GIS Project: Analyzing skatepark location in New York city in relation with complaints about requests on graffiti cleaning

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# Part 1: GIS Project

The objective of this project is to show the main functionalities of a GIS open source software. These ones are some of the objectives:

- Create new views and work in different reference systems.

- Reproject vector layers to work in a same reference system.

- Create event layers from an attribute table where there are two fields with point coordinates.

- Label layers and change symbology.

- Create a layout with scale, north, legend...
- Add hyperlinks to image files.
- Load remote layer from external services.
- Use field calculator for operation.
- Create files to be loaded in Google Earth.
- Edit a shapefile graphically and the attribute table associated to a shapefile.
- Analyze different situations using geoprocessing tools.
- Apply color tables in order to see the results of an analysis easily.

# Data of the project

At this project we are going to use several layers:

- Skateparks of New York.

This layer contains the skateparks of New York city. It is a SHP file available in EPSG 4326 reference system (geodetic coordinates, WGS84).

- Graffiti complaints.

This is a CSV file that contains the graffiti complaints in New York city. It has two fields with Latitude and Longitude values, that will be used to get a point layer. Its reference system will be EPSG 4326.

- Streets of New York.

This layer is in SHP format, and contains the streets of New York city, that we will have as reference in the View. The reference system of this layer is EPSG 26918 (NAD 1983 UTM Zone 18N).

- Neighborhood Tabulation Areas of New York.

This is a polygon layer that contains the different neighborhood areas of New York city. It is available in EPSG 4326 reference system.

- Population of the Neighborhood Tabulation Areas of New York.

This is a table that contains the population of the neighborhood areas in New York. It is available in XLS format.

- Orthophoto of New York city.

This is an ortho imagery of a small area of New York city. It is available in SID format.

# Introduction

Geographic information is information that can be associated with a place name, a street address, a zip code, or coordinates.

A great number of government functions require geographic information. A high percentage of the information used by governments is geographically referenced. For example, infrastructure and transportation management, agriculture, safety and emergencies, property records and assessment, planning, natural resource management, economic development planning, health...

All of these applications consider the location of certain features on the landscape in relation to other features. A geographic information system (GIS) allows the user to examine and visualize these relationships.

At this mini-project we want to analyze the skateparks location in New York city in relation with the complaints about requests on graffiti cleaning.



Picture 1. Graffiti in New York city

We will load the different layers in a View, reprojecting some of them in order to work in a same reference system. If they are not reprojected, they won't be able to be visualized correctly, over the other ones.

We will apply a first symbology by district to the neighborhood layer. It will allow us to see the different districts easily by different colors, and we will label the neighborhood areas too by their name.

We also will link some image to a neighborhood. It will be a photography characteristic of that area. When we click on the polygon we get that image. At this point we will edit a layer alphanumerically, adding a new field to the attribute table and filling it in.



Picture 2. New York neighborhood

An Excel file will be imported too with the population of every neighborhood area. At that table there's a field with neighborhood codes, and other one with the names. Both ones are included at the neighborhood layer too, and we will join both tables in order to add the population value to the neighborhood layer. Every polygon will have the population after that. To join the tables we will do it through a common field. We will have to take into account that the neighborhood name can be different in both tables (one of them can have the article "the" for example, so it wouldn't be joined). To avoid that problem we will use the neighborhood codes because they are the same in both tables.

At that point we will have population and area for every polygon, so we will calculate the density for every neighborhood. Area is available in squared meters, but we will calculate inhabitants per squared kilometer. With the field calculator it can be calculated with a simple operation. That tool allows the user to calculate areas of polygons, length of lines, coordinates of points, to split strings or concatenate them, fill in the registers of a field with a value easily...

After having a new field with the densities, we also will obtain the media of all of them. There's an option to get the maximum and minimum values, media...

We will apply a new type of symbology in order to visualize the neighborhoods with higher density in an easy way. Using a legend by intervals, with a graduation from a light color to a dark one, we will show it.

Having the neighborhoods by density we will create a layout. The layout is the graphical representation of a view, the "paper" space, where we can add scale, north, legend, images, titles... It would be able to be printed directly, or exported to a PDF file.

We also will load a raster file over the neighborhood layer. As the raster file will cover the vector layer we will apply transparency to the image in order to see the symbology of the neighborhoods applied previously. Other tools for raster files are: Brightness, contrast, filters... that allow users to do analysis, for example to find the areas with high humidity, coastal boundaries...

We have skateparks and neighborhoods layers in a view at this moment, and we will want to get the neighborhoods that have the biggest skateparks of the city. For that we will select the skateparks, the area of which are more than 15000 squared meters firstly, and then we will intersect the results with the neighborhood layer.

Besides loading local files, we also have the possibility to load remote layers, from external services. There are a lot of public servers available that we can connect to, and at this project we are going to connect to a national server in USA, to load an orthophoto, and to a worldwide service, where we will load a layer with country boundaries. We could work with this last layer like a local vector file. We could select elements, export to a shapefile, do geoprocessing, apply symbology and labeling...

Apart from editing alphanumerical information of a layer, like we have done in a previous step, we also can edit a layer graphically, creating new elements, moving them, scaling them, applying rotation, autocompleting a polygon... We will create a new layer, and we will edit it then.

If we have a vector layer, it can be exported to a format supported by Google Earth. We will do it. Then, that layer can be loaded in Google Earth, where we can get the information of the attributes, change its symbology, create animations following a line...

After loading the previous layers, a point layer will be created from the attribute table got with the graffiti complaints. The table has two fields with Latitude and Longitude values, and a point layer will be created from it, in Geodetic coordinates, and then it will be reprojected to work in the same reference system than the other layers.

At that point, the final analysis will start. For that, the first step would be to get an estimated area of influence from the skateparks. It will be the estimated area around the skateparks where the skaters would be able to work, going by walk or skating.



Picture 3. Graffiti in a Skatepark

Then, for the point layer with the complaints, a density map will be got, where the values will be different where there's a higher density of points (complaints).

The results will be a raster layer, and a color table will be applied on that layer in order to

see the areas with more graffiti complaints in an easier way for a better analysis.

Finally, visualizing the information that have been got at this point, we will be able to analyze if the skateparks location in New York city has any relationship with the complaints about requests on graffiti cleaning. We will see if the area of influence of each skatepark contains the areas with highest density of complaints.

# Part 2: Using gvSIG for analysis

# Exercise 1: Installing gvSIG

To download the application we will access to the gvSIG website (<u>http://www.gvsig.com</u>), and then to the Products->gvSIG Desktop section.

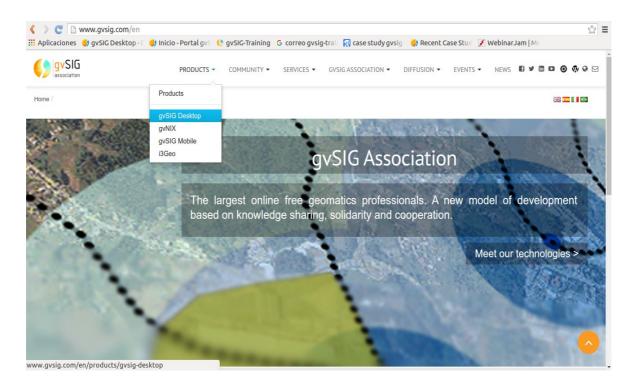


Figure 1. gvSIG website homepage

At the gvSIG Desktop we will access to the "Downloads" section, from the menu at the right side. At this section the latest final gvSIG version is available to download (in this case it is gvSIG 2.2).

licaciones 🛛 🤳 gvSIG Desktop - 🛛 🌖 Inicio - Portal gvS 🔇 🔮 gvSIG	G-Training 🛛 G. correo gvsig-train 🔃 case study gvsig 🛛 🌖 Recent Case Stud 📝 Webinar Jam   Me
PRODUCTS - COMM	MUNITY - SERVICES - GVSIG ASSOCIATION - DIFFUSION - EVENTS - NEWS 🖬 🌶 🛅 🗖 🚳 🚸 🚱
oducts / gvSIG Desktop / Downloads /	時 🎞 🛯 🖾
gvSIG 2.2	gvSIG Desktop
Binaries New features Manuals	Downloads
	Documentation
03/06/2015	Development
All-included version (recommended):	Case studies
🎥 EXE (316 MB)	Videos
A RUN (64 bits) (327 MB)	Development versions downloads
A RUN (32bits) (307 MB)	Previous versions
Portable version:	
🎥 ZIP (488 MB)	
A ZIP (64 bits) (658 MB)	
A ZIP (32bits) (491 MB)	

Figure 2. gvSIG downloads web page

There are two different distributions:

- All-included version: It is a version to be installed on the computer.

- Portable version: It is a ZIP file to be unzipped, and the file to run gvSIG is available in the unzipped folder. It's very useful to install in a pen-drive to run it in different computers.

If you download the "All-included version" you will have to install it, following the instructions.

# Exercise 2: Download the layers to be used at the project

We will download the cartography from public servers, and we will use the open source GIS software called gvSIG.

