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QGIS Handbook for Supervised Classification of Areas

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This manual was designed to assist the students of the Environmental Health Management course of the Faculty of Medicine of ABC, to perform the remote sensing from the Landsat^{MT} satellite images, and the QGIS software, for the classification and quantification of land use and land cover

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Introduction

The protocol described below is a complete manual from the download of the scenes to the treatment of the same ones, as the cut of the areas under study, the classification and quantification of the use and occupation of the soil.

This manual was conceived after a work of Scientific Initiation of the Faculty of Medicine of ABC, with the intention of helping other students of the geoprocessing discipline of the Environmental Health Management course, to carry out the process of remote sensing, classification and quantification of the use and occupation of the soil, for future research.

Remote sensing today is a process widely used in research around the world for those who wish to classify and quantify land use and occupation over time, in urban or forest areas.

This protocol uses the QGis software that is freely accessible, and satellite data (imagens) are obtained through the Landsat satellites through the LandsatLook platform.




This protocol was initially developed to observe and quantify the temporal dynamics of forest cover in the Amazon forest and to relate it to the dynamics of border malaria to obtain a more solid paradigm in relation to border malaria in Brazil and in the World.

Introduction to installation

As a first step, you must install the software and plugins used in this protocol.

To download the free access software QGis go to <http://www.qgis.org>, preferably to download the latest version.

After downloading QGis (latest version), you must install the plugins. On the top command bar, click the Add option and select Manage and Install Add-ons, select and install one plug-in at a time.

First the SCP plugin  Semi-Automatic Classification, then the Plugin Statistic by Zone  , and finally the Group Stats plugin  .

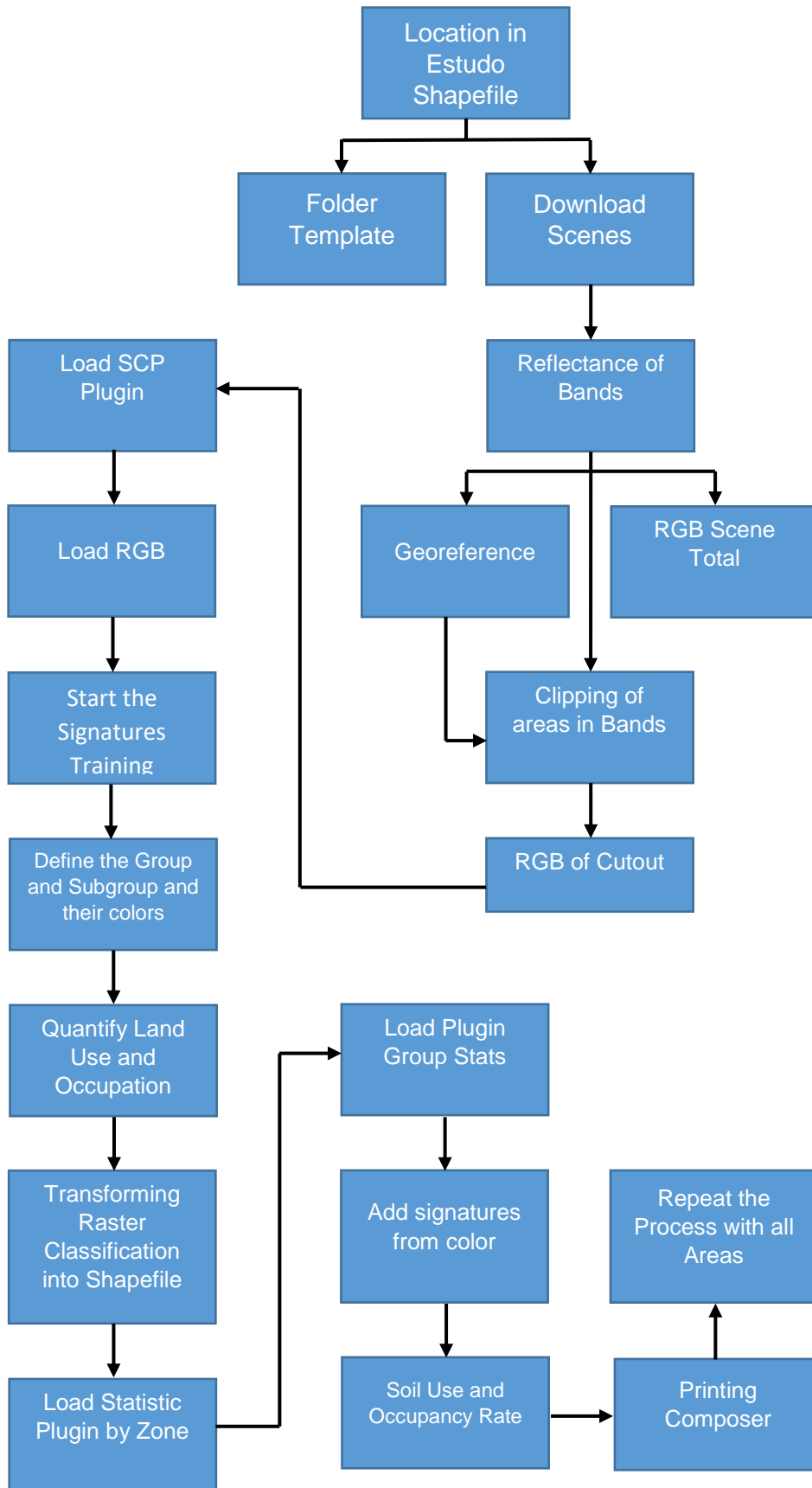
Soil Use and Occupancy Dynamics Protocol Steps

1. Determine the location under study.
2. Image Composer. Collect data as coordinates and study area.
3. Transform the coordinate data and the locale area into a Shapefile file.

