

Exercise 6: Establishment of Reference Points

Duration	Purpose of Learning
30 minutes	<ul style="list-style-type: none">To determine reference points for ground-truth survey

Requirements:

- QGIS (latest most stable version)
- Laptop/Desktop
- *Lesson 11: Establishment of Reference Points from the Geospatial Training Manual on Green Assessment for Ecosystems Disaster Mapping*
- NDVI pre- and post- (reclassified into 8 classes)
- NDVI difference
- Barangay boundaries (in Activity 1 folder)
- 0.5 and 1 ha training polygons

Expected Output:

- Reference points for Ground-truth with initial assessment of land cover classification for pre-event and post-event based on satellite images

About this Exercise

This activity finalizes the reference points that will be used for Stage 2 of Green Assessment.

Instructions

1. Load the pre-event and post-event NDVI raster layers (reclassified into 8 classes), NDVI difference raster layer, barangay boundary and training polygons in the QGIS project. You may access the sample layers from the activity folder.
2. Once all these layers are ready, follow the steps provided in *Lesson 11. Establishment of Reference layers* to finalize your reference points.



Lesson 12

Establishment of Reference Points

Duration	Purpose of Learning
1 hour	<ul style="list-style-type: none"> To determine reference points for ground-truth survey

Requirements:

- Lecture with powerpoint presentation, on-the fly demonstration of image downloading and hands-on activity

Satellite images downloaded will be reclassified based on their NDVI values to compare the NDVI that occurred due to *Odette* using image stacking.

This section covers the collection of reference/training points in the area of interest in preparation for the Stage 2 of the Green Assessment.

The following are the layers that should be loaded in the QGIS project to generate the reference points:

- NDVI pre- and post- (reclassified into 8 classes)
- NDVI difference
- Barangay boundaries (in Exercise 1 folder)

Then follow the instructions below:

- Search for 'random points' in the *Processing toolbox* of QGIS and select it.
- Use the *barangay_boundary* layer as the input layer.
- As a rule of thumb, there should be 30 to 50 points present per land classification (you may use the formula below in determining the number of random points per barangay);** however, for this activity we will use the barangay boundaries as our input layer so let's set the random points per feature to 30 and set the 50 meter distance from each random point.

Formula in determining the number of random points to be generated per barangay:

$$\frac{\text{specific barangay area (m}^2\text{)}}{\text{largest barangay area (m}^2\text{)}} \times 50$$

- Set the file name and location folder of your output layer.
- Click *Run* to initialize the generation of random points.