The data for the project can be download from <u>https://nycopendata.socrata.com/</u>.

#### - Skateparks:

At the previous web page we can look for "Skateparks" at the "Searching" text box. The first result will be: Skateparks, (Directory of Skateparks)

#### Search Results

Name	Popularity	Туре	
Skateparks Directory of Skateparks	405 views	0	
NYC Open Data Available Datasets A listing of all available and planned datasets for use in feeding API calls and embedded lists on the NYC Open Data Compliance Plan Dashboard	43,544 views	¥	

Figure 3. Search results for "Skateparks" expression

We will click on the "Skateparks" link, and a new web page will be opened with a viewer.

At the right side, there's a button to export the layer (the blue one).



Figure 4. Main menu at the Viewer

When we click on it we get the export options for the current layer. At the "Download Geospatial Data" section we can select the file format to be exported. We will select the shapefile format, that can be loaded in gvSIG. When we download it we will get a .ZIP file, that we can save in our hard disk.

Then we will access to the folder where we've saved it ans we unzip the ZIP file. We'll see the shapefile, that is composed by 4 files (.shp, .shx, .dbf and .prj files).

We have to take into account the Reference System of the layers in order to load them correctly in gvSIG (from gvSIG 2.3, if the layer has the prj file attached, it will be loaded correctly).

If we open the prj file, we can see the reference system of this layer. We can see "GEOGCS["WGS84(DD)", DATUM["WGS84", SPHEROID["WGS84", 6378137.0, 298.257223563]], PRIMEM["Greenwich", 0.0], UNIT["degree", 0.017453292519943295], AXIS["Geodetic longitude", EAST], AXIS["Geodetic latitude", NORTH]]", so that means that its reference system is EPSG 4326 (Geodetic coordinates, WGS84).

#### - Graffiti complaints:

At the same webpage, <u>https://nycopendata.socrata.com/</u>, we can look for "graffiti" at the "Searching" text box. At the "Search Results" section we will see: "311 Service Requests from 2010 to Present", where the 311 Service Requests are compiled in a database.

We can filter by type of complaint in order to get the graffiti complaints. For that we will click on the "filter" option at the right side, and we will display the pull-down menu to select:

"Complaint Type" is,

and we will write

"graffiti"

and then we mark that option.

At the attribute table we can see that there are registers where the Latitude and Longitude fields are empty. So they can't be georeferenced. We will apply another filter then to remove these registers. Firstly we have to press "Add a New Filter Condition", and we will display the pull-down menu to select:

"Latitude" is greater than

and we will write "0".

Here we can see the filter applied:

Filter	-	
Filter this dataset based on contents.	些	
Complaint Type ▼ is ▼ ✔ graffiti	×	
	options 🗱	
Latitude - is greater than -	× options 茶	
+ Add a New Filter Condition		

Figure 5. Filter options to be applied

The filter is applied automatically. We will see only the complaints related to "graffiti" issues (we can check it at the "Complaint type" column"), and all the Latitude values completed.

In addition, as there are a lot of columns without information, and other ones with less important information, we can reduce the number of fields, keeping only the important ones. We will access to the "Manage" option (the brown menu), where we can select the fields to show or hide.

🗱 Manage 🗖	More Views	Visualize Discuss () Embed () About
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.73818672424208	34°, -73.992840	Show & Hide Columns 🗾 🗸 🦳
1.67903667298386	6°, -73.9624794	Adjust which columns are visible in this view
1.72276838798646	6°, -73.9829067	Columns
0.71900362490452	2°, -73.9023707	Unique Key
0.70143937110389	95°, -73.886830	Created Date
0.7636231641439	9°, -73.7869581	Closed Date
0.71240189726053	34°, -73.793784	Agency Name
1.8595644585995	15°, -73.899561	Complaint Type
1.85922525273754	45°, -73.904124	Descriptor
1.85857893955207	75°, -73.896266	T Location Type
1.66447785143458	3°, -73.9315391	✓
1.58392316799617	7°74.1600858	T Street Name

Figure 6. Selection of fields to be exported

We will hide all of them, excepting "Complaint type", "Incident address", "City", "Latitude" and "Longitude", and then we will press "Apply". We will see only five columns.

	Complaint Type	Incident Address	6 ≡	City	•≣	Latitude	6 ≡	Longitude	6 ≣	
1 🗄	Graffiti	48 CYPRESS AVENUE		BROOKLYN		40.7084198	37068637	-7	3.92025126305457	â
2 ≔	Graffiti	446 HIMROD STREET		BROOKLYN		40.7050235	52999103	-7	3.91492819272159	J
3 ≔	Graffiti	194 CYPRESS AVENUE		BROOKLYN		40.7052513	31600889	-7	3.91488822791456	
4 :⊟	Graffiti	142-20 FRANKLIN AVENUE		Flushing		40.75652326	68499144		73.8230940725963	
5 🗮	Graffiti	7 WEST 17 STREET		NEW YORK		40.73818672	24242084	-7	3.99284069840155	
6 🗄	Graffiti	836 DEAN STREET		BROOKLYN		40.6790366	67298386	-7	3.96247945090056	
7 \Xi	Graffiti	38 AVENUE B		NEW YORK		40.7227683	38798646	-7	3.98290679257309	
• :=	Croffili			Maapath		40 7400020	20400450	-	000007070076640	

Figure 7. Visualization of the table to be exported

And finally we will click on the "Export" button at the top part (the blue one):

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🗱 Manage	🖚 More Views 🕎 Filter	⊻	Visualize	Export	19 Discuss	C Embed	i About
E Agency	● ≔ /	Age	Export				×
DSNY	De	e	SODA API	l.			• 6

Figure 8. Export menu

and then on the "CSV" format to download the results. We will save the file in the folder where we are saving the cartography. We can name it "graffiti\_complaints.csv".

About the reference system, in this case, the Latitude and Longitude fields indicate that

the data are in EPSG 4326 (Geodetic coordinates, WGS84).

#### - Streets of New York:

We are going to use a layer with the streets of New York. To download it we will access to <u>http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=932</u>, and we have the option "NYS Streets – Public ", inside the "Files available to the Public" section, where we can download a SHP file.

Files available to the Public				
Files	Download	Metadata		
NYS Streets – Public	SHAPE Revised: September 2015	<u>Metadata</u>		
Simplified NYS Streets for Labeling	GEODATABASE Revised: December 2015     SHAPE Revised: December 2015	<u>Metadata</u> <u>Metadata</u>		

Figure 9. NY Streets layer to be exported

Firstly we have to accept the conditions, and then clicking on "Download the NYS Streets – Public File" we will save it in our computer. We will unzip the ZIP file finally.

About the reference system of the layer, if we open the PRJ file we can read "NAD\_1983\_UTM\_Zone\_18N". If we search in Google that string, and "EPSG" word, we can find that the EPSG code for that layer is 26918 (http://spatialreference.org/ref/epsg/nad83-utm-zone-18n/)

#### - Neighborhood Tabulation Areas of New York:

We also will use the Neighborhood Tabulation Areas layer of the city. We can download it from:

https://data.cityofnewyork.us/City-Government/Neighborhood-Tabulation-Areas/cpf4-rkhq.

We press "Export" like we did with the Skatepark layer, and then we select the Shapefile format. Se save the layer in our disk, and we will unzip the ZIP file.

About the reference system of the layer, if we open the PRJ file we can see that it is in EPSG 4326.

#### - Population of the Neighborhood Tabulation Areas of New York:

We will use a table with the population of every Neighborhood Tabulation Area in New York, that we will join to the graphical part. It can be downloaded from: <u>https://data.cityofnewyork.us/City-Government/New-York-City-Population-By-Neighborhood-Tabulatio/swpk-hqdp</u>

We will press "Export" at the right side, like in the previous layers, and we will export it as a XLS file. We will call it: New\_York\_City\_Population.xls

#### - Ortophotography of an area in New York city:

We will use an ortho imagery of New York city, in SID format. It can be downloaded from <a href="http://ftporthos.dhses.ny.gov/napp%5CI9/Jersey\_CityNE\_tile2.zip">http://ftporthos.dhses.ny.gov/napp%5CI9/Jersey\_CityNE\_tile2.zip</a>

After unzip the file we will have a file called Jersey\_CityNE\_tile2.sid.

It is available in EPSG 26918 (NAD\_1983\_UTM\_Zone\_18N) reference system.

# Exercise 3: Starting with gvSIG

Now we run gvSIG, and when it opens we will see a window called "Project Manager", where we can manage our project.

gvSIG allows to work with different types of documents. These documents allow to work with data from different points of view: data as a map, as a alphanumeric table, as graphics... Each document has a series of menus and buttons.

When we save a session or project in gvSIG, this is saved in a file with a ".gvsproj" extension.

In gvSIG there are the following documents:

- Views: It allows to work with geographical data. The geographical information is represented as a set of layers.

- Tables: It allows to work with alphanumeric data.

- Maps: It allows to design maps with the different cartographic elements which make a map (View, legend, scale...) to print it or export it as a PDF.