** Data above provided by the researcher responsible for the research.*

4. Folder template (see Figure-1).
5. Download the scenes from the Landsat satellites.
6. Reflectance of bands.
7. Georeferencing of bands.
8. Full RGB of the scene.
9. Cut out the areas under study.
10. Cutout RGB.
11. Load the SCP (Semi-Automatic Classification) plugin.
12. Load the RGB from the clipping into the SCP plugin.
13. Start the training (make signatures of the pixels).
 - Define group and subgroup of signatures.
 - Determine the colors of each group and subgroup.
14. Start and Save the rating.
15. Quantify land use and occupation.
16. Transform the Raster from sorting into a Shapefile.
17. Upload the Statistics plugin by Zone.
18. Load the Group Stats plugin.
19. Add the signatures according to the color of each one.
20. Calculate the percentage of land use and occupation.
21. Image Composer.

Protocol Flowchart



Understand all steps of the Process

1. Determine the location under study.

The study sites should be chosen according to what you want to study, a location with a high rate of zoonotic diseases for example.

2. Collect data as coordinates and area of study location.

Fieldwork made in the study areas, using equipment such as GPS, to obtain the coordinates of each area under study, and can also be done by remote sensing.

3. Transform the coordinate data and area of the locality into a Shapefile file.

*Data above made available by the researcher responsible for the research, including the Shapefile of the study area.

4. Folder template (see Figure -1).

These folders are very important because they will be used to organize all the information obtained during the process of treatment and classification of each area.

5. Download the scenes from the Landsat satellites.

Use the LandsatLook platform at www.landsatlook.usgs.gov, which is easy to manipulate to download the scenes in which the study areas are contained.

6. Reflectance of bands.

The band reflectance process is an algorithm that helps to improve the sharpness of the bands thus improving the final RGB product.

7. Georeferencing of bands.

The process of georeferencing of the bands and a process that is only used when the scenes are out of position, being out of position study area is outside the correct location, even though it is in the same projection.

8. Total RGB of the scene.

The total RGB of the scene is used to merge all the bands of the scene, allowing the manipulation of these bands, being able to compose scenes of different spectra of light that will provide colored images like the natural color formed by the Bands 1-2-3, or false color formed color by Bands 5-4-3, which is used in this protocol.

For this protocol can be used images of all satellites available on the LandsatLook platform, but each satellite has different equipment for capturing the images, this causes each one to have different bands, and sequences different from the bands to merge the RGB.

*Obs. Satellites available on the LandsatLook platform, and their bands sequences to form the RGBs are:

Landsat 1-3; Bands: 4-5-6-7; RGB: 4-5-6-7; RGB False Color: 6-5-4.

Landsat 4-5; Bands: 1-2-3-4-5-6-7; RGB: 1-2-3-4-5-7; RGB False Color: 5-4-3

Landsat-7**

Landsat-8; Bands: 1-2-3-4-5-6-7-8-9-10-11-BQA; RGB: 2-3-4-5-6-7; RGB False Color: 5-4-3.

** The Landsat-6 satellite exploded when it was launched, Landsat-7 the main camera of images was damaged when the satellite was already in orbit, only product made available by Landsat-7 are the panchromatic layers, not used in this one. protocol.

9. Cut out the areas under study.

This technique is used to cut the area of study of the total scene, so the area of study becomes evident facilitating its classification and quantification.

10. Cutout RGB.

The RGB of the cutout is used to merge all the bands of the cut, allowing the manipulation of these bands by composing a scene with the natural color (Bands 1-2-3), or false color (Bands 5-4-3). and used in this protocol.

11. Load the SCP (Semi-Automatic Classification) plugin.

This tool and an algorithm, the main plugin of this protocol, is provided by the software itself, and serves to classify the use and occupation of the soil, among other things.

12. Load the trimmer RGB into the SCP plugin.

To start the classification of the use and occupation of the ground and necessary to load the RGB of the cutout of the study area in the SCP plugin.

13. Start the training.

After loading the RGB of the clipping of the study area in the SCP plugin, it must initiate the training, which will condition the plugin to classify the use and occupation of the soil according to the value of each pixel, which is determined by color.

Define group and subgroup of signatures.

Training is based on signatures, which are polygons of each type of land use and occupation. That is divided into groups, such as soil, water, and subgroups, such as exposed soil, urban soil, river and lakes, these groups and subgroups make up the training.

Determine the colors of each group and subgroup.

According to the signatures of the groups and the subgroups made, the colors of each will be defined, in a suggestive way, for a better contrast in the visualization of the use and occupation of the soil.

14. Start and Save the rating.

After saving the training starts the classification of the area, the algorithm of the SCP plugin interprets each signature and classifies according to use and occupation of the whole area, at the end of the classification it must be saved in the classification folder of each area individually.