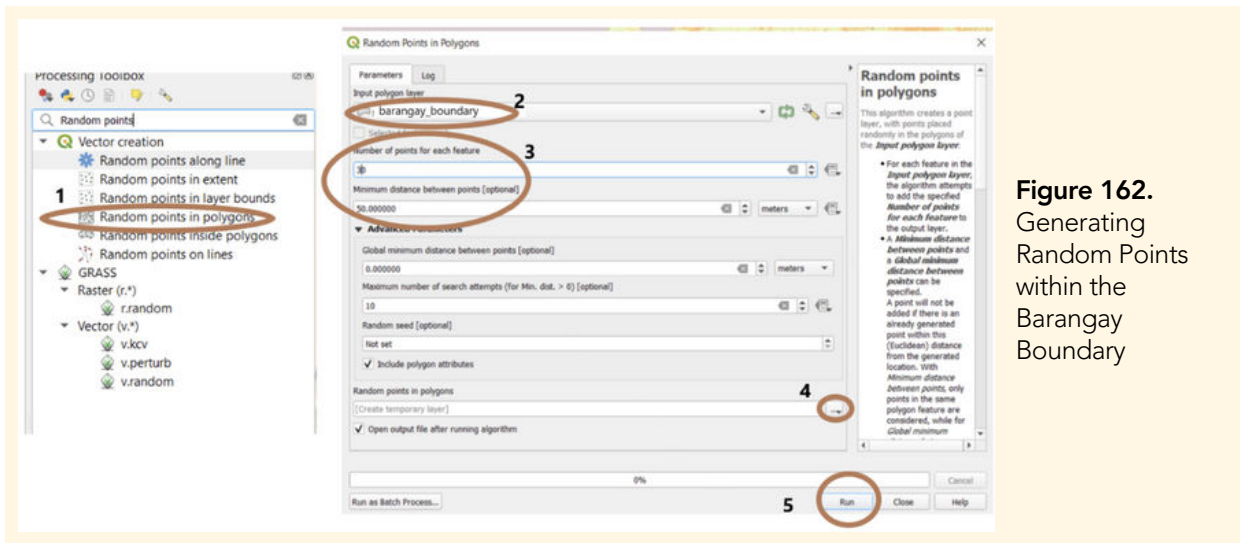


Figure 162. Generating Random Points within the Barangay Boundary

6. After generating the random points layer, go to the *Layers Panel* and open the attribute table of the resulting layer.
7. In the attribute table, you will notice that the attributes of the points are the same as the features where the random points are generated. Edit the attribute table by clicking on the *toggle editing button*.
8. Click on the *Delete field* button to delete unnecessary fields. Leave only the municipality and barangay fields from its original attributes.
9. In the *Delete fields* window list that prompts, click on the field/s that you want to delete
10. Click *Ok*
11. If you want to save your changes, just click the *toggle editing button* again.

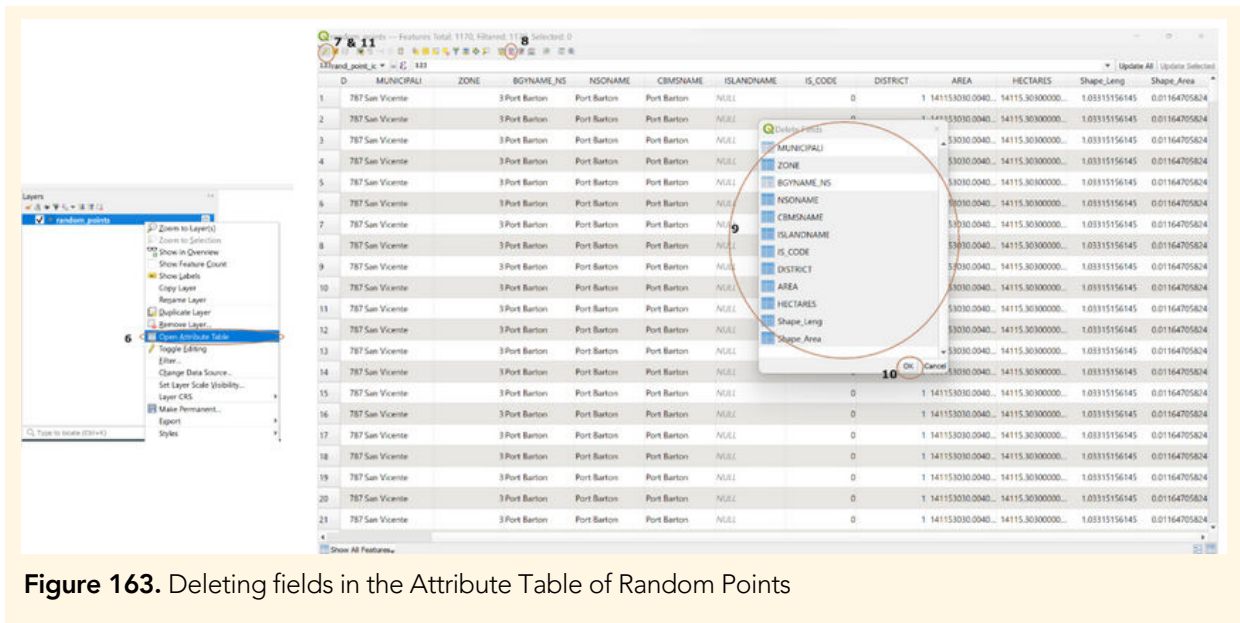


Figure 163. Deleting fields in the Attribute Table of Random Points

12. To compare the pre-event and post-event land cover, fields must be added within the attribute table. To do this repeat steps 6 and 7 and click on the *New Field* button.

Continue

Lesson 12: Establishment of Reference Points

13. In the *Add Field* window that prompts,

Set the following:

Name: 'Name'

Type: Text (String)

Length: 80

Repeat steps 12 and 13 but add the fields: 'LC_Pre'; 'LC_Post' and 'Remarks'