First step would be to create a new View in our gvSIG project. For that we would select the View icon at the Project Manager, and then we would choose the "New" button. The View will be created and opened automatically, with the name "Untitled".

We can change the name by clicking the button "Rename" from the project manager (The View that we want to rename should be selected). Then a dialog box appears where we can type the new name.

We also can rename the View from the View Properties window (at the View, accessing to the View->Properties menu).

From the View Properties window we also can change the Reference System of the View.

In our project we had some layers in EPSG 4326 (Geodetic coords.-WGS84) and other ones in EPSG 26918 (NAD\_1983\_UTM\_Zone\_18N, in Meters). As they are different reference systems, we have to decide the CRS to use. In our case we will work in EPSG 26918 (coordinates are in Meters and some geoprocesses work better).

So we will change the reference system in our first View. From the View Properties window we will access to the "Current projection" section.

🌖 View propertie	s			° <sub>⊾</sub> ⊠₂	×
General \Snappir	ig \ 3D \				
Name:	Untitled				1
Creation date:	Apr 15, 2016				1
Owner:					1
Map units:	Degrees			-	5
Measuring units:	Meters			•	] [
Area units:	Meters <sup>2</sup>			•	] [
				_	
Background color	:				
Current Projection	ו	EPSG:4326	· · ·		
🗌 Set as applicat	ion's default CRS				
Comments:					
					1
					_
		Cancel	Apply	ОК	

Figure 10. Window where reference system of a View can be changed in gvSIG

At the new window we will select Type EPSG, and we will search "26918", at the "By code" option. We get only one reference system.

8	New CRS						
		Туре	e: EPS	G 🔻			
	Search criteria: ( Search 26918	) By code	С	) By name	⊖ B	y area	
	Code Name		Туре	Area			
	26918 NAD83/UTM 2	one 1 pr	ojected	North America	- 78° I	North America - t	
						<u></u>	
						Info CRS	
		<u>C</u> ar	ncel	ОК			

Figure 11. Selecting the reference system of the current View in gvSIG

Then we accept it, and we also accept the View properties window.

If we open the View we can see its reference system at the bottom line.

	ew Map Portable View Tools Window Help
🗋 😰 🛃 의 🚳 😫 🤘	
🌖 View: Untitled	6° t 🗵
2	
5	
	5
4	
4	
l	Meters X = 743 Y = 0 EPSG:26918

Figure 12. Parts of the "View" document in gvSIG

The parts of the View are:

- 1. Menu toolbar.
- 2. Buttons bar.
- 3. Table of contents (ToC): All the layers containing in the View and the Legend representing the symbology of each layer are listed.
- 4. Locator. Displays the current frame in the total work area.
- 5. Visualization area. Workspace where the geographical information is displayed and the main work is taken place (navigation, selection, edition, etc.).
- 6. Status Bar. Displays information of the View coordinate system, scale, coordinates and units. The information resulting from the use of certain tools is shown in the status bar.

The 3, 4 and 5 components are resizables, dragging its edge to the right/left and for the Locator and the TOC from up/down.

Once the View is open we are going to add our first layer. It will be the NY streets shapefile. We will access to the "View->Add layer" menu, or through the button at the Toolbar

A new window will be open where we can select the type of layer that we want to add. We can add vector and raster local files (File tab), or remote services (WMS, WFS, WCS, OSM... tabs). At the File tab we will press on the "Add" button at the right side.

We will look for the file "StreetSegmentPublic.shp", that will be at the folder where we downloaded the cartography, and we will load it. We can see that the assumed reference system is the same than the View, and it's correct because the layer is at that CRS.

File \WMS \WCS \WFS \WMTS \G treetSegmentPublic.shp	CRS unknown. Assumed EPSG:26918	
		Add
		Properties
		Remove
		Up
		Down

Figure 13. Reference system of the layer when it's not indicated

NOTE: From gvSIG 2.3, if the SHP file includes a PRJ file, if the projection of the layer is different than the View, it will be indicated at that point (something like "CRS xxxxx, Reprojected on the fly").

We finally click on the "OK" button and the layer is added to the View (it is a big layer so it can last some time in being loaded).

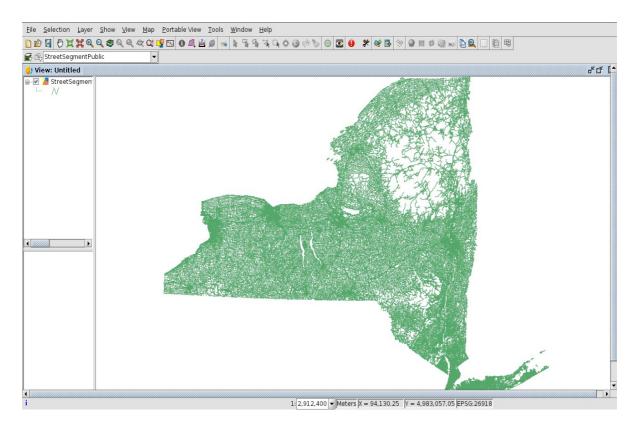


Figure 14. Layer loaded in a View in gvSIG

# **Exercise 4: Reprojecting vector layers**

Now we are going to load the layer about Neighborhoods. We open the "View->Add layer" menu again, and at the "File" tab we click on "Add" button. We select the shapefile about the Neighborhood-Tabulation-Areas (its name starts with "geo\_export...", and the rest of the name is different every time is downloaded). In this case, after selecting it, at the "Add layer" window we have to indicate that this layer is in another reference system. For that we press "Properties", and at the Properties window we access to the CRS option.

🕲 🗉 Add layer			
File \WMS \WCS \WFS \WMTS \Ge			
geo_export_18dec4ab8b59e.shp	CRS unknown. Assumed EPSG:20	Add	South S
		Properties	
		Remove	
		Up	Last P
		Down	STATE I
Sto	ore the parameters need to	open a shp fil	e
Advanced	Basic		
Encoding	Default (use dbf language)		•
shpFile	ks/geo_export_18d062fa-7e74-	45f0-8057-dce	c4ab8b59e.shp
CRS	EPSG:26918		
		Accep	ot Cancel
		OK Cancel	er Carrie

Figure 15. Changing the reference system of a layer, when it's different than the View

At the new window, if we see the EPSG 4326 at the "Recent" Type (because it is the CRS by default in gvSIG), we select it and press "Finish". In case it's not available at the "Recent" CRS's, we will select "EPSG" type, and we will search "By code" and "4326", and we press Finish.

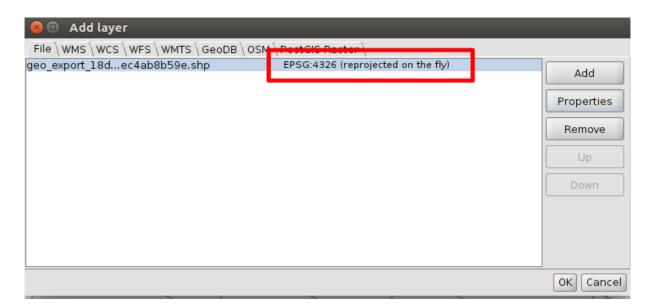


Figure 16. Reference system of a layer, when it is different than the View one

We finally accept the "Add layer" window and the Neighborhood layer will be reprojected on the fly at the View.

As the window says, the layer is reprojected on the fly, but if we want to do analysis (geoprocesses...), it will be done on the original coordinates, so we need to have the layer at the View CRS physicality. For that, we will export the reprojected layer (on the fly) to a new layer. The new one will be in the View CRS.

Firstly we have to put the layer active, clicking on it at the ToC. And then we go to the "Layer->Export to" menu.

At the new window we will select "Shape format", then we press "Next, and we will access to the "..." button in order to select the folder where the file will be saved, and the file name. We can name it "Neighborhood\_26918.shp" (because it will be its new CRS). Then we press "Next", and "All records" option, and we finally press "Export". We indicate that we want to add that layer to the View, and we close the Window.

A new layer is added to the View, and its CRS is the same than the View.

We can delete the old layer from the View, clicking on it (the "geo\_export..."), and with the secondary button a contextual menu is open, where we select "Delete layer".

We can see the attribute table associated to the Neighborhood layer. For that we active it and we press on  $^{\textcircled{B}}$ .

The attribute table contains different fields with the data of each neighborhood.

We can order the field about the neighborhoods ("ntaname" field). For that, we click on the field name, and then we press

The field values are ordered alphabetically.

#### Question 1:

#### After ordering neighborhood field, look for the value "Manhattanville" and select it. Which is the area of that neighborhood (the value of the "shape\_area" field)? Take into account that the three last numbers are the decimal ones.

Now we are going to load the layer about Skateparks. We will follow the same steps than the Neighborhood layer previously. We open the "View->Add layer" menu again, and at the "File" tab we click on "Add" button. We select the shapefile about the Skateparks (its name starts with "geo\_export..."). After selecting it, at the "Add layer" window we have to indicate that this layer is in another reference system. For that we press "Properties", and at the Properties window we access to the CRS option.