15. Quantify the use and occupation of the soil.

With the classification finished and saved in the folder correctly, we must quantify each element of the use and occupation of the soil in percentages, for that it is necessary two more plugins, also available in the QGIS software they are: Complementary statistics by zone and Stats Group.

16. Transform the Raster's classification into a Shapefile.

The final product of the classification is a Raster, but Raster can not quantify because it is a photo, so it must transform the photo into a vector, only thus it is possible to quantify the correct number of pixels of all the elements of the use and the occupation of the solo, the Raster becomes a Shapefile, which can be quantified.

17. Statistical plugin by zone.

This plugin allows to quantify the pixel number of each signature, in zones like count, sum, average, maximum and minimum.

18. The Group Stats plugin.

This plugin will allow us to work on the zones determined in the statistical plugin by zone, we can count, add to take the average, maximum, and minimum of each classified area.

19. Sound the signatures according to the color of each.

After running the two plugins will be provided the number of pixels per equivalent signatures per color, add the signatures according to the color, and calculate the percentage of each use and occupation of the soil.

20. Calculate the percentage of land use and occupation.

This calculation will provide the amount of pixels of each use and occupation of the soil in percentage, to facilitate the interpretation of the data.

21. Printing Composer.

The print composer is a very important tool because it is only for him that images can be generated for printing or for filing the classification as an image since they are information in vector layers and can not be viewed in other software. be in the QGIS.


Protocol Step-by-Step


- 1. Determine the location under study.**
- 2. Collect data as coordinates and area of study location.**
- 3. Transform the coordinate data and area of the locality into a Shapefile file.**


*Data above made available by the researcher responsible for the research, including the Shapefile of the study area.

4. Folder template (see Figure -1).

5. Download a Landsat satellite image at www Landsatlook.usgs.gov.


The platform of the site and easy to access and self-explanatory, will be demonstrated here the step by step to download the scenes, when entering the platform. The image is with a topography filter, it should be changed to real image, click on the  Basemap gallery button, choose the image option, first option on the left side. Now the image is in natural color, closer to reality.

Click on the Search button  and enter the name of the locality, city, municipality or neighborhood, as an example was used the name of a city of the state of the acre in Brazil, Mâncio Lima, immediately the platform searches the locality.


Click the Load Images button  to select the desired satellite and the maximum cloud coverage, in the example the Landsat 4-5 satellite, which covers images from 1982 - 2011, was chosen.

When choosing the satellite click on Show Images, and the platform will search in your database the images with the desired profile.

After searching the platform database, the range of available images will be displayed for the search.

For a better understanding of the scope of each scene, make it necessary to use a layer superimposed on the map that delimits each scene, click the  Map Overlay button and choose WRS2 Path / Row Overlay (blue lines).

Blue lines appear on the entire map, these lines form the perimeter of each scene, and in the center a number, in this case 5/65, which represents the position of the scene on the terrestrial globe, in the Display Image choose the option Active Data Only and not Mosaic, so only the active images for the locale searched will appear on the screen.

After choosing the scene you want to download click the Export Images button , and then click Export. The platform will export all available images.

