b>\</b>	Broadleaved Tree Crop with Mean Layer 8 (DEM) <= 100 at Level-1: unclassified
	Broadleaved Tree Crop with Mean Layer 5 (Mid-IR) >= 60 at Level-1: unclassified
	Broadleaved Tree Crop at Level-1: merge region
	Broadleaved Tree Crop with Area <= 47000000 at Level-1: unclassified

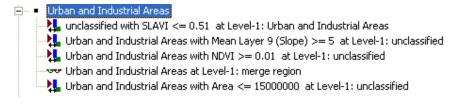
### Please set following condition for others land cover

⊟⊸ ■ Bare Soil in seasonally flooded area
🚬 unclassified with NDVI <= 0.01 at Level-1: Bare Soil in Seasonally Flooded Area
🕂 Bare Soil in Seasonally Flooded Area with Mean Layer 8 (DEM) >= 7 🏻 at Level-1: unclassified
🗏 📙 Bare Soil in Seasonally Flooded Area with Distance to Deep To Medium Deep Perennial Natural Waterbodies >= 8000 m at Level-1: unclassified
Bare Soil in seasonally flooded area

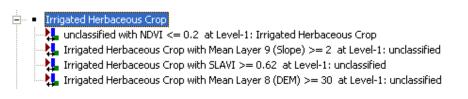
## Bare Soil

Bare Soil	
👯 unclassified with SLAVI <= 0.42 at Level-1: Bare Soil	
👯 Bare Soil with Distance to River >= 5000 m at Level-1: uncla	ssified

Urban and Industrial Areas



#### Irrigated Herbaceous Crop



Rainfed Herbaceous Crop

<u> </u>	<ul> <li>Rainfed Herbaceous Crop</li> </ul>		
		o op all and a patrice durates	-
	$\sim$	= 0.35 at Level-1: Rainfed Herbac	eous Crop
	Delefe di Jack en en erre Con	with Manage Lawrence (Classe) of the	- Film and the second second
	🗛 Rainred Herbaceous Cro	p with Mean Layer 9 (Slope) <= 1	at Level-1: unclassified
	Deterfend Uterhansen of	with Distance to Labor 4, 10000	and the set of the set of the set of the set
	🛛 🖓 🗛 Rainred Herbaceous Cro	p with Distance to Lake <= 12000	at Level-1; unclassified

00:13 Closed to Open Rooted Forb	Clos ed to
<ul> <li>0.157s unclassified with SAVI &lt;= 0.3 at Level-1: Closed to Open Rooted Forb</li> <li>00:12 Closed to Open Rooted Forb with Distance to Lake &gt;= 40000 m at Level-1: unclassified</li> <li>&lt; 1 ms Closed to Open Rooted Forb with Mean Layer 9 (Slope) &gt;= 2 at Level-1: unclassified</li> </ul>	Ope n Root

ed Forb

🖕 🔹 Closed to Open Grassland	Grassland
Inclassified with NDVI <= 0.2 at Level-1: Closed to Open Grassland     Closed to Open Grassland with Mean Layer 9 (Slope) <= 2 at Level-1: unclassified     Closed to Open Grassland with Mean Layer 3 (Red) <= 33 at Level-1: unclassified	

Closed to Open

	Small
	Herba
5mall Herbaceous Crops in sloping land	ceous
unclassified with NDVI <= 0.25 at Level-1: Small Herbaceous Crops in sloping land	-
Small Herbaceous Crops in sloping land with Mean Layer 9 (Slope) <= 3 at Level-1: unclassified 🕹	Crops
Small Herbaceous Crops in sloping land with Mean Layer 8 (DEM) <= 10 at Level-1; unclassified 🕹	in
sloping land	

## Closed to Open Seasonally Flooded Shrubs

:	<ul> <li>Closed to Open Seasonally Flooded Shrubs</li> </ul>
	📲 unclassified with NDVI <= 0.3 at Level-1: Closed to Open Seasonally Flooded Shrubs
	📲 Closed to Open Seasonally Flooded Shrubs with Distance to Lake >= 10000 at Level-1: unclassified
	Closed to Open Seasonally Flooded Shrubs with Mean Layer 9 (Slope) >= 4 at Level-1: unclassified

Closed to Open Shrubland



#### Small Sized Field Of Tree Crop

:	Small Sized Field Of Tree Crop
	unclassified with NDVI <= 0.2 at Level-1: Small Sized Field Of Tree Crop
	Small Sized Field Of Tree Crop with Mean Layer 9 (Slope) >= 1 at Level-1: unclassified