At the new window, if we see the EPSG 4326 at the "Recent" Type, we select it and press "Finish".

We finally accept the "Add layer" window and the Skateparks layer will be reprojected on the fly at the View.

We also are going to export the reprojected layer (on the fly) to a new layer in order to have the new one in the View CRS, like we did with Neighborhood layer.

Firstly we have to put the layer active, clicking on it at the ToC. And then we go to the "Layer->Export to" menu.

At the new window we will select "Shape format", then we press "Next, and we will access to the "..." button in order to select the folder where the file will be saved, and the file name. We can name it "Skateparks\_26918.shp" (because it will be its new CRS). Then we press "Next", and "All records" option, and we finally press "Export". We indicate that we want to add that layer to the View, and we close the Window.

A new layer is added to the View, and its CRS is the same than the View.

We can delete the old layer from the View, clicking on it (the "geo\_export..."), and with the secondary button a contextual menu is open, where we select "Delete layer".

# **Exercise 5: Changing symbology**

We will keep visible only the Neighborhood layer at the View (we unmark the check for Streets and Streetparks layers).

We are going to apply a legend to the Neighborhood layer.

For that, press double click on the layer at the View, and the Properties layer window will be opened. Then press "Symbols" tab.

Now we will open "Categories" section and we press "Unique values". Then we select "boro\_name" field, and we select a table color with assorted colors. We press "Add all". If

colors are different we press "Apply" firstly and finally "OK".

🖇 Layer properties 🖉			ಕ್ ಡ <sup>7</sup>
General $\mathcal{Symbols}$ Lab	elling \\ Hype	erlink \ Metadata \ 3D \	
			Save legend Load legend
Categories	Class	ribute field, Show the layers features	Color scheme
Unique symbols		ther values:	
Multiple attribute	Symbol	Value	Label
Linked chart	B	ronx	Bronx
Pie legend	B	rooklyn	Brooklyn
Quantity by cateo	M	lanhattan	Manhattan
Quantities	Q	lueens	Queens
	s	taten Island	Staten Island
· · · ·		Add all Add Remov	re all Remove Symbol levels
			Cancel Apply OK

Figure 17. Symbology configuration

We will be able to see the different districts of New York at the Neighborhood layer.

# **Exercise 6: Labeling a layer**

Now we are going to label the neighborhoods by their name. Open the Properties layer window again and press "Labeling" tab, and enable the labeling. Now we will label by "ntaname" field, with 200 for "fixed height" value, and "Meters" for units. We will change the label color, and we select red or yellow for example. Then we accept that window, and labels will be added.

Now use the "Center view to point" tool ( or in the View->Navigation menu), and center the View to X=600000, Y=4509000.

Question 2: After applying symbology and adding labels, and zooming to the specified point, which is the neighborhood under that point?

# **Exercise 7: Hyperlink**

Now we are going to use hyperlink tool to link an element of the Neighborhood layer to an

image.

Firstly we will download this image to our computer, and we can save it in a short path (for example C:\temp\), and name it "chinatown.jpg":

http://www.newyork.com/articles/wp-content/uploads/2013/04/manhattanchinatown\_a\_540x340\_2013424-450x235.jpg

Then we are going to active the Neighborhood layer at the View and we are going to "Start editing".

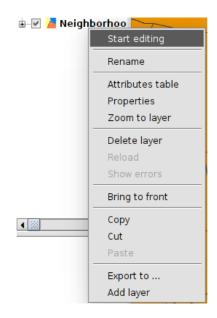


Figure 18. Start editing option

Then we open its attribute table, and we access to the "Table->Add column" menu.

We will add a new string field called "Link", and size "100".

😣 New field prope	rties
Field name	Link
Туре	String 🔹
Length	100
Precision	
Default value	
	OK Cancel

Figure 19. New field configuration

After accepting we will have the new field.

Now we are going to use the "Select by attribute" tool  $\checkmark$  to select one of the elements. We want to select the neighborhood "Chinatown". So we will write this sentence (or clicking on the field and value): ntaname = 'Chinatown'

🤳 Select by attribut	es (Table of attributes	s: Neighborhood_2 🗗 🔀
Table filter		
Fields: boro_name county_fip shape_leng boro_code shape_area ntaname GEOMETRY Link	= != Date < > <= And Or Not Delete text	Contents: Canarsie Carroll Gardens-Col Central Harlem Not Central Harlem Sou Charleston-Richmor Charleston-Richmor Chinatown Claremont-Bathgate Clinton Clinton Hill Co-op City
ntaname = 'Chinatow	m'	New set
		Add to set
		Select from set

Figure 20. "Select by attribute" tool

Clicking on "New set" the Chinatown register will be selected on the View and in the Table.

If we press the "Move up selection" button 💷 we can see it at the first line.

Then we can use the "Zoom to selection" button  $\triangleleft$  to see it on the View.

At the table, at that register, we will fill in the "Link" field with our path to the "chinatown.jpg" image.

	boro_name	ntacode	county_fip	shape_le	boro_code	shape_ar	ntaname	Link	
1	Manhattan	MN27	061	20,786.284	1.000	14,501,6	Chinatown	C:\temp\chinatown.jpg	
2	Bronx	BX40	005	15,878.272	2.000	6,307,28	Fordham South		
3	Brooklyn	BK88	047	39,247.228	3.000	54,005,0	Borough Park		
4	Queens	QN52	081	25,843.365	4.000	29,454,3	East Flushing		
5	Queens	QN48	081	32,446.879	4.000	34,164,2	Auburndale		
6	Queens	QN51	081	33,266.905	4.000	52,488,2	Murray Hill		
7	Queens	QN27	081	19,816.712	4.000	19,726,8	East Elmhurst		
8	Bronx	BX46	005	12,373.256	2.000	9,180,65	Parkchester		
9	Bronx	BX35	005	27,740.846	2.000	16,891,7	Morrisania-Melrose		
.0	Queens	QN44	081	33,596.526	4.000	45,665,5	Glen Oaks-Floral Park		
.1	Bronx	BX98	005	18,903.346	2.000	18,154,5	Rikers Island		
.2	Queens	QN28	081	29,422.792			Jackson Heights		
.3	Bronx	BX55	005	19,755.306	2.000	16,260,5	Soundview-Bruckner		
.4	Queens	QN07	081	20,976.336	4.000	22,887,7	Hollis		
.5	Manhattan	MN06	061	17,040.686	1.000	10,647,0	Manhattanville		
.6	Queens	QN02	081	25,433.583	4.000	28,428,4	Springfield Gardens N		
.7	Manhattan	MN23	061	29,385.030	1.000	25,000,5	West Village		
.8	Bronx	BX62	005	38,709.079	2.000	39,744,9	Woodlawn-Wakefield		
.9	Queens	QN71	081	19,335.567	4.000	15,621,2	Old Astoria		
20	Queens	QN46	081	43,014.805			Bayside-Bayside Hills		
21	Queens	QN38	081	30,731.592			Pomonok-Flushing He		
22	Queens	QN68	081	27,067.653			Queensbridge-Raven		
23	Bronx	BX28	005	22,003.840			Van Cortlandt Village		
	Bronx	BX13	005	30,338.277		39,875,7			
25	Manhattan	MN15	061	35,037.171		18,381,3			
26	Brooklyn	BK25	047	27,514.023	3.000	29,991,9	Homecrest		

Figure 21. Path to the image for the hyperlink tool

Then we will close the table and using the secondary button of the mouse on the "Neighborhood" layer we will finish editing mode. We will have a zoom to Chinatown neighborhood at that moment.

Now we have to configure the Hyperlink properties. We will open the Neighborhood layer properties (double-click, or secondary button of the mouse). Then we will access to the "Hyperlink" tab.

At that window, we will enable the Hyperlink, we will select the "Link" field at the display, and "Link to image files". Then we accept it.

🗳 Layer properties					🎆 <b>-</b> 🖉	×
General \Symbols \Labelling Hyperlink \Metadata \ 3D \						
🗹 Enable hyperlink						
Actions						
Add action Remove action						
Field Link    Extension	Action	Link to	image files	•		
		[	Cancel	Apply	ОК	

Figure 22. Hyperlink settings

At the View we will use the "Hyperlink" tool *solution* and we will click on the "Chinatown" polygon. The Chinatown image will appear in gvSIG.

#### **Exercise 8: Loading Excel files**

At this point we are going to join the fields of a table to another one. First of all we will load an Excel file, that we have downloaded at the beginning. The file is called New York City Population.xls.

We will open the Project Manager (from the "Show->Project manager" menu), and we select "Table" document. Then we press "New", and at the "File" tab we press "Add". We select the "New\_York\_City\_Population.xls" file that we saved in our cartography folder, downloaded from the NY website.

When the XLS file appears at the "New table" window, we will have to configure it to be loaded correctly, so we have to select the table and press "Properties".