14. Repeat steps 10 and 11.

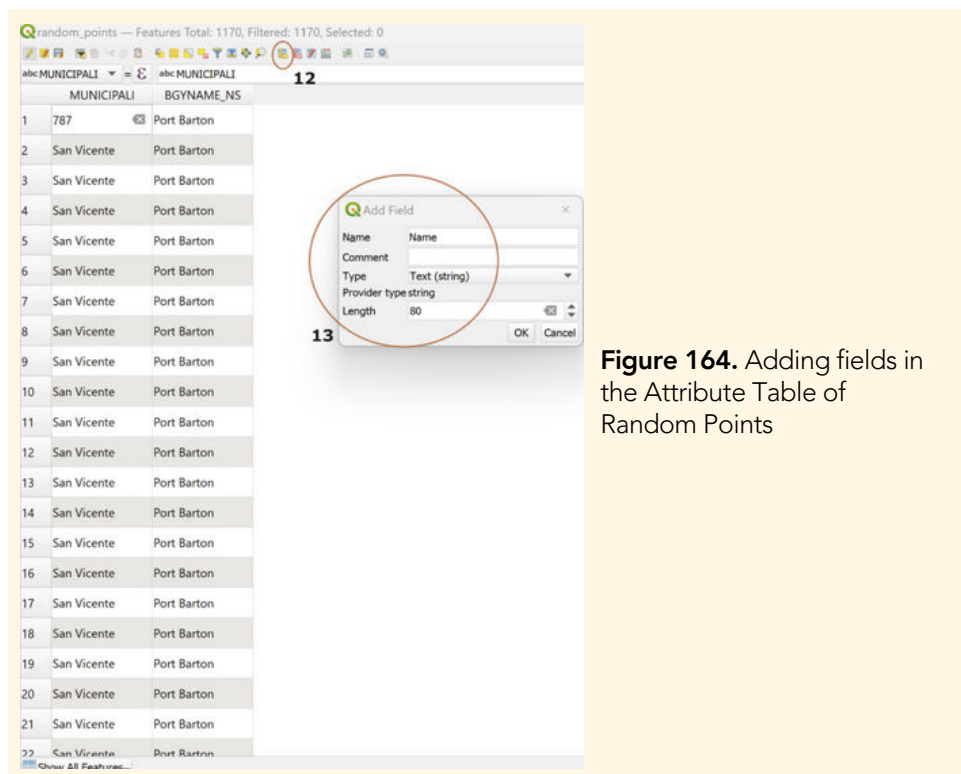


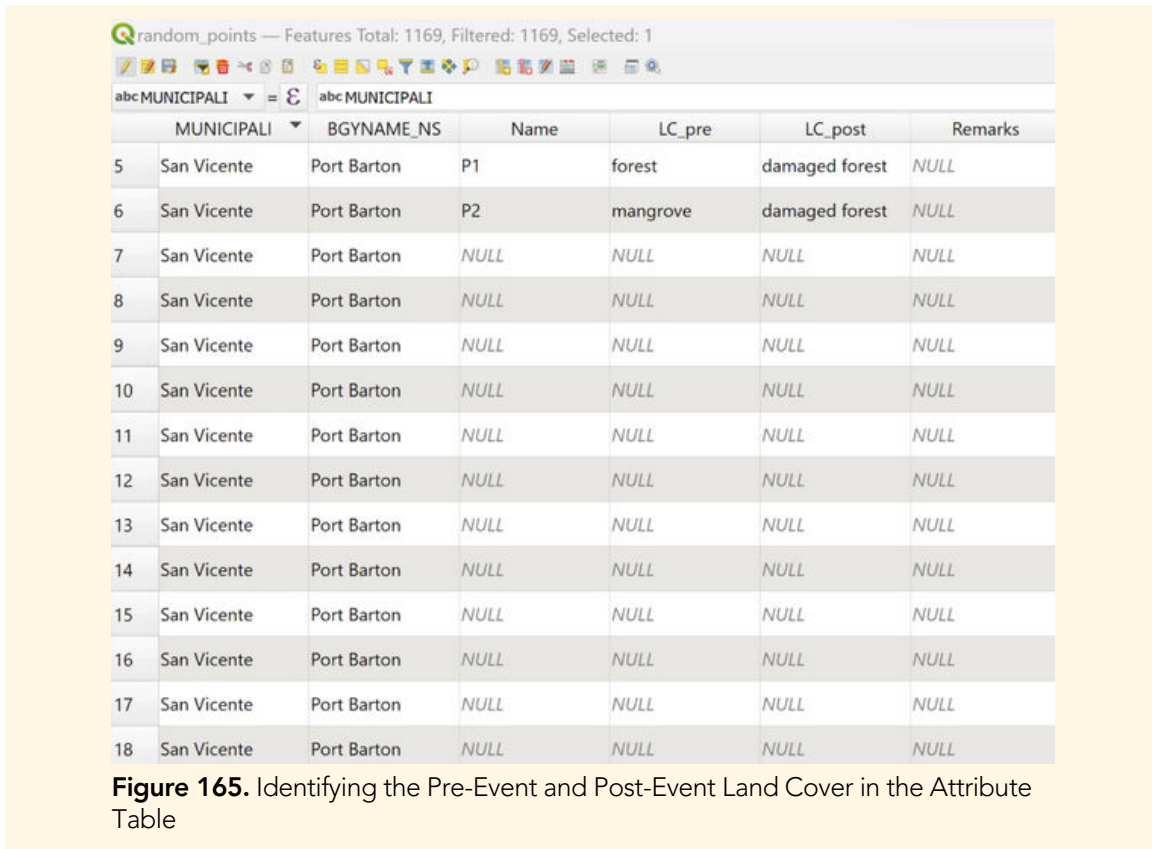
Figure 164. Adding fields in the Attribute Table of Random Points