### Broadleaved Tree Crop

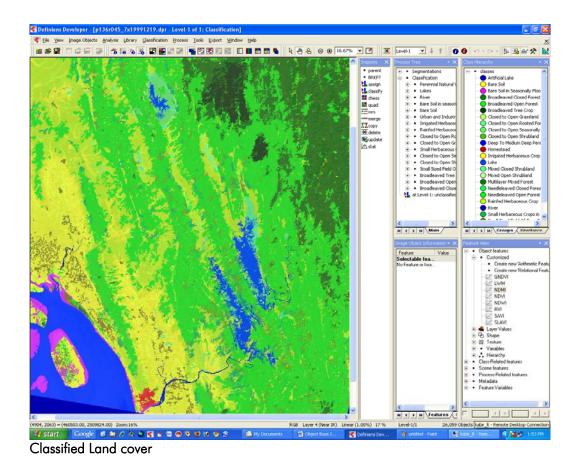
÷	Broadleaved Tree Crop	
	뭦 unclassified with NDVI >= 0.35  at Level-1: Broadleaved Tree Crop	
	💺 Broadleaved Tree Crop with Brightness >= 90  at Level-1: unclassified	
	뭦 Broadleaved Tree Crop with Mean Layer 9 (Slope) >= 15 🏻 at Level-1: unclassified	
	💺 Broadleaved Tree Crop with Max. diff. <= 1.9 at Level-1: unclassified	
	提 Broadleaved Tree Crop with Mean Layer 8 (DEM) <= 100 🏻 at Level-1: unclassified	l
	提 Broadleaved Tree Crop with Mean Layer 5 (Mid-IR) >= 60 🏻 at Level-1: unclassified	d
	🕶 Broadleaved Tree Crop at Level-1: merge region	
	💺 Broadleaved Tree Crop with Area <= 47000000  at Level-1: unclassified	

#### **Broadleaved Open Forest**



### **Broadleaved Closed Forest**

- 🗄 🗝 Broadleaved Closed Forest
  - unclassified with SLAVI >= 0.8 at Level-1: Broadleaved Closed Forest



\*Note The entire classification process shown base on single variable. For better results more variable need to use.

## 2.8 Manual Editing

Manual editing of image objects and thematic objects allows you to manually influence the result of an image analysis. The main manual editing tools are **Merge Objects Manually**, **Classify Image Objects Manually** and **Cut an Object Manually**.

While manual editing is not commonly used in automated image analysis, it can be applied to highlight or reclassify certain objects or to quickly improve the analysis result without adjusting the applied rule set.

To open the **Manual Editing** toolbar choose **View > Toolbars > Manual Editing** on the main menu.

| Image object editing 🔍 unclassified 💽 - New Layer - 💌 2 💽 🗞 🌾 🟠 🎞 🙆 🗞 🐝 🧱 👪 🗔 🕼 🤣 💥 🦉

### Change Editing Mode

The Change Editing Mode drop-down list on the Manual Editing toolbar is set to Image Object Editing by default. If you work with thematic layers and want to edit them by hand, choose Thematic editing from the drop-down list.

Image object editing 📃 💌
Image object editing
Thematic editing

#### **Selection Tools**

Objects to be fused or classified can be selected from the **Manual Editing** toolbar in one of the following ways:

R	<b>%</b> \$	₽	
1	2	3	4

1 Single Selection Mode selects one object. Select the object with a single click.

2 Polygon Selection selects all objects that lie within or touch the border of a polygon.

Set vertices of the polygon with a single click. Right-click and choose **Close Polygon** to close the polygon.

3 Line Selection selects all objects along a line. Set vertices of the line with a single click. A line can also be closed to form a polygon by right-clicking and choosing **Close Polygon**. All objects that touch the line are selected.

4 **Rectangle Selection** selects all objects within or touching the border of a rectangle. Drag a rectangle to select the image objects.

#### Merge Objects Manually

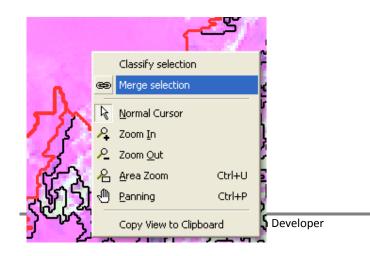
The manual editing tool Merge Objects is used to manually merge selected

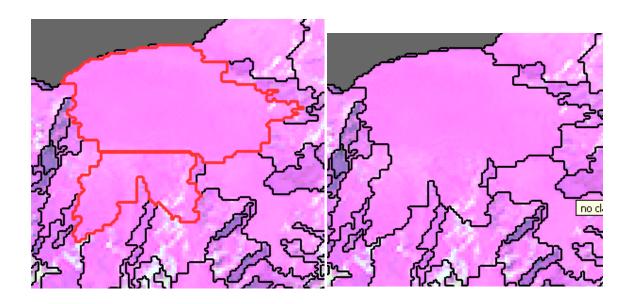
neighboring image or thematic objects.