🕲 🕒 New t	able							
File \ DB \								
New_York_City_	Population.xls		Add					
			Properties					
			Remove	riBeC				
			Up	ibec				
	😣 💷 Store the para	meters need to oper	n a Excel file					
	General \ Advanced \							
	File	:tos/Abu_Dhabi/T2/Net	w_York_City_Popu	Ilation.xls				
	Locale	Default (use system l	Default (use system locale) 🔹					
	Sheet to load	New York City Populat	ion By Ne	•				
	Use first row as header							
	CRS							
	Point (X,Y,Z)							
	Excel file							
			Accept	Cancel				
			OK Cancel					

Figure 23. Loading an Excel file

Then, at the "General" tab, we will mark the "Use first row as header" option. We accept both windows and the table will be open in gvSIG.

We can see a field called "NTA Code" that contains the Neighborhood codes, like we had at the "Neigborhood" layer. We also have a field with the population of every neighborhood. We are going to include that population to the Neighborhood shapefile attribute table.

		nager			d X											i ∎k
<b>\$</b> 7	Table	of attribute	s: Neighboi	rhood_2691	8					් වී 🗵		<				
le		boro_name	ntacode	county_fip	shape_leng	boro_code	shap	e_area	ntaname	Link						
1	1	Manhattan	MN27	61	20,786.284				. Chinatown				$\downarrow$			
	2	Bronx		05	15,878.272				Fordham							
	3	Brooklyn		d <mark>4</mark> 7	39,247.228				Borough					<u> </u>		
	4	Queens		081	25,843.365				. East Flus	12			/			
		Queens		<b>d</b> B1	32,446.879		34,16		w York City	Populat	ion.New York City	Population	By Ne		ේ ස් ල්	۲ X
		Queens		C 81	33,266.905		52,48	_					-			
		Queens	QN27	<b>6</b> 81	19,816.712		19,72		Borough	Year	FIPS County Code		NTA Name	Population		
		Bronx		05	12,373.256		9,180		Bronx	2,000		BX01	laremont	28,149		
		Bronx		05	27,740.846		16,89		Bronx	2,000		BX03	astchest	35,422		
		Queens		C 81	33,596.526		45,66		Bronx	2,000		BX05	edford Pa	55,329		ľ
		Bronx		05	18,903.346		18,15		Bronx	2,000		BX06	elmont	25,967		
		Queens		<b>C</b> B1	29,422.792		47,85		Bronx	2,000		BX07	ronxdale	34,309		
		Bronx		05	19,755.306		16,26		Bronx	2,000		BX08	/est Farm	34,542		
		Queens	QN07	C 81	20,976.336		22,88		Bronx	2,000		BX09	oundview	50,753		
		Manhattan		<b>d</b> 61	17,040.686	1.000			Bronx	2,000		BX10	elham Ba	27,140		
		Queens		<b>G</b> B1	25,433.583		28,42		Bronx	2,000		BX13	o-Op City	40,676		
		Manhattan		61	29,385.030	1.000			Bronx	2,000		BX14	ast Conc	58,961		
		Bronx		C05	38,709.079		39,74		Bronx	2,000		BX17	ast Trem	39,280		
		Queens		<b>0</b> 81	19,335.567		15,62		Bronx	2,000		BX22	orth River	28,013		
		Queens		681	43,014.805		80,79		Bronx	2,000		BX26	lighbridge	33,844		
		Queens	QN38	<b>G</b> B1	30,731.592		38,83		Bronx	2,000		BX27	unts Point	25,142		
		Queens		<b>G</b> B1	27,067.653		23,31		Bronx	2,000		BX28	an Cortla	50,607		
		Bronx		05	22,003.840		25,67		Bronx	2,000		BX29	puyten D	29,872		
		Bronx		C05	30,338.277		39,87		Bronx	2,000		BX30	ingsbridg	33,286		
	25	Manhattan	MN15	C <mark>61</mark>	35,037.171	1.000	18,38		Bronx	2,000		BX31	llerton-Pe	28,510		
		•		8 <mark></mark>					Bronx	2,000		BX33	ongwood	23,082		
Þ				1/19	5 Total of select	ed records			Bronx	2,000		BX34	lelrose So	33,195		
				- / - 0	o rotar or ocioet				Bronx	2,000		BX35	lorrisania	29,797		
						7			Bronx	2,000		BX36	niversity	54,335		
						(R)			Bronx	2,000		BX37	an Nest	27,135		
									Bronx	2,000		BX39	lott Have	49,030		
									Bronx	2,000		BX40	ordham S	26,880		
								26	Bronx	2,000		BX41	lount Hope	52,649		
						e -					0 / 390 T	tal of selecte	records.			
						*{		<u> </u>			v					

Figure 24. Common fields to join tables

# **Exercise 9: Joining tables**

We are going to open the View, and we will open the Neighborhood attribute table. Then we will open the "Create join" tool **2** (or in the Table menu). At the new window we will select "Neighborhood\_26918" table as data store, and then we press Next. Then we select Neighborhood\_population table as second data store. Then at the next window we select "ntacode" for field of the first table, "NTA Code" for the second one, "N" as a prefix for the first tabla (from "Neighborhood"), and "P" for the second one (from "Population"), and we select "Population" field to be imported.

😣 🗉 🛛 Apply a transfor	m
COL1 COL2 COL3	Select the transformation parameters Select the key of the first table
Image: marked bit is a state of the state of th	ntacode  Select the key of the second table NTA Code
	Type a prefix for the first table
COL1 COL2 COL3 COL4	Type a prefix for the second table P Select the attributes to join
	Year  FIPS County Code NTA Code NTA Name Population
	<pre></pre>

Figure 25. Table join settings

Then we press "Next" and at the last window we mark the option to load the transformation as a layer, and we select the "Untitled" view (it was the first one, in EPSG 32918). Then we press Finish and a virtual layer called "Join" is loaded at the View. If we open its attribute table we can see that the Population field has been added at the end.

We can order the field about the neighborhoods ("N\_ntaname" field). For that, we click on the field name, and then we press

The field values are ordered alphabetically.

#### Question 3:

# After ordering neighborhood field, look for the value "Erasmus" and select it. How many population does it have?

#### **Exercise 10: Field calculator**

Now that we have the population and area values of every neighborhood we want to calculate their density. For that we will use the field calculator.

As the "Join" layer that we created from the join of tables is a "virtual" layer, we will have to export to a new SHP file in order to work on it. So we put the "Join" layer active qat the View, and we go to "Layer->Export to" menu, like we did previously. Then we will select Shapefile, and at the next window we access to the "..." button to select the output layer. We will name it "Neigborhood\_population.shp", and we will export all the registers. We finally will add it to the current View. We can see that some fields will be renamed because the field names of dbf files can't have more than 10 characters.

Now we will put the new layer active and we will start editing (second button on it). We will open its attribute table, and we will go to "Table->Column manager" menu. We will click on "New field" and we will add a new field called "Density", type: "Double", and size: 50. The new field will be added at the end of the table.

Field name	Туре	Length	Decimal count	Default value	New field
V boro nam	String	254	0		New Held
V ntacode	String	254	0		Rename field
V county f	String	254	0		Delete field
V shape le	Double	18	6	0.0	
V_boro_cod	Double	18	6	0.0	
V_shape_ar	Double	18	6	0.0	
V ntaname	String	254	0		
Link	String	100	0		
Populati	Long	18	0	0	
GEOMETRY	Geometry	0	0		

Figure 26. Creating new field in a table

Then we put it active and we open the Field calculator <a>[</a></a>

We have to take into account that area value is available in meters, so the density won't be clear. We will need to convert it to squared meters. So we have to write this operation:

[P\_Populati]/([N\_shape\_ar]/1000000)

(we can double-click on the field names to add them to the Expression box)

Calculate expression	ut right now	
with current values in table.		
General \ Advanced \		
Field	Туре	Commands
[N_boro_nam]	<ul> <li>Numeric</li> </ul>	abs
[N_ntacode]	🖉 🔘 String	acos
[N_county_f]	🖉 🔘 Date	area
[N_shape_le]		asin
[N_boro_cod]		atan
[N_shape_ar]		ceil
Expression Column : Density	1	
[P_Populati]/([N_shape_ar]/100	0000)	
	Clear expression	
		OK Cancel

Figure 27. Field calculator

If we press OK, the density of every neighborhood will be added to the table (the last 3 characters are the decimals).

We finish editing of the layer.

#### Question 4:

After ordering neighborhood field again, look for the value "Hollis" and select it. How much density does it have?

We also can see the main statistics of a field. For that, keeping the "Density" field active, we can press "Statistics".  $\sum$  Then we will see the Maximum and minimum values, Media...

#### *Question 5: What's the media of the population density in New York?*

Now we are going to apply a symbology by intervals, where we can see what neighborhood areas are more populated in an easy visualization.

Firstly we will zoom to the Neighborhood\_population layer. We put it active, and then secondary button of the mouse, and finally "Zoom to layer".

Then we will double-click on the Neighborhood\_population layer to open its properties, and we access to the Symbols tab.

Then we access to Quantities-> Intervals.

Now we select "Density" as Classification field, "Equal intervals", and 5 intervals. We select the white color as origin one, and a dark color (we can keep the blue one that is by default). Finally we press "Compute intervals", and then "Apply" and "OK".