Now that you have already generated your random points within the barangay boundaries, carefully observe the location of the points. If you are familiar with the area and you notice that the point is either of the following. Delete the points from your random reference points since ground-truthing activities will either be difficult or impossible to do:

- located on bodies of water
- located on extremely high elevation area
- located on inaccessible area (far from road networks)

For this activity, with the remaining random points, identify and search for a minimum of 10 points according to the 6 land classifications discussed in lesson 4. Fill in the land classification on the LC_pre and LC_post fields of your attribute table:

- forest
- cropland
- wetland
- grassland
- settlement
- other land (mixed vegetation; other woodlands)



To identify a point to validate, make sure that the point is the midpoint of either a 0.5 ha or 1 ha training polygon to make sure that the surrounding area of the point has homogenous spectral signatures. You may download the 0.5 ha and 1 ha training polygons from our exercise folder or you can try creating your own by drawing a polygon in QGIS.

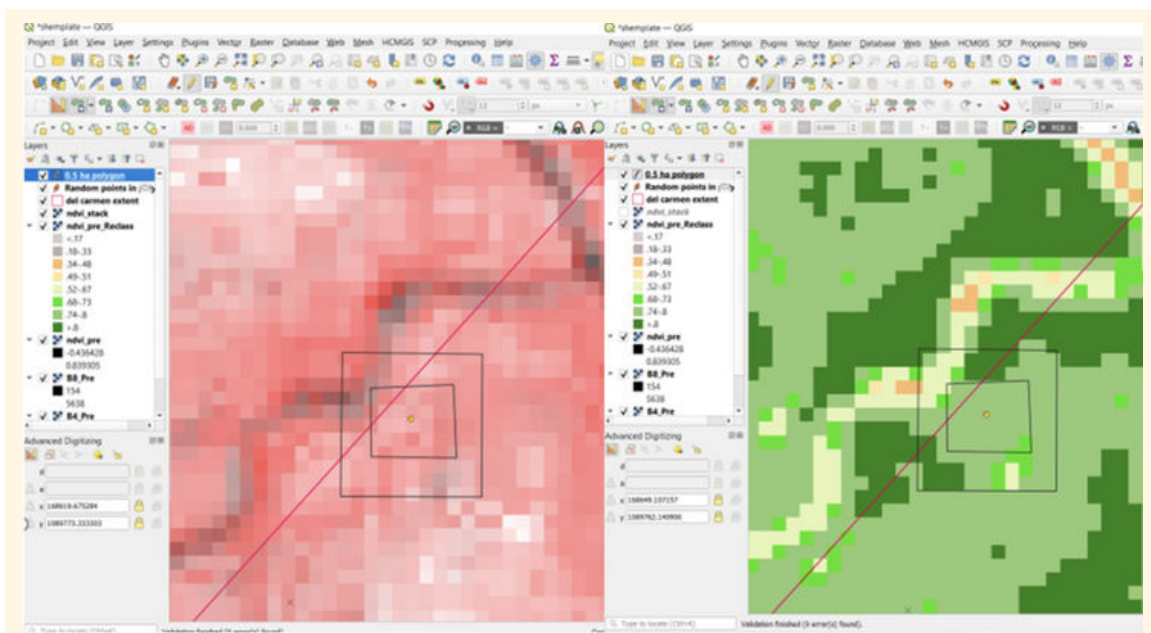


Figure 166. 0.5 ha and 1 ha Polygons over the NDVI Rasters

Editing the Training Polygons

Once you have loaded the 0.5 and 1 ha training polygons in QGIS, you may duplicate those features and move them to your desired area in the map where the points for ground truthing are located.