Note: Manual object merging operates only on the current image object level.

Tools > Manual Editing > Merge Objects from the main menu bar or press the Merge Objects Manually button on the Manual Editing toolbar to activate the input mode. Or you can use right click.

Note: You should have at list two objects.





## 2.9 Classify Image Objects Manually

The manual editing tool **Classify Image Objects** allows easy class assignment of selected image objects.

Manual image object classification can be used for the following purposes:

• Manual correction of previous classification results including classification of previously unclassified objects.

• Classification without rule sets (in case the creation of an appropriate rule set is more time-consuming), using the initial segmentation run for automated digitizing. Precondition: To classify image objects manually, the project has to contain at least one image object level and one class in the **Class Hierarchy**.

To perform a manual classification, do one of the following:

- Choose Tools > Manual Editing > Classify Image Objects from the menu bar.
- Click the Classify Image Objects button on the Manual Editing toolbar to activate

Image object editing	<ul> <li>unclassified</li> </ul>	- New Layer -	- 2	🛚 🐮 🗮 🕷 👬 🛛
the ma	nual classificati	on input mode.		

In the Select Class for Manual Classification drop-down list box, select the class to which you want to manually assign objects. Note that selecting a class in the Legend window or in the Class Hierarchy window (if available) will not determine the class for manual editing; the class has to be selected from the before-mentioned drop-down list.



Now objects can be classified manually with a single mouseclick. To classify objects, do one of the following:

• Select the Classify Image Objects button and the Class for Manual

Classification. Click the image objects to be classified.

• Select the image object(s) you want to classify first. Select the **Class for Manual Classification** and press the **Classify Image Objects** button to classify all selected objects.

• Select one or more image objects, right-click into the image object(s) and select **Classify Selection** from the context menu.

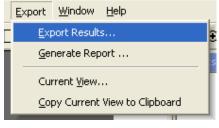
When the object is classified, it is painted in the color of the respective class.

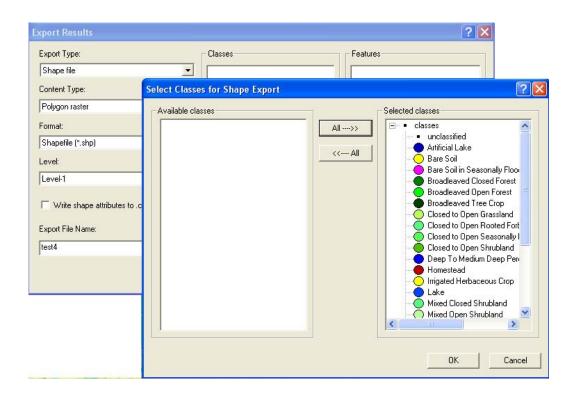
If no class is selected, a mouse-click deletes the previous class assignment; the image object becomes unclassified.

To undo a manual classification on a previously unclassified object, simply click the object a second time. If the object was previously classified, then clicking again does not restore the former classification; instead, the object becomes unclassified.

## 2.10Export Results

To export results, open the **Export Results** dialog box by choosing **Export > Export Results** from the main menu bar.





- Choose Sapefile/Raster from the Export Type drop-down list.
- From the Content Type drop-down list, choose to export shape file for: Classes
- The Format has to be \*.shp.

- Select the image object Level for which you want to export results: Level-1.
- Change the default file name in the **Export File Name** text field if desired.
- To save the shape file to disk, press **Export**.

Note: Definiens Trial version cannot export the results

## Segmentation Creates a New Image Object Level

The new image objects created by segmentation are stored in what is called an new image object level. Each image object is defined by a contiguous set of pixels, where each pixel belongs to exactly one image object. Each of the subsequent image

object related operations like classification, reshaping, re-segmentation, and information extraction is done within an image object level. Simply said, image object levels serve as internal working areas of the image analysis.



## Delete Image Object Level

Delete an image object level. This enables you to work with image object levels that are temporary, or that might be required for testing processes while developing rule sets.