🌖 Layer properties 🦉	r 2 <sup>™</sup> ⊠
General Symbols Lab	pelling \ Hyperlink \ Metadata \ 3D \
	Save legend
⊕ Categories ⊕ Features	Show the layers features using a range of color according to values of a attribute field.
Multiple attribute	
Quantities	Fields Color ramp
- Dot density - <del>Graduated</del> symbo	Classification field Density Begin color
-Intervals	
Proportional sym	Nr of intervals 5 End color
	Other values:
	Symbol Value Label
	0.0-1129.3727999999999 0 - 1,129.373
	1129.3827999999999-2258.7 1,129.383 - 2,258.746
	2258.7556-3388.1183999999 2,258.756 - 3,388.118
	3388.128399999996-4517.4 3,388.128 - 4,517.491
4	4517 501 2-5646 864 4 517 501 - 5 646 864
Ver-ut	Compute intervals Add Remove all Remove
	Cancel Apply OK

Figure 28. Symbology by intervals configuration

We will able to see the areas with a high density in an easy way.

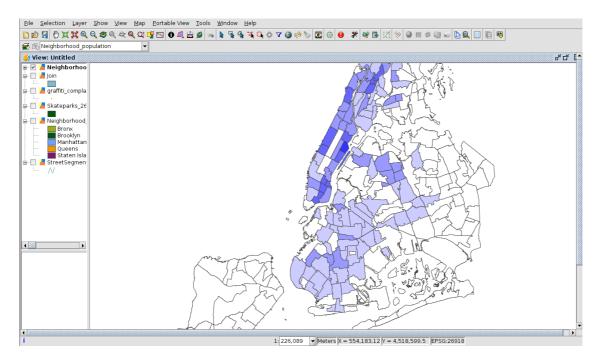


Figure 29. Symbology by intervals for neighborhood density of population

# **Exercise 11: Cartographic representation**

Now we are going to create a map with the cartography of the last view. We also will include a legend, north arrow, scale...

At the current view ("Untitled"), we are going to keep only the Neighborhood\_population layer visible, with the legend by density.

Firstly we will download this image in our disk: <u>https://cdn.civitatis.com/guias/nuevayork/fotos/thumbs/nueva-york.jpg</u>

Now, to create a map, we will open the Project manager ("Show-Project manager" menu), and we click on the Layout document. Then we press "New", and a new window is opened.

We will select "Page Size": A4, "Horizontal", and we select the "Untitled" view. A new layout is created with that view.

Now we can reduce its size, to have enough space for the different elements.

Then we can access to the "Map->Insert" menu, and we will insert:

- Legend: We will draw a rectangle on the map, and we will select the view that we have at the layout. We select only Neighborhood\_population layer for the legend.

😣 Properties o	f legend framework		
Framework of th	FFrameView 0: Untitled	Neighborhood_pop Join graffiti_complaints Skateparks_26918 Neighborhood 269	Degrees:
Quality	Presentation • OK Cancel Font	StreetSegmentPub	<b>▲</b> 0 <b>▲</b>

Figure 30. Legend settings at the layout

- Scale: We will draw a rectangle where the scale will be inserted, and we will select the view that we have at the layout. Then we will choose a graphical scale.

Framework of the viev	v	Scale Degrees:
FFrameView 0: Untitled		1:271875
		Show numeric scale.
Bar:		🗌 On the scale bar 🚹 🚺 🚺 🗲
🗌 Keep interval		Units:
	•	Meters -
Number of decimals 0		Show units
Interval	5000	On the scale bar
Number of Intervals	1	Lables:
Divisions to the left	2	✓ On the scale bar
	-	Font I IIII
Color:		
Accept		Cancel

Figure 31. Scale settings at the layout

- North: We will draw a rectangle where the north will be inserted, and we will select the view that we have at the layout, and the type of north arrow. At this way, if we rotate the view at the layout, the north arrow rotates at the same time.

8	Propert	ties of Ir	nage fra	mework		
	ž	ف	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	÷.		
	A	()	$\Delta_{\mathbf{z}}$	Ĩ	٢	
		+	W + E	•	*	
	للله	Ä	Å	Ä	N.	-
		f the view				
FFran	neview (	0: Untitle	d			
					OK Car	ncel

Figure 32. North settings at the layout

- Image: We will draw a rectangle where the image will be inserted, and we will select the image that we have downloaded (nueva-york.jpg), accessing to "Browse". The image will be added to the layout.

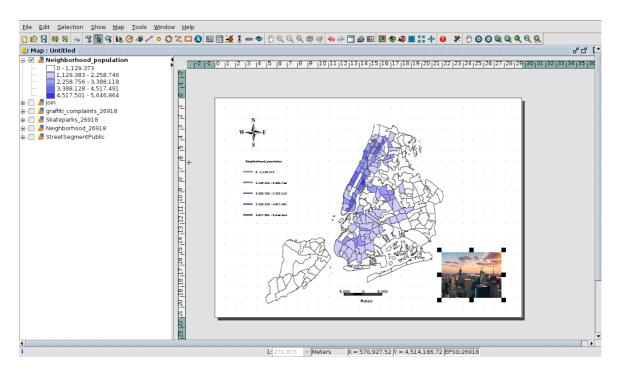


Figure 33. Layout in gvSIG

Now we can export it to a PDF file (from #).

#### *Question 6: Create a PDF file with the map of densities in New York neighborhoods.*

# **Exercise 12: Adding raster files**

We are going to add a raster file at the View now, so we are going to open it (the view "Untitled", from "View->Project manager" menu).

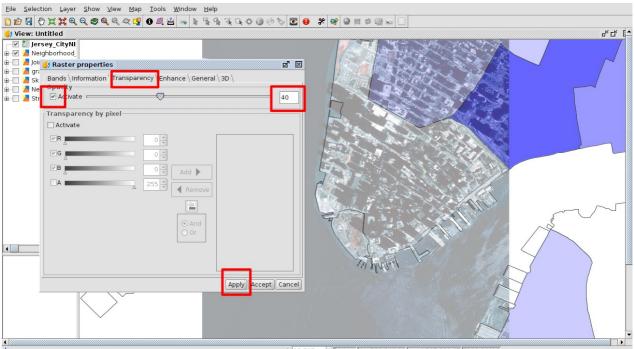
Then we press "Add layer" (or from the View menu), and at the File tab we press "Add". We look for the file "Jersey\_CityNE\_tile2.sid" that we downloaded at the beginning (it is an orthophotography). And after accepting it, the image is added to the view.

We can zoom to it, clicking on the active layer, and then using the secondary button of the mouse, we select "Zoom to layer". We will see the image on the Neighborhood layer.

We can apply transparency to the raster layer in order to see the neighborhood layer symbology too (the density).

For that we put the Jersey\_CityNE\_tile2.sid layer active, and with the secondary button of the mouse we select "Raster properties".

Then we go to the "Transparency" tab, we active "Opacity" and we apply about 40%. We finally press "Apply" and "Accept". We will see the colors of the Neighborhood layer and the image.



1:15,787 VMeters X = 580,846.09 Y = 4,507,800.67 EPSG:26918

Figure 34. Applying transparency to a raster file

# **Exercise 13: Geographical selection**

At this section we are going to use some selection tools. For example we want to select the biggest skateparks in New York city and know their neighborhood area.

For that we will put the Skatepark layer active, and we will open its attribute table. Then we will open the "Select by attribute" tool  $\checkmark$ . We want to select the skateparks the area of which is bigger than 15000m2, So we will write this sentence (clicking on the field name):

shape\_area > 15000

and then we press "New set". They will be selected on the table and on the view.

Then we go back to the view, and we put the neighborhood\_population layer active. We want to know the neighborhood that have the selected skateparks. For that we will open the "Select by layer" tool (at the Selection menu), and we configure it at this way:

Select items from active layer that... Intersect with

Selected items of a layer Skateparks\_26918

we finally press "New set". If we close that window, we can see them on the view, and if we open its attribute table and we use "Move up selection" tool we can see them at the top of the table.

# *Question 7:* How many neighborhoods have big skateparks (the records that have been selected)?

# **Exercise 14: Loading WMS servers**

We are going to load some remote layers, from different servers. There are several types of servers. We are going to use Web Map Service (WMS), where the origin layers can be raster or vector ones, and it's loaded as an image in Geographic Information Systems, and Web Feature Servers (WFS), when data are in vector format and it is loaded as a vector layer too, having access to the attribute information.

We are going to load some layers in EPSG 4326 (Geodetic coordinates, WGS84), so we are going to create a new view in that reference system. For that, we will open the Project Manager ("Show->Project Manager" menu), and we will select the "View" document. We press "New" to create a new one, and a new View is created in EPSG 4326 (because it's selected by default at the gvSIG Preferences; if we change it, the new Views would be created in the selected CRS). We can check it at the bottom of the View. It's called "Untitled-1".

Now we are going to load a layer from a remote server. It will be the ortho of USA. For that we will press "Add layer", and we open the "WMS" tab.