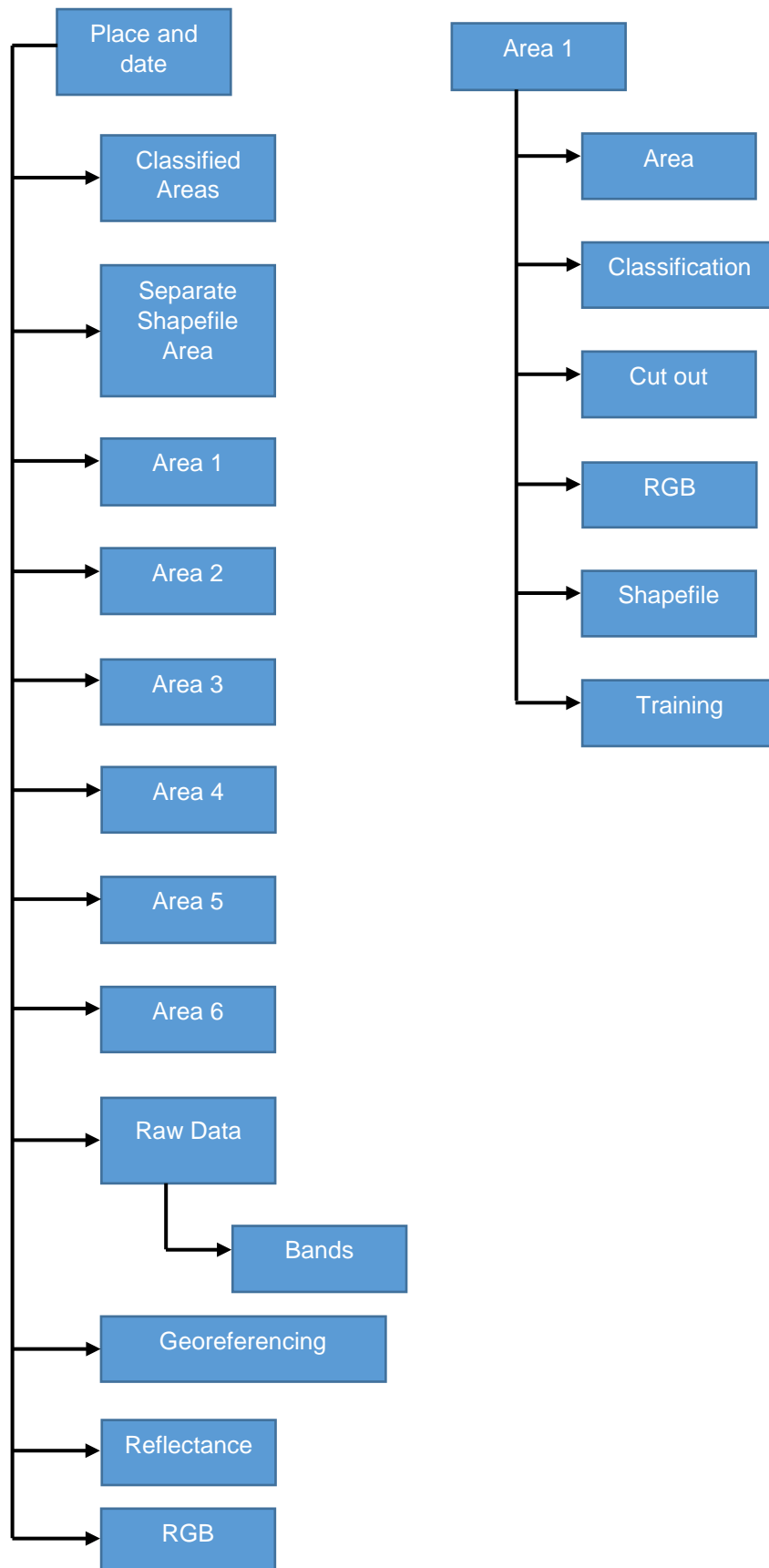
Export completed click Hide Metadata, will open a window where all available images will appear within a range, choose the scene according to the desired date on the left side of the window, following the table after the date, will have important information such as the number of the scene in relation to the terrestrial globe, and important to confirm not to download the wrong scene, and next to it has the percentage amount of clouds on the scene, click on Full Product Download, next will open the interface to download the scene, click the green arrow on the right side of the screen next to the red X.

You will have several products to download, for this protocol and used the product Level-1 Geo TIFF Data Product, it is the most complete product of all.


After downloading the scene, save the information in the Raw Data folder, so all information should be in the Raw Data folder and the Bands should be placed in the Bindings folder for future processes.


Folder template (see Figure -1).


It is necessary to make a folder template so that you can organize and save the information produced during the application of the protocol.





6. Reflectance of bands.


This process helps improve the sharpness of the bands, click Semi-Automatic Classification (SCP),  to start the process.

In the window that opened click on Preprocessing  which is pre-procedure, that is to say before the classification.

There are several tool tabs available, at that time the Landsat tab will be used that is of  the reflectance.

Click the  Select a directory button to load the folder with the bands in the scene, open the Raw Data folder, and select the Bands folder.

After loading the Bands folder, you must load the MTL file by clicking the  Open a file key, the MTL file must be saved in the Raw Data folder.


After all the information loaded, just click the  Run key in the lower right corner.


Select the Reflectance folder, so the new bands are saved. This process lasts a few seconds.



At the end of the process the new bands are loaded automatically, now the bands have an RT prefix.

7. Georeferencing of bands.

Georeferencing is only used when the bands are slightly out of the correct position in relation to the Shapefile of the study area.

First load an RGB that is correct in relation to the study area by clicking the  Raster key.


Look for common dots between the correct RGB and the bands that are out of the correct position, click the  Georeference button.

When you open the georeferencing panel, click the  Open Image button, open the Reflectance folder to select one of the Bands, which are outside the correct location, with the band loaded in the georeferentiator, click the  Add Points button.

Choose common points of the band to be corrected and the correct RGB, when marking a point the geo-referer will ask if you would like to enter the coordinates or mark a point from the map on the screen, choose mark from the map on the screen, check the same point that was marked in the Band, in RGB.

By marking the same point on the map screen the coordinates are saved automatically, and the point is marked in the Band, and the coordinates are saved.

This process must be repeated at least three times or more preferably that the points form a triangle, so that the georeferencing becomes more accurate.


After marking the three points in the wrong band and the correct RGB, click the  Start button Georeferencing. The system will ask. Set the Transformation type, click OK.


When you open Transformation Setup, click Output Raster, select the Georeferencing folder, to save the new Band.

The new band will have the same band name as the only difference that the new band will have a modified suffix, click Save.

The transformation settings window will open again with the address where the new modified band will be saved, click OK.

After the modification make the modified RGB and compare with a correct RGB if they are overlapped correctly.

After marking the three points, click on the  Save GCP points button, so that these saved points are used in the other bands, so you are patronizing, and you do not risk the Bands not overlap correctly one over the other after the georeferencing.


To use the saved points in the other Bands, simply click the  Load GCP points button.

Open the folder where the points file is saved, click the file and the points will be loaded immediately.


Soon after will appear the message GCP file loaded successfully.