1. Right click on your training polygons layer and select *toggle editing*

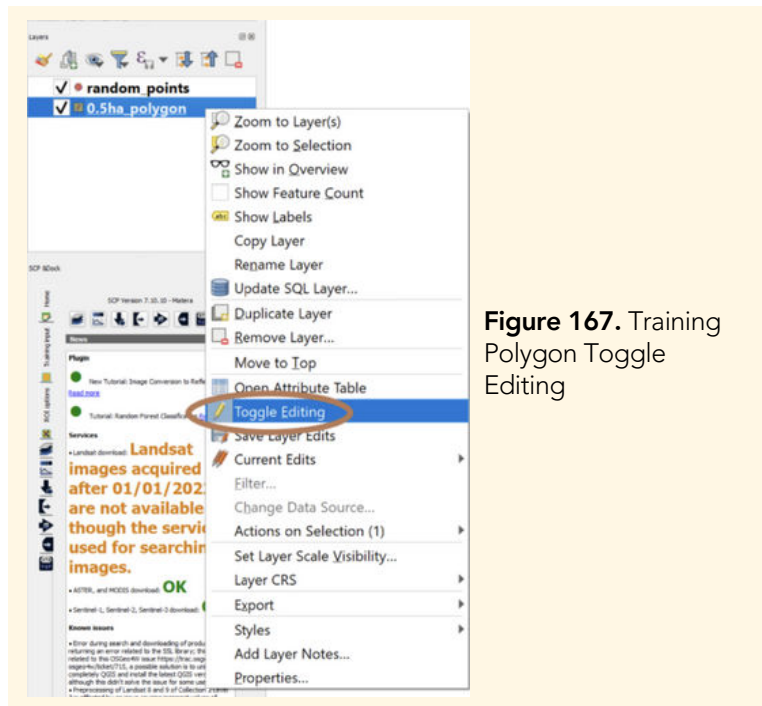


Figure 167. Training Polygon Toggle Editing

2. Once the *toggle editing* button is initialized, you can now duplicate any existing training polygon and just move it using the *digitizing toolbar*.

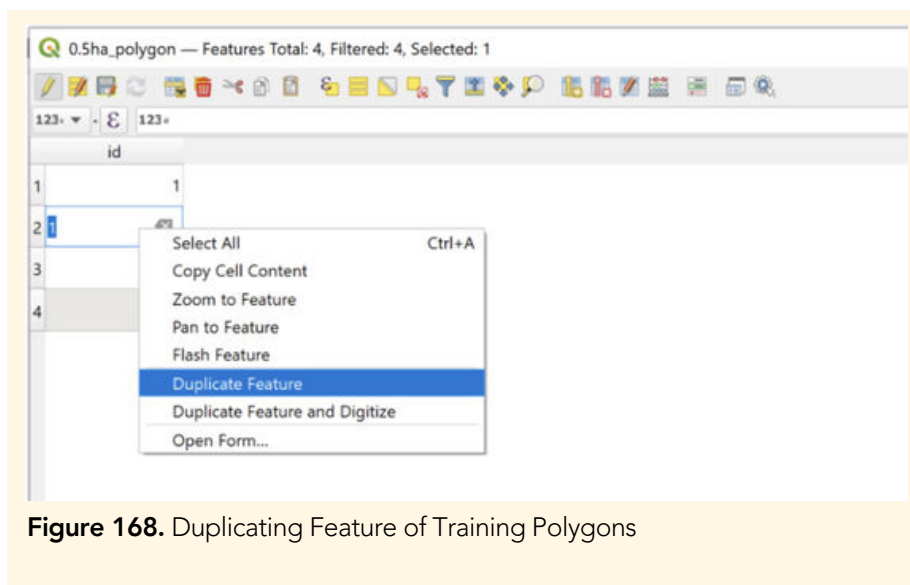


Figure 168. Duplicating Feature of Training Polygons

Lesson 12: Establishment of Reference Points, Editing the Training Polygons

3. After selecting the feature that you will move from the attribute table, click on the *Move Feature* from the *digitizing toolbar*.

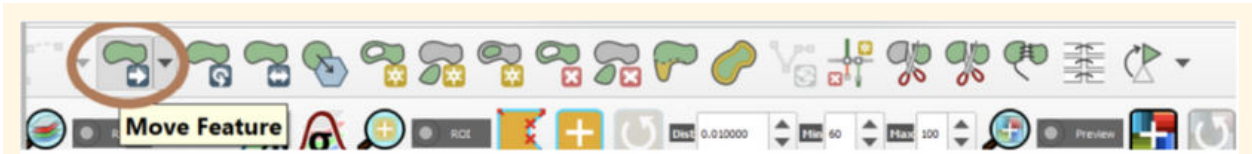


Figure 169. Move to Feature Icon

4. If the *Move Feature* is active, hover your mouse in the map area, you will notice that your cursor will now become a cross. Click on any training polygon on the map and you can drag it to any location.