Now we will connect to this URL:

http://services.nationalmap.gov/arcgis/services/USGSNAIPPlus/MapServer/WMSServer?

😣 🗉 🛛 Add layer	
File WMS WCS \WFS \WMTS \GeoDB \	OSM \ PostGIS Raster \
Server	
ationalmap.gov/arcgis/services/USGS	NAIPPlus/MapServer/WMSServer? 👻
Refresh cache	Connect
Use of local tile cache	
Assume coordinates follow XY axis (	order
Description	
Name:	
WMS	
Ц	
Server Type: WMS 1.3.0	Previous Next
	OK Cancel

Figure 35. Connecting to WMS server

Then we press "Next". At the next window we open the "USGSNAIPImagery" folder, we select "Image" and we press "Add".

Add layer     /File \ WMS \ WCS \ WFS \ WMTS \ GeoDB \ OSM \ PostGIS Raster \
/ Information \`Layers \`Styles \`Dimensions \`Formats \
Layer name
Select raster layers
Lavers     USGSNAIPImagery     USGSNAIPImagery     Decommons     Proceptime     Decommons     Anchorage_AK     Guam     V
Image
Maintain layer structure     Show layer names     Add     Remove
Server Type: WMS 1.3.0 Previous Next
OK Cancel

Figure 36. Selection of layers in a WMS server

At the next window, we will keep the styles by default, and at the "Formats" tab we will select:

- Format: png
- SRS: 4326
- Text format: application/vnd.esri.wms\_raw\_xml

😵 🗊 Add layer
File WMS \WCS \WFS \WMTS \GeoDB \OSM \PostGIS Raster \
Information \Layers \ Styles \Dimensions > Formats \
Select formats
image/bmp  image/jpeg
image/png
V Transparency
Select SRS
CRS:84 EPSG:102100
EP36:3537 EPS6:4326
application/vnd.esri.wms_raw_xml
lapplicatiopånd osci wms_taaturainto_yml
Server Type: WMS 1.3.0 Previous
OK Cancel

Figure 37. Selecting image format, reference system and text format in a WMS service

We will press "OK" and the USA ortho imagery will be loaded. It will take some seconds because it has to connect to the server.

## Exercise 15: Creating new layers, graphical editing

Now we are going to create a new layer, from "View->New layer" menu. At the first window we will select "Shapefile", and at the next one we will access to "..." button to select the folder where it will be saved and its name. We can call it "buildings".

At the next window we will change the "Type" of the shapefile to "SURFACE" (it will be a polygon layer), and we will add one field that we can call "buildings".

😣 🗈 🛛 New layer wiz	ard							
Shape	Field definition	S						
	Define fields							
-Postgis	Name	Туре	Length	Geom type	Dimensions	CRS	PK	Mand.
+ +	GEOMETRY				GEOM2D	EPSG:4326		
G CMI	buildings	String	20	Not applica	Not applica	Not applica		
GML								
DXF								
DAF								
				Add fie	eld	Dele	te field	4
				Add In				
				. ľ	, i l			
			< <u>B</u> a	ck <u>N</u>	ext >	<u>F</u> inish	<u>C</u>	ancel

Figure 38. Configuring geometry type and fields in a shapefile

Then at the last window we keep it by default and we finish. The layer is added to the view.

Now we are going to zoom to a neighborhood area and we are going to add elements to the layer, concretely some buildings, so we put it active and we start editing mode.

Then we press "Insert polygon" tool.



Figure 39. "Insert polygon" tool

And we can start to draw a polygon, and with secondary button of the mouse we can finish it.

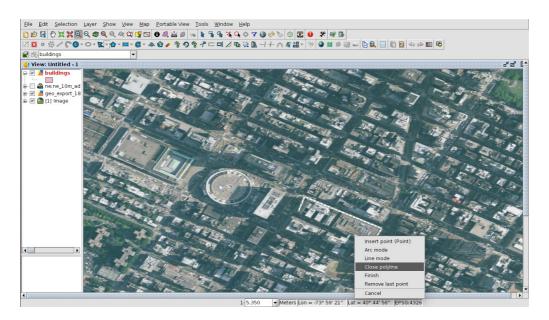


Figure 40. Drawing polygons in editing mode in a vector layer

We can draw several polygons,

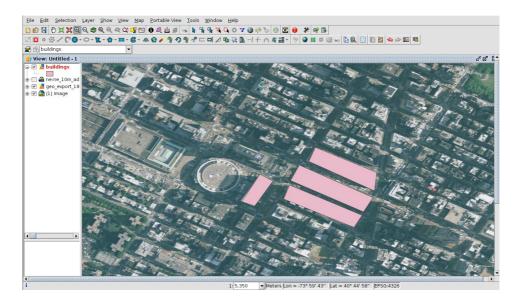


Figure 41. Polygons created in a shapefile

We also can move them, changing their location (it's a supposed case). For that we will select a building and we will use "Move geometry" tool P to move the geometry from the current position to other one at the view.

After that we will finish editing and we save changes.

## Exercise 16: Creating KML file to be loaded in Google Earth

We can export the "buildings.shp" layer to a KML format in order to load it in Google Earth. For that we put it active and go to "Layer->Export to" menu. We select KML format at the first window, and at the next one we mark the "Show attributes in balloon" option (to show the attribute information in GE. At the next window we access to "..." button to select its name and folder. We call it "buildings-GE.kml", and we export all registers. If we open that file in Google Earth we can see it (we will have to change the color of the lines to see them easily).

## **Exercise 17: Loading WFS servers**

Now we are going to load a Web Feature Service (WFS). For that we will "Add layer", and we'll go to "WFS" tab.

Then we will connect to http://demo.opengeo.org/geoserver/wfs?

Add layer      Hile \WMS \WCS \WFS \WMTS \ GeoDB \ OSM \ PostGIS	Raster
Server	
http://demo.opengeo.org/geoserver/wfs?	•
✓ Refresh cache	Connect
Description	
WFS version: 1.1.0, 1.0.0	IS Next
Features cache: none	IS NEAL
	OK Cancel

Figure 42. Connecting to WFS service

At the next window we will select "Countries" layer.

Information Layers Fields Layer name Countries Select the layer	\GeoDB \OSM \PostGIS Raster \ Options \Area \	
Layer name	Geometry type	
landuse	Geometry type	
natural		355
ne 10m lakes		
ne 10m land		
ne 10m ocean		
ne 10m wgs84 bounding box	(	
ne 50m admin 0 countries		
ne_50m_land		
ne_50m_ocean		
Ocean		
parks		
Country Boundary Lines		
Countries	MultiSurfacePropertyType	
State Boundaries		
Populated Places		
Roads		-
Show layer names		
WFS version: 1.1.0, 1.0.	0	
Features cache: non	e 👻 Previous Next	

Figure 43. Selecting layers in a WFS service

At the next window we can select the fields to be loaded. We keep all of them. And at the Options window we check that EPSG is 4326.

😣 🗉 Add layer		🞯 🗊 Add layer
File \WMS \WCS \WFS \WMTS \Geo	DB \ OSM \ PostGIS Raster \	File \ WMS \ WCS \ WFS \ WMTS \ GeoDB \ OSM \ PostGIS Raster \
∫Information \Layers `Fields \ Option Select the layer fields	ns \Area \	Information \Layers \Fields `Options \Area \ WFS protocol version
Name	Туре	Version 1.1.0 -
Image: Provide the second s	Object  MultiSurfacePropertyType Integer String Double String Str	Connection Max. features 10,000 Timeout 5 sec Srs Srs Vectorial cache Corden de los ejes V Use axis YX order
WFS version: 1.1.0, 1.0.0 Features cache: none	Previous     Next	WFS version: 1.1.0, 1.0.0 Features cache: none  Previous Next
	OK Cancel	OK Cancel

Figure 44. Fields and general options settings in a WFS service

At the last window we could load only the elements from a location, but we are going to load all of them. So we press "OK".

Figure 45. Selecting the area of a layer in a WFS service

The layer will be loaded after some seconds (it will take more than WMS because it manages more data). We can do a "Zoom extent" store the new layer.

We can put it active at the view, and open its attribute table. We could select elements, change symbology... At the WMS we couldn't do it because it was loaded as an image.

#### *Question 8:* Which is the country with "postal" = "DZ"?

### Exercise 18: Adding an event layer

The other data that we have is an attribute table, in CSV format, with the graffiti complaints, but they don't have geographical component, only two columns with Latitude and Longitude. At gvSIG we can load that table, and create a point layer from it, where Latitude and Longitude fields are used to georeference the complaints.

We can open the CSV file with a text editor (Notepad, gedit, kate...) to check how it is created, and we can see that field separators are comma.

Firstly we have to load the attribute table in gvSIG. We will open the Project Manager (from the "Show->Project manager" menu), and we select "Table" document. Then we press "New", and at the "File" tab we press "Add". We select the "graffiti\_complaints.csv" file that we saved in our cartography folder, downloaded from the NY website.

When the CSV file appears at the "New table" window, we will have to configure it to be

loaded correctly, so we have to select the table and press "Properties".