8. Total RGB of the scene.


Before starting to do RGB, you have to know which satellite provided the scene, since each satellite has its own combination for RGB fusion. In this protocol, images of the Landsat 4-5 satellites are used, which to merge the RGB bands 1-2-3-4-5-7 are used.



Click the  Raster key to load the Bands, open the Reflectance folder, and select all Bands in the folder.


When opened, the Bands appear open on the left side of the screen in the legend, a red stripe will appear on this card and a warning that some selected files can not be opened as Raster, it will disappear or you can click on the (x) on the right side of the card.



Click the  Close All button, above the legend, the Bands are in descending order from Band-7 to Band-1, the order must be increasing from Band-1 to Band-7, the order must be reversed, with Bands in increasing order from Band-1 to Band-7.

For the RGB merge process, I need to remove the 6-Band because it is not part of the process.

To delete Band-6, select the band to be deleted and click the  Remove Layer / Group button, the system will ask (Remove 1 entry from the legend?).

Click the  Semi-Automatic Classification button, the SCP plugin window will open, the RGB and a process done before the classification, then click the  Band set tab.

Click the  Refresh list key to the right of the window, this button will load the bands that are in the legend, in the same order.


Click the  Select all key, so that all bands are selected, then click the  Add Band to Band button on the right side of the window.

The selected bands, go to the lower window in the same order, select in the lower left corner of the window, the Create a virtual Raster of band set option to create the RGB.

Above the Create a virtual Raster of band set option, has a Quick wavelength settings window, wavelength settings.

It will open a window with several satellite options, choose the one you are working at the moment, realize that besides the satellite has the number of bands and the order in which they must be for the merging of RGB, this protocol uses images from the satellite Landsat 4- 5.

With the option chosen, Landsat 4-5 TM [bands 1, 2, 3, 4, 5, 7], if the band order is not correct, RGB will not output correctly.

Now the information is loaded and just click the  Run key on the lower right side to save and start the RGB merge process.

Save to the RGBs folder, and the process will start automatically after a few seconds.

RGB, soon. It is presented in natural color, composed by the combination of Bands 1-2-3.

This protocol uses the combination of false color, should position the mouse cursor over the RGB and click the right mouse button, a quick access menu will appear, click on properties.

You will see the properties of the Raster you just merged, open the Style tab on the left side of the window, see that some fields Red Band, Green Band, and Blue Band appear, which are filled by Bands 1-2-3, respectively, for false color the field of the Red Band must put the Band-5, in the Green Band put the Band-4, and in the Blue Band put the Band-3.


Open the Load Min / max Values window, select the Cumulative Count Cut option, and then load ...


The Min. And Max information for each Band will change, and the image behind the window will change color.


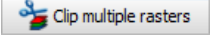
To finish click Apply in the lower right corner of the window, and then Ok, ready the RGB is false color, with the combination of Bands 5-4-3 in that order.



Approaching the image a little, it is observed the elements of the use and the occupation of the soil in different colorations and shades for each use or element of the soil.


9. Cut out the areas under study.


The cut of the study areas allows you to work with only the areas of interest, to start the process, you must first load the bands you want to cut the area under study, to do this click  on the Raster key, open the Reflectance folder and select all available in the folder.



When loading the bands they were presented in a descending order from Band 7 to Band 1, Band Bands should be placed in ascending order from Band 1 to Band 7, Bands placed in ascending order from Band 1 to Band 7, now Shapefiles of the areas under study, which will be used to cut out the areas of interest, click  on Vector, will open a window, click on Search, open the folder of Separate Areas and select files with the extension shp, from all areas and open -the.

After the successfully loaded shapefile, open the SCP plugin, clicking  on the Semi-Automatic Classification button, in the plugin window click the Clip tab .

Click the  Refresh list button on the right side of the window to load the bands, then click the  Select all button, so that all the bands are selected.

Select the Use Shapefile for clipping option, to make the cut using the Shapefile, click the  Refresh list button on the bottom right of the window, to load the shapefile, it will open a list with all the Shapefile loaded, select the landscape 1.


Click the  Run button in the lower right corner to start the process, choose the Cut folder in the Area-1 folder, and save it.

Click again on the  Refresh list button on the bottom right of the window, and select the shapefile-2, click the  Run button in the lower right corner to start the process.

Choose the Crop folder within the Area-2 folder, and save it.

Make this process as many times as necessary according to the number of areas under study, and very important the correct storage of the information generated in the image classification process.

10. Cutout RGB.

To start loading the clippings of the area you want to sort, click the  Raster key.

Click in the Clipping folder, select all Bands in the folder.




Put the Bands in ascending order and remove the Band-6.

To remove Band-6, select Band-6 and click the  Remove Layer / Group button.

The system will ask if you want to, Remove 1 legend entry, click Ok, removed band.


Open the  SCP plugin to start merging RGB.

Select the Band set tab  .

Click the  Refresh list button on the upper right side of the window to load the Bands, then click the  Select all button, the Bands will be selected, now click on  the Add band to Band set button on the right side of the window, and the Bands will be loaded to the window underneath.

Open the Quick wavelength settings window, and choose the satellite according to which you downloaded the scene, for that Landsat 4-5 protocol.

Notice that the numbers of the wavelengths have changed.