To delete an image object level do the following:

• Choose **Image Objects > Delete Levels** on the main menu bar.

• The opening **Delete Level** dialog box displays a lists of all image object levels according to the image object hierarchy.



• Select the image object level to be deleted

• Confirm with **OK**. The selected image object levels will be removed from the image object hierarchy.

Satellite	Sensor	Band		Resolution
Landsat	ETM+	Band 1	0.45 - 0.52µm (Blue)	30 meter
		Band 2	0.52 - 0.60µm (Green)	30 meter
		Band 3	0.63 - 0.69µm (Red)	30 meter
		Band 4	0.75 - 0.90µm (NIR)	30 meter
		Band 5	1.55 - 1.75µm (IR)	30 meter
		Band 6	10.4 - 12.50µm (TIR)	60 meter
		Band 7	2.08 - 2.35µm (NIR)	30 meter
		Band 8	0.52 - 0.90µm (Pan)	15 meter

#### Normalized Difference Vegetative Index (NDVI)

NDVI = (NIR - red) / (NIR + red) (ETM+) NDVI = (Band 4 - Band 3) / (Band 4 + Band 3)

### Normalized Difference Snow/Ice Index (NDSII)

NDSII = (green – infra-red) / (green + infra-red) (ETM+) NDSII = (Band 2 - Band 5) / (Band 2 + Band 5)

#### Land and Water Masks (LWM)

Water Mask = infra-red) / (green + .0001) \* 100

(ETM+) Water Mask = Band 5) / (Band 2 + .0001) \* 100

#### Modification of Normalized Difference Water Index (NDWI)

NDWI = (NIR - IR / (NIR + IR)) (ETM+) NDWI = (Band 4 - Band 5) / (Band 4 + Band 5)

#### Normalized Burn Ratio

NBR = (NIR - TIR) / (NIR + TIR)

(ETM+) NBR = (Band 4 - Band 7) / (Band 4 + Band 7)

### Ratio vegetation index

RVI = NIR / red(ETM+) RVI = Band 4 / Band 3

## Green normalized difference vegetation index

 $GNDVI=(NIR - Green) \div (NIR + Green)$ (ETM+) GNDVI = (Band 4 - Band 2) / (Band 4 + Band 2)

## Specific leaf area vegetation index (SLAVI)

 $SLAVI = NIR \div (Red + infra-red)$ 

(ETM+) SLAVI = Band 4 / (Band 3 + Band 5)

## Normalized Difference Moisture Index (NDMI)

NDMI = (NIR-IR)/(NIR+IR)

(ETM+) NDMI = (Band 4 - Band 5) / (Band 4 + Band 5)

## 1.10 Export the Flood Inundation Area

• From dropdown menu, Click on Export and select Export Results then export Results dialog box will open

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• Choose Shapefile / Raster from the	Process Iools Exp	ort Window Heb Export Results Export Results Export Results Export Type Shape Re Content Type: Polygon raiter	Classes	Features
Export Type		Format Shapelie (*.sho)	-	
drop- down list.		Level	-	
• From		Export File Name: Flood_Flood_Inundation_Area	Select classes	Select features
the <b>Content</b>			Export.	Preview Close

Type drop-down list, choose to export shape file for: Classes

- The Format has to be \*.shp.
- Select the image object Level for which you want to export results: Level-1.
- Change the default file name in the **Export File Name** text field if desired.
- To save the shape file to disk, press **Export**.

Note: eCognition Trial version do not export the results

## 1.11 Manual Editing

Manual editing of image objects and thematic objects allows you to manually influence/update the result of an image analysis. The main manual editing tools are **Merge Objects Manually**, **Classify Image Objects Manually** and **Cut an Object Manually**.

While manual editing is not commonly used in automated image analysis, it can be applied to highlight or reclassify certain objects or to quickly improve the analysis result without adjusting the applied rule set.

To open the **Manual Editing** toolbar choose **View** > **Toolbars** > **Manual Editing** on the main menu.

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## 1.11.1 Change Editing Mode

The **Change Editing Mode** drop-down list on the **Manual Editing** toolbar is set to **Image Object Editing** by default. If you work with thematic layers and want to edit them by hand, choose **Thematic editing** from the drop-down list.

Image object editing	•
Image object editing	
Thematic editing	

## 1.11.2 Selection Tools

Objects to be fused or classified can be selected from the **Manual Editing** toolbar in one of the following ways:

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	1	2	3	4

1. Single Selection Mode selects one object. Select the object with a single Click.

2. **Polygon Selection** selects all objects that lie within or touch the border of a polygon.