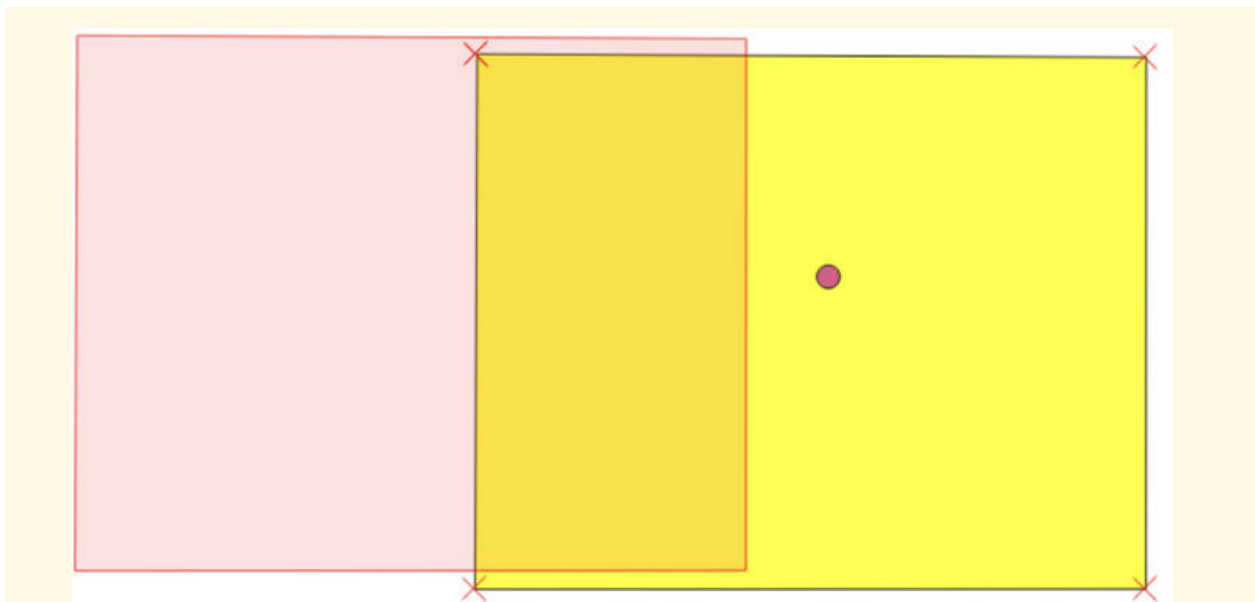


Figure 170. Moving the Training Polygon from its Original Location (yellow) to a New Location (Red)

Exercise 7: Produce Map Layouts

Duration	Purpose of Learning
2 hours	<ul style="list-style-type: none">To visualize into maps all the relevant layers generated in preparation for the Stage 2 of the Green Assessment

Requirements:

- QGIS (latest most stable version)
- Laptop/Desktop
- CCIPH's Manual for the Introduction to Geographic Information Systems (GIS) and Basic Quantum GIS
- Pre- NDVI, Post- NDVI, NDVI Stack and Reference Points Map
- barangay boundary, roads
- Other layers that are relevant into the map

Expected Output:

- Pre-event NDVI Map
- Post- event NDVI Map
- NDVI Stack Map
- Reference Points Map