Select the option in the lower left corner Create the virtual raster of band set, to create the RGB, then click the  Run key in the lower right corner to start the process.

Select the RGB folder within the Area-1 folder to save RGB.

Automatically the plugin merges the Bands creating the RGB in natural color, Bands 1-2-3.

Select the RGB, click on it with the right mouse button, open the RGB properties, to turn it into a fake RGB color.

In the Banda Vermelha, Banda Verde, Banda Azul, there are Bands 1-2-3 respectively, this combination and natural color, should change the Bands 1-2-3 by Bands 5-4-3 to obtain the false color, then.

In the Red Band put the Band-5.

In the Green Band put the Band-4.

And in the Blue Band put the Band-3

Open the Load Min / Max Values window, select the Cumulative Count Cut option, and then Load.


To finish click Apply in the lower right corner of the window, and then click Ok.

Ready the trimming RGB is in false color, with the combination of Bands 5-4-3 in that order.

This is the end of the first part of the image classification process, which was to download the treatment and cut of the study areas, next steps and the classification of land use and occupation.

11. Load the SCP (Semi-Automatic Classification) plugin. To start sorting.

The SCP plugin has been used up to the present time only to treat and crop the images from here the SCP plugin will be used to classify the use and occupation of soil and its elements.

To start loading the clippings of the area you want to sort, click the  Raster key.


Open the Areas-1 folder, click the RGB folder, and select the file, and Open.

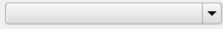
With the RGB loaded, right click on the RGB button to open the properties, and change the Red Band that is with the Band-1 on the Band-5, the Green Band that has the Band-2 on the Band-4, the Blue Band that is with Band-3 leave with Band-3.



With the Bands changed, open the Load Min / max Values window, select the Cumulative Count Cut option, click Load, Apply, and Ok, RGB is in false color and loaded into the SCP plugin.


12. Getting Started

With RGB in fake color, open the SCP plugin tab in the lower left corner of the screen or in the upper toolbar on the SCP key.

Click the  Refresh list button on the top left side of the SCP plugin menu to load the RGB.

Open the window  on the left side Select in the image, to select the image, select the RGB, which you want to sort, that is loaded in the legend.

With RGB selected only need to create a training, to start the classification, for this can be created a new training by clicking on the key to the left of the menu of the plugin  Create a new training input, to create a new training, or if you already have a file training, click the  Open training input button to open the existing training.

Click the  Create a new training input button to create a new training, open the Area-1 folder, then open the Training folder, in this Training folder, enter the training name and Save.

13. Start the Training (make the signatures of the pixels)


The RGB and Training loaded, open the Classification dock tab in the lower left corner.

The Info tab is Macro Class, MC ID is the Macro Class number, C Info is Class, and C ID is the class number.



Enter the Macro Class name in the MC Info field.

Macro Class 1 is Vegetation.

The Class is Preserved Forest.

The Activate ROI Pointer key,  serves to make a polygon automatically, simply click on any point in the image that automatically the system selects the pixels of the same value and forms a polygon.

The  Create a ROI Polygon button is used to make a polygon manually.

Click on the  button then click on a place in the area that corresponds to Preserved Forest, a polygon will form immediately, then Click on  the Save Temporary ROI to training input button to save the signature.

The process takes only a few seconds, when the signature was saved it appears in the frame of the ROI Signature list, on the upper left side.

Repeat as many times as necessary for each use or surface type.

Change the Macro Class number in the MC ID field, place the number 2, to another Macro Class, change the Macro Class from Vegetation to Soil, and change the Preserved Forest Class to Exposed Ground.

Changed Class and Class Macro click on an area corresponding to Solo Exposed.

Click the  Save Temporary ROI to training input button to save the signature.

The process takes only a few seconds.

The signature has been saved and appears in the ROI Signature list box.

Repeat as many times as necessary.

Change the Exposed Solo class to another class corresponding to Solo, changed to Solo Urban.

Click elsewhere in the area that corresponds to Urban Ground, and another signature will be generated.

Click the  Save Temporary ROI to training input button to save the signature.

The process takes only a few seconds.

The signature has been saved and appears in the ROI Signature list box.

Repeat as many times as necessary for each use or surface type.

Change the Macro Class number to enter another Macro Class, enter the number 3, and change the Macro Class to Water, and then change the Class to Rio.

Click on a place in the area that corresponds to Rio, and another signature will be generated.

Click the  Save Temporary ROI to training input button to save the signature.

The process takes only a few seconds.

The signature has been saved and appears in the ROI Signature list box.

Define the colors of each class

Each generated signature has a random color, double-click the color of each signature to be able to change them, leaving the signatures of the same class with the same color.

Clicking twice will open a color window, for Preserved Forest select the Green color and click Ok. Repeat the process with all the signatures of Preserved Forest.

Repeat the process with the Signatures of Exposed Solo selecting for them the color Yellow.

All signatures of Solo Exposto with the color Yellow, repeat the process with the signatures of Solo Urbano, select the color Pink, for Solo Urbano.

Repeat the process with all other Urban Solo signatures, all Urban Solo signatures with the color Pink.

Select the color of the Rio signature, choose the color Blue and click and Ok.

All signatures duly colored according to their classes.