Set vertices of the polygon with a single **Click**. **Right-Click** and choose **Close Polygon** to close the polygon.

3. Line Selection selects all objects along a line. Set vertices of the line with a single Click. A line can also be closed to form a polygon by **Right-Click**ing and choosing **Close Polygon**. All objects that touch the line are selected.

4. **Rectangle Selection** selects all objects within or touching the border of a rectangle. **Drag** a rectangle to select the image objects.

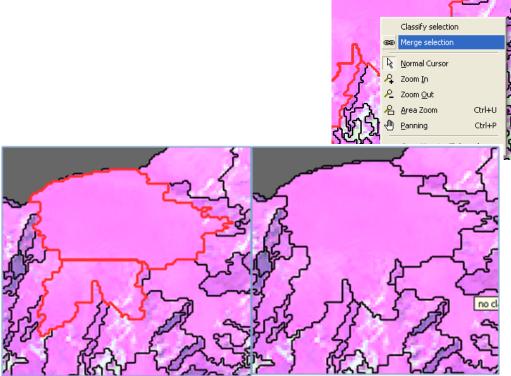
# 1.11.3 Merge Objects Manually

The manual editing tool **Merge Objects** is used to manually merge selected neighboring image or thematic objects.

Note: Manual object merging operates only on the current image object level.

Tools > Manual Editing > Merge Objects from the main menu bar or press the Merge Objects Manually button on the Manual Editing toolbar to activate the input mode. Or you can use Right-Click.

Note: You should have at list two objects.



1.12 Classify Image Objects Manually

The manual editing tool 'Classify Image Objects' allows easy class assignment of selected image objects.

Manual image object classification can be used for the following purposes:

- Manual correction of previous classification results including classification of previously unclassified objects.
- Classification without rule sets (in case the creation of an appropriate rule set is more time-consuming), using the initial segmentation run for automated digitizing. Precondition: To classify image objects manually, the project has to contain at least one image object level and one class in the Class Hierarchy.

To perform a manual classification, do one of the following:

• Choose Tools > Manual Editing > Classify Image Objects from the menu bar.

• Click the Classify Image Objects button on the *Manual Editing* toolbar to activate the manual classification input mode.

Image object editing	•	Flood Inundation Area 💌	- New Layer -
		unclassified	
		Flood Inundation Area	

In the **Select Class for Manual Classification** drop-down list box, select the class to which you want to manually assign objects. Note that selecting a class in the **Legend** window or in the **Class Hierarchy** window (if available) will not determine the class for manual editing; the class has to be selected from the before-mentioned drop-down list.

Now objects can be classified manually with a single mouse-**Click**. To classify objects, do one of the following:

• Select the Classify Image Objects button and the Class for Manual

Classification. Click the image objects to be classified.

• Select the image object(s) you want to classify first. Select the **Class for Manual Classification** and press the **Classify Image Objects** button to classify all selected objects.

• Select one or more image objects, **Right-Click** into the image object(s) and select **Classify Selection** from the context menu.

When the object is classified, it is painted in the color of the respective class.

If no class is selected, a mouse-**Click** deletes the previous class assignment; the image object becomes unclassified.

To undo a manual classification on a previously unclassified object, simply **Click** the object a second time. If the object was previously classified, then **Click**ing again does not restore the former classification; instead, the object becomes unclassified.

# Segmentation Creates a New Image Object Level

The new image objects created by segmentation are stored in what is called an new image object level. Each image object is defined by a contiguous set of pixels, where

each pixel belongs to exactly one image object. Each of the subsequent image object related operations like classification, reshaping, re-segmentation, and information extraction is done within an image object level. Simply said, image object levels serve as internal working areas of the image analysis.



# Delete Image Object Level

This enables you to work with image object levels that are temporary, or that might be required for testing processes while developing rule sets.

To delete an image object level do the following:

# 2 References and Useful links

User Guide eCognition Developer <u>www.ecognition.com/</u> Global Land Cover Facility <u>http://www.glcf.umd.edu/index.shtml</u> Global SRTM Datasets <u>http://srtm.csi.cgiar.org/</u> International Centre for Integrated Mountain Development <u>http://www.icimod.org</u> Mountain Geoportal <u>http://geoportal.icimod.org</u> Satellite imagery <u>http://edcsns17.cr.usgs.gov/NewEarthExplorer/</u> Satellite imagery <u>http://glovis.usgs.gov/</u>