About this Exercise

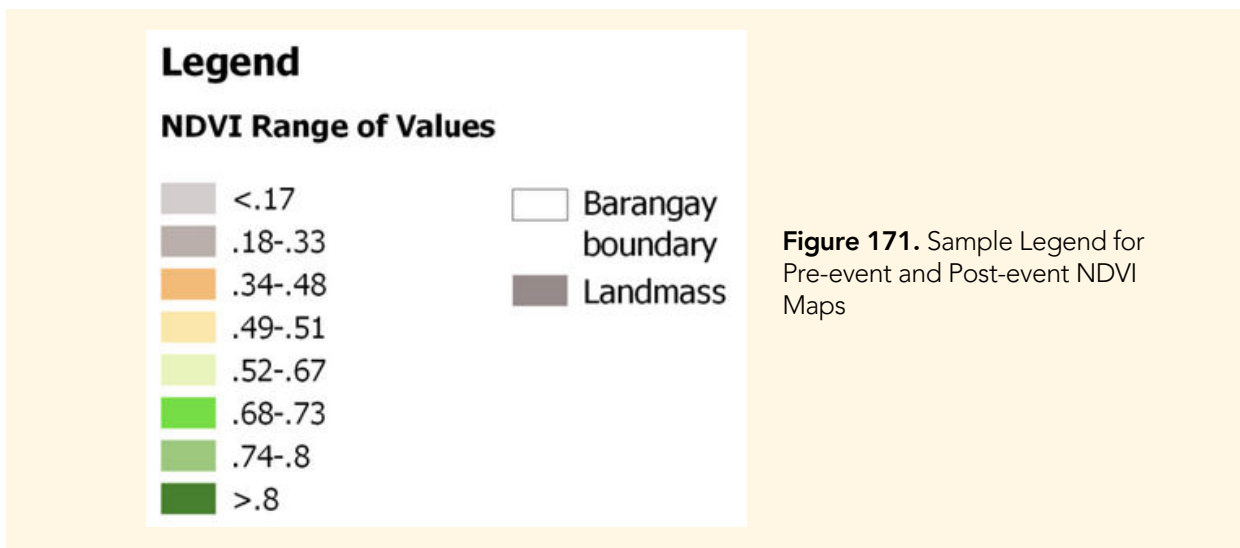
In this activity, participants will have to use their produced pre-event, post-event, NDVI stack and reference points layers to produce four different map layouts.

Instructions

1. Load the reclassified pre-event NDVI, post-event NDVI, NDVI stack and reference points layers to the QGIS Project. Make sure to use the **.qml** provided in the exercise folder to symbolize the pre-event and post-event NDVI features in your layers. For the NDVI stack layer, refer to Lesson10 for the proper symbology.
2. Load all your other layers such as barangay boundary and road networks, which are relevant reference layers for the position of the points on ground.
3. Refer to the CCIPH's Manual for the Introduction to Geographic Information Systems (GIS) and Basic Quantum GIS in creating a map layout.
4. The Legend of your map of NDVI should look like this. However if you have more layers there can be more legend items on the map:

 Continue

Exercise 7: Produce Map Layouts



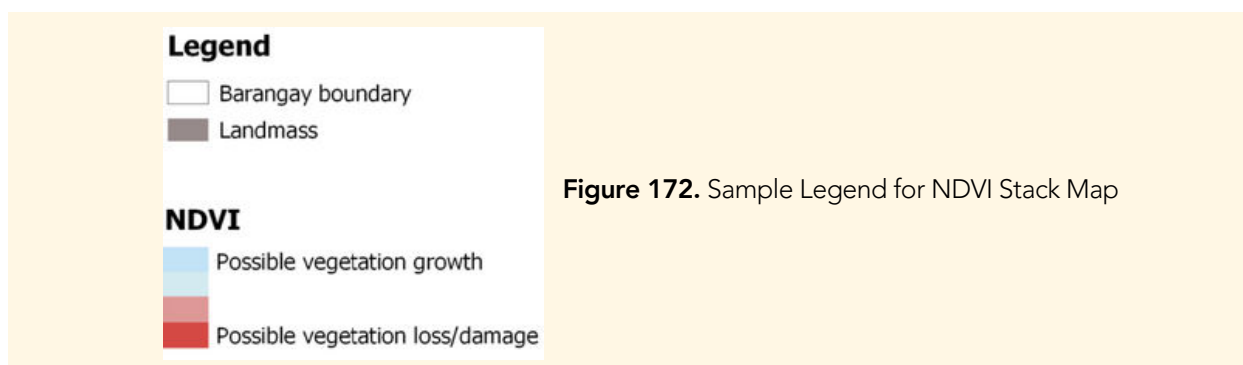
5. Add a note within your map for the pre-event and post-event NDVI . You can place it anywhere on the map:

Note: Normalized Difference Vegetation Index (NDVI) values and their corresponding identification:

- < 0.34: inactive cropland, settlements or barren land
- 0.34 - 0.51: cropland, grassland or non-forest vegetation
- 0.52 - 0.72: mixed vegetation or less dense forest
- 0.8 - 0.74: moderately dense forest
- >0.8 : dense forest

Changes in these values in the post-Odette event would indicate land cover transformation or damage and will need to be ground validated.

6. For the NDVI stack map, the suggested legend should look similar to this:



7. As for the reference points map, you can load the reference points layer, barangay boundary and road network. You can also assign unique codes to each point to easily identify the points in the map.