Set the colors of the Macro Class.

Click the Macroclasses tab, and change the colors of the Macros Classes according to what they suggest.

Double click on the color of the Macro Class to change it to Green Color Vegetation, Yellow Color Solo, and Blue Water Color.

Defining the algorithm for Classification

Open the Classification algorithm tab.

Select the type of algorithm to use for sorting, choose the Minimum Distance option.

14. Start and Save Rating



Open the Classification output tab, select the Classification report option, and click the Run button to start sorting.

Select the Classification folder, from a name to the classification of that area, and Save, the process takes a few seconds.

Ready sorting completed.

Click on the Layers tab, on the lower left side, the layers tab will have the RGB Training and Classification.

Disabling the classification can see the signatures of the training, about the RGB, disabling the training can see the RGB, click on the classification file and it will open, showing the signatures and their colors.

Save rating

Click the Save As button to save the rating, locate the QGis folder and open it.

Select the folder with the name of the location and the correct date, the area you have just classified, a name for the classification, and Save.

Rating done and properly saved in your folder.


15. Quantify land use and occupation.

To start the quantification of the use and occupation of the soil open the Classification folder, and select the file, with the extensions .qml and .Tif.

The classification file must be saved on the desktop.

Paste the files of the classification into the workspace, with the saved file, rename the files, place only a letter or number, avoid big names, the system may have problems, ready file saved and renamed.

16. Transform the Raster from sorting into a Shapefile.

Click the  Raster key to load the RGB to be sorted.


Load the sorted files that were saved to the desktop, select the files, and click Open, a few seconds after sorting and loaded.

At the top command prompt, click Raster, go to Convert, Raster to Vector (Polygon), will open a window, the input file the Raster will be loaded automatically.

Click the select button in the Output File for Polygons (Shapefile).

Save these files to your desktop, then click Ok.

Automatically the Raster Transforms into a Shapefile (polygon), click Ok to close the windows, Shapefile ready.


Click the  New button to start a new assignment, the system will ask if you want to save the current project click Discard.


Go to the desktop there will be the folder with the Shapefile, click on the folder Shapefile1, with the button of the mouse to cut it.

Select the Area-1 folder, open the Shapefile folder, paste the Shapefile1 folder into this folder.

Paste properly glued.

Click it to verify that all files are correct, it should always contain 4 files from the following extensions .dbf, .prj, .shp, .shx.

Click the  Open button, choose the QGis folder, open the folder of the location and date in question.

Click and open the file that was previously saved, the file of the complete classification, the Shapefile of this area that was made must be saved together with these files, then click on the  Vector key, to load the Shapefile that will do.

The vector search window will open, click Search, open the Area-1 folder, open the Shapefile1 folder, and select the file with the .shp extension, click Open to load the Shapefile, loaded.

Right-click to open the properties of Shapefile, in the Style tab open the first bar, which is written Simple symbol.

It will open a window with several options choose the Categorized, then click in the field of the Column below the previous one, and choose the 123 DN option.

Click Sort.

The system will sort according to the information contained in the Shapefile, this classification and mirror of Shapefile information, notice that the colors do not match, but the number of signatures does.

Then the colors of the classification should be changed, to be the same as the signatures of the Shapefile, double click on the color to be changed, the color configuration window will open.

Choose the coloration that matches the signature of the Shapefile.

In case the color is black, click Ok.

Make a change of all the colors of the signatures according to the classes, Preserved Forest Green, Exposed Yellow Color, Urban Pink Color and Blue Color.

Delete the last rating, click it then click the Delete button, then click Apply, and to finish Ok.

It can be seen that the signatures of both the classification and the Shapefile are the same.

17. Loading Plugin Complement Statistic by Zone


Click on the button  Statistics by Zone.


It will open a window already with some options selected so the process in question can leave the options checked, make sure in the field Polygonal layer containing the zones, is Shapefile1, click Ok.


18. Loading the Group Stats plugin

In the very fast process, click the GroupStats button.

You will open the GroupStats window.

Click the option  with the left mouse button and hold and drag to the second square on the right side of the Value window.

Now click the option  with the left mouse button and hold and drag to the second square on the left side of the Rows window.

Click the option  with the left mouse button and hold and drag to the second square on the right side of the Value window, all the options loaded, click Calculate.

The Plugin will calculate the pixel quantity of each signature, which will appear on the left side of the window, now and only add the signatures according to the class and color.

19. Add the signatures according to the color of each

Note that from the result that the Group Stats plugin provides is arranged with the corresponding signature number, the signatures 1-2-3 matches the Preserved Kill add fields 1-2-3 of the Group Stats result will provide the pixel amount that was sorted as Mata Preservada, in the whole area, repeat this process with all the corresponding signatures.

For Solo Exposed add the signatures 4-5-9, for Urban Solo add the signatures 6-7-8, the for the River the value is the one of the signature 10, and for Not Classified the value is the one of the signature 0.

Having these values in hand, you can move on to the next step which is to quantify these pixel values of each class by percentage.

20. Calculate the percentage of land use and occupation

So to know how much Preserved Forest has in this area, simply add the signatures of 1-2-3, in this case will give 2040 pixels, for the Solo Exposed add the signatures 4-5-9, in which case it will give 2496 pixels, so Urban Solo adds the signatures 6-7-8, in this case will give 749 pixels, and for Rio as and only a signature that gave 265 pixels, in some cases may appear a signature that was not made by the user, the own system classifies as an unclassified area that appears as a zero signature and its value is 75 pixels in that case, the sum of all signatures has to give a total of 5625 pixels in that case.

The total value of the pixels of each area will vary according to its size and the satellite, to transform these numbers of pixels in percentage is enough to subtract from the total of pixels the value of the zero signature, and the value of the Rio signature, in this case would be : $5625 - 75 - 265 = 5285$ pixels.

Then the total number of pixels of the Preserved Forest by the total value of the pixels already subtracted the values of the signatures of the unclassified and the River and multiply by 100 in that case would be $2040/5285 * 100 = 38.60\%$ of Preserved Forest.

To know the amount of Solo Exposed it is enough to divide the total value of the Signatures of the Exposed Soil by the total value of the pixels already subtracted the values of the signatures of the unclassified and the Rio and multiply by 100 in that case would be $2496/5285 * 100 = 47,23\%$ of Ground Exposure.

To know the amount of Urban Soil it is enough to divide the total value of pixels of the Urban Soil signatures by the total value of the pixels already subtracted the values of the signatures of the unclassified and of Rio and multiply by 100 in that case would be $749/5285 * 100 = 14,17\%$ Urban Ground.

In this way we have the percentage of each use and occupation of the soil.

Preserved Forest = 38.60%


Soil Exposure = 47.23%

Urban Only = 14.17%

21. Printing Composer

The print composer is a tool for image saving and print the data in manipulated layers in QGIS, upload all the information (mount the map), the images can be saved in .png or .pdf extensions, in this case and of fundamental importance the composer of impression, to be able to generate the images.

On the Tools Bar click Project, select the New Print Composer option, when you click New Print Composer, a window will open to name the new composer. After naming, the composer will open.


In the composer click the  Add New Map button, position the mouse cursor in the upper left corner, click and pull to the lower right corner, the area determined by the red rectangle, and the size of the image to be added.

When you release the mouse button the image will immediately appear within the rectangle determined by the user.

Click the image and hold the left mouse button, you will see that the image will move when it is centered will appear two red lines crossing the image.

Release the button and the image will be centered, on the right side of the image click on Item Properties.

In the item property select Frame option, selected the option will open the frame properties, change the Frame thickness, Color or Frame style and apply.


To add the map scale click the  Add new scale bar button, then click the map and the scale will automatically appear, open the item Properties tab, select the style of the scale, there are several scale style options, choose one, select Font and Colors, it will open the properties for the font and the color of the scale, click the Font button.

It will open a window where you can change the Font Font and Size.


Changing colors, in the Font color field, click the color window on the right of the screen, and open the color panel, choose the best color for each map element.

Now change the color of the Line Color field. Will open the color panel, choose the best color for the line, color changed.

Click Position and Size. Change the position of the scale in the x, y, and size fields in the Width and Height fields.



To add a caption click the  Add New Caption button, just click anywhere on the map that the caption will appear automatically.

Disable Automatic Update so you can change the subtitle information, allowing you to delete some information, thus customizing the subtitle.

Select Shapefile1, and click the  Delete key.

Select the other items that will not be used, and delete them, after deleting all change the remaining information.

Double-click the selected item to change its title, and click OK, repeat with all the caption elements you want to change.

Organize the caption items, select the item and click on the   keys to move the caption items to the desired position, organized items.

To change the font size or style of the caption, open the Fonts tab.

In this tab the properties of each subtitle item is available in title, subgroup, group and item.


Click Title Source, it will open a window with the properties, type, style, size of the letters, change the information according to the desired, repeat the process in all the items, Source of the subgroup, Item Source.


To place the caption in the correct place click on Position and size, it will open the configuration window to change Position and size, to change the position change the options X, Y, position as desired, the caption has the Background option, where it can be changed the background color of the caption or remove it.

To change the color and just open the color worksheet in the setting window of the Background option, and change the background color of the caption, to the desired color, or you can choose the background option, just disable the Background function, the caption the background will be transparent.


Choose the background and color options of the caption words to get a better contrast between the options for better viewing caption information.

Caption font color changed, caption positioned, the next step and put a picture if you wish.

To add an image click the  Add Image button, and click the map with the left button and arrest forming a perimeter where the image will be included.


On the right side of the image has the properties of the image, click on the  button to choose the desired image, open the folders to find the desired image, click on Open, the image will be loaded.


Select the Position and Size tab to define the size and position of the image, to change the size simply change the Width and Height fields, to change the positioning simply change the X and Y fields, image positioned in place and with the size right.

To add a title to the map click the  Add new label button, left-click on the map and drag by creating a rectangle to insert the title.

On the right side you will open the title properties, to place the desired title. In the Appearance tab, select Source ... to change the title properties.

Select the Position and Size tab to position the title, change the X, and Y fields to change the title position, ready image.

To save click the  Export as image button, choose the folder to save the image, then open a window to configure the image resolution, it is recommended to leave with 300 dpi, and click Save.

To save in PDF click the  Export as PDF button, choose the folder to save the image to PDF, images saved in the chosen folder.