References

- Abbas, S., Nichol, J., Fischer, G., Wong, M., & Irteza, S. 2020. Impact assessment of a super-typhoon on Hong Kong's secondary vegetation and recommendations for restoration of resilience in the forest succession. *Agricultural and Forest Meteorology*, 280. doi: 10.1016/j.agrformet.2019.107784
- Arcgis. (2022). Sentinel-2 10m Land Use/Land Cover Time Series (Mature Support). [online] Available at: <https://www.arcgis.com/home/item.html?id=d3da5dd386d140cf93fc9ecbf8da5e31>.
- Alexandre, R. (2018). DEM Spatial Resolution. [online] www.jbarisk.com. Available at: <https://www.jbarisk.com/news-blogs/dem-spatial-resolution-what-does-this-mean-for-flood-modellers/>.
- Center for Conservation Innovation Philippines Incorporated (2022). Manual for the Basic and Advanced QGIS.
- Earthblox (2022). Advantages and disadvantages of Google Earth Engine | Blog |
- Earth Blox. [online] www.earthblox.io. Available at: <https://www.earthblox.io/blog/advantages-and-disadvantages-of-google-earth-engine>.
- GISGeography (2015). What is Remote Sensing? The Definitive Guide - GIS Geography. [online] GIS Geography. Available at: <https://gisgeography.com/remote-sensing-earth-observation-guide/>.
- GIS (Geographic Information System) | National Geographic Society. <https://education.nationalgeographic.org/resource/geographic-information-system-gis>.
- GIS DATA TYPES (uwc.ac.za)
- GIS Program Background | Ontario County, NY - Official Website (ontariocountyny.gov). <https://ontariocountyny.gov/1176/GIS-Program-Background>.
- NASA ARSET - Fundamentals of Remote Sensing. NASA Applied Remote Sensing Training Program (ARSET). <http://appliedsciences.nasa.gov/get-involved/training/english/arset-fundamentals-remote-sensing>.
- "QGIS Training Manual". QGIS. https://docs.qgis.org/2.8/en/docs/training_manual/index.html.
- "Gentle Introduction to GIS". QGIS. https://docs.qgis.org/3.16/en/docs/gentle_gis_introduction/index.html.
- "What is Google Earth?" Pedagogy in Action: the SERC portal for Educators. Last modified December 09, 2016. http://serc.carleton.edu/sp/library/google_earth/what.html.

- Landsat Missions (2022). Landsat 9 | U.S. Geological Survey. [online] www.usgs.gov. Available at: <https://www.usgs.gov/landsat-missions/landsat-9>.
- Mondal, Bhabani. (2018). Hyper-Spectral Analysis of Soil Properties for Soil Management
- Natural Resources Canada. (2014). Radiation - Target Interactions. [online] Available at: <https://natural-resources.canada.ca/maps-tools-publications/satellite-imagery-air-photos/remote-sensing-tutorials/introduction/radiation-target-interactions/14637>.
- Papale, D., Vanderbilt, V. and Hart, Q. (2014) 'Remote sensing and modeling in forestry Lecture 4 Resolutions and sensors'. Available at: <https://www.slideserve.com/yanka/remote-sensing-and-modeling-in-forestry-lecture-4-resolutions-and-sensors>.
- Sanderson, R. (2003). Introduction to Remote Sensing. The Photogrammetric Record, 18(103), pp.259–259. doi:<https://doi.org/10.1111/0031-868x.t01-1-00020>
- Wang, X. L., 2008: Penalized maximal F test for detecting undocumented mean shift without trend change. J. Atmos. Oceanic Technol., 25 , 368–384.
- Ya'acob, N., Azize, A.B.M., Mahmon, N.A., Yusof, A.L., Azmi, N.F. and Mustafa, N. (2014). Temporal Forest Change Detection and Forest Health Assessment using Remote Sensing. IOP Conference Series: Earth and Environmental Science, 19, p.012017. doi:<https://doi.org/10.1088/1755-1315/19/1/012017>.
- USGS. (2022). EarthExplorer | U.S. Geological Survey. [online] Available at: <https://www.usgs.gov/tools/earthexplorer> [Accessed 11 Nov. 2022].
- Zhang, X., Wu, S., Yan, X., & Chen, Z. 2016. A global classification of vegetation based on NDVI, rainfall and temperature: identify global vegetation types. International Journal of Climatology, 37(5), 1-7. doi: 10.1002/joc.4847