Then, at the "Basic" tab, we will select the "Standard (double quote, comma and crif)" option in "profile". That's because the field separators at the CSV file are ",".

8 B New t	able	
File \ DB \		
graffiti_complai	nts.csv	Add
		Properties
😣 🗉 Stor	e the parameters need to open a CSV file	
Advanced File profile	Basic \ JG/Otros_proyectos/Abu_Dhabi/T2/graffiti_compla Standard (double quote, comma and crif)	ints.csv
quotePolicy	Quotes fields which contain special characters Default (use system locale)	
Predefined fo	rmats Accept	Cancel
		OK Cancel

Figure 46: Selecting field separators in a CSV file

Then, at the "Advanced" tab, we have to uncheck the "automaticTypesDetection" option, and fill the "fieldtypes" box in with this text:

type:string,address:string,city:string,lat:double,lon:double

At that way we are indicating the field types in order to load them correctly in gvSIG. As we have 5 columns at the table, we indicate the name of every field and its type.

NOTE: From gvSIG 2.4 it is planned to include a tool to load tables in an easy way, like in the spreadsheets (Excel, LibreOffice...).

🕲 🔲 New table	
File DB \	
graffiti_complaints.csv	Add
😣 💿 Store the parameters n	need to open a CSV file
Advanced \ Basic \	
ProviderName	csv
recordSeparator	
delimiter	
quoteCharacter	
commentStartMarker	
automaticTypesDetection escapeCharacter	
header	
Number of lines to skip	0
Fields definition	
surroundingSpacesNeedQuotes CRS	
fieldtypes	type:string,address:string,city:string,lat:double,lon:double
charset	UTF-8
point	
Comma separated list of field types	
	Accept Cancel

Figure 47: "Advanced" tab configuration

After that we Accept it, and the table will be loaded in gvSIG, with the 5 fields, and their new names.

We can see that Latitude and Longitude fields have only 3 decimals. We can show 10 decimals changing the Table properties. For that we will access to the "Table->Properties" menu, and at the "Pattern" column of the "lat" and "lon" fields we change it. Now we can see:

#### #,##0.000

and we will add 7 "zeros". It will remain:

#,##0.000000000

(after editing the pattern, we have to press "Enter" for it to have effect).

🜖 Table prop	oerties				r q X
Name:	graffiti_com	plaints			
Creation date	Apr 15, 201	6			
Owner:					
Locale:	English				•
Comments:					
					<b>_</b>
Column inforn	nation:				
Vi Nam	e Alias	Туре	Size	Precision	Pattern
🗹 type	type	String	8	0	
address	address	String	99	0	
🗹 city	city	String	19	0	
🗹 lat	lat	Double	0	0	#,##0.000000000
🗹 lon	lon	Double	0	0	#,##0.000000000
				Cancel	Apply OK

Figure 48. Changing pattern of fields in an attribute table

And now we see the fields with more decimals:

g	raffiti_	complain	nts				de B
ſ		type	address	city	lat	lon	
	1	Graffiti	140 BAXTER STR	NEW YORK	40.7187568104	-73.9985570132	
	2	Graffiti	1011 WESTCHES	BRONX	40.8240668115	-73.8931041588	
Г	3	Graffiti	6323 17 AVENUE	BROOKLYN	40.6213251929	-73.9916032693	
П	4	Graffiti	25-98 STEINWAY	Astoria	40.7675139404	-73.9120613654	
Г	5	Graffiti	208 MALCOLM X	BROOKLYN	40.6861824408	-73.9297212023	
Г	6	Graffiti	201 CHRYSTIE ST	NEW YORK	40.7221078788	-73.9918106382	
	7	Graffiti	1092 EAST 15 ST	BROOKLYN	40.6232484853	-73.9610374693	
	8	Graffiti	1001 TIFFANY ST	BRONX	40.8232560201	-73.8948939629	
	9	Graffiti	1014A WESTCHE	BRONX	40.8238886894	-73.8934115643	
	10	Graffiti	1035 WESTCHES	BRONX	40.8242257198	-73.8927967826	
	11	Graffiti	210 LEWIS AVENUE	BROOKLYN	40.6892439512	-73.9363095082	
	12	Graffiti	418 LAFAYETTE S	NEW YORK	40.7287968898	-73.9923618418	
	13	Graffiti	2842 GRANDCON	BRONX	40.8699977025	-73.8911899443	
	14	Graffiti	301 WEST 13 ST	NEW YORK	40.7391365867	-74.0031935848	
	15	Graffiti	56-09 56 DRIVE	Maspeth	40.7244094714	-73.9145029831	
	16	Graffiti	482 TOMPKINS A	BROOKLYN	40.6806071031	-73.9433771382	
	17	Graffiti	23 POST AVENUE	NEW YORK	40.8629894808	-73.9242488026	
	18	Graffiti	130 WEST HOUS	NEW YORK	40.7277239338	-74.0014973002	
Г	19	Graffiti	53-14 111 STREET	Corona	40.7431743486	-73.8513899941	
Г	20	Graffiti	555 EAST 141 ST	BRONX	40.8089820110	-73.9166159463	
E	21	Graffiti	595 EAST 141 ST	BRONX	40.8082259053	-73.9148287963	
	22	Graffiti	27-02 CRESCENT	Astoria	40.7703410950	-73.9237151709	
	23	Graffiti	125 3 AVENUE	BROOKLYN	40.6823379647	-73.9827152481	
	24	Graffiti	1051 SOUTHERN	BRONX	40.8243209584	-73.8919113969	
Г	25	Graffiti	209 LEWIS AVENUE	BROOKLYN	40.6892466840	-73.9362878704	
	26	Graffiti	581 MAC DONAL	BROOKLYN	40.6397548103	-73.9788456364	
				0/9	8600 Total of selected re	ecords.	

Figure 49. Attribute table with new pattern

The next step would be to create a point layer from the attribute table. It can be done with "Create event layer" tool when there are two fields with the coordinates.

But they are in EPSG 4326 CRS, so we will have to load them in a View in that reference system. For that, we will open the "Untitled-1" View, that was in that CRS.

Now we are going to add an Event layer, from the previous attribute table. We will go to the "View->Add event layer" menu (or . At the first window we will select the "graffiti

complaints" table, and we press "Next". Then we select the "lon" field for X coordinates and "lat" field for Y coordinates, and we change projection to EPSG 4326. Then we press "Next". At the last window we keep the "Load the transformation output as a layer" option, and we select the "Untitled-1" View at the list.

The event layer is loaded at the "Untitled-1" View, but it is a virtual layer (it is a csv file, a text file). The way to have a point layer in gvSIG would be to export it to a new layer.

For that, we have to put the layer active, clicking on it at the ToC. And then we go to the "Layer->Export to" menu.

At the new window we will select "Shape format", then we press "Next, and we will access to the "..." button in order to select the folder where the file will be saved, and the file name. We can name it "graffiti\_complaints\_4326.shp" (because it is its CRS). Then we press "Next", and "All records" option, and we finally press "Export". We indicate that we want to add that layer to the View, and we close the Window.

A new layer is added to the View, and now it is a SHP file, that is in EPSG 4326.

Now we want to have that layer on the other View (Untitled), in EPSG 26918, so we have to reproject it on the fly, and finally export the layer to a new SHP to have it in the new reference system. For that, we go to Show->Project manager, and at the Project manager we click on the "View" document, and we open the View "Untitled".

Now we are going to add the new point layer, so we open the "View->Add layer" menu, "Add" and at the "File" tab we click on button. We select the "graffiti complaints 4326.shp" file, but in this case, at the "Add layer" window we have to indicate that that layer is in another reference system. For that we press "Properties", and at the Properties window we access to the CRS option.

File \WMS \WCS \ graffiti_complaints_	WFS \ WMTS \ GeoDB \ OSM \ PostGIS Raster \	Add
		Properties
😣 🗊 Ste	ore the parameters need to open a shp file	Remove
Advanced	J <sup>°</sup> Basic∖ Default (use dbf language)	Up
shpFile	3/Otros_proyectos/Abu_Dhabi/T2/graffiti_complaints_4326.shp	Down
CRS	EPSG:26918	
		OK Cancel
	Accept Cancel	AR- A

Figure 50. Changing reference system of a new layer

At the new window, we select the EPSG 4326 at the "Recent" Type, and press "Finish". We will see now the "reprojected on the fly" text at the CRS properties.



Figure 51. Reference system of the layer to be added

We finally accept the "Add layer" window and the Complaints layer will be reprojected on the fly at the View.

As the layer is reprojected on the fly, and we want to do analysis (geoprocesses...), we need to have the layer at the View CRS physicality. For that, we will export the reprojected layer (on the fly) to a new layer. Firstly we have to put the layer active, clicking on it at the ToC. And then we go to the "Layer->Export to" menu.

At the new window we will select "Shape format", then we press "Next, and we will access to the "..." button in order to select the folder where the file will be saved, and the file name. We can name it "graffiti\_complaints\_26918.shp" (because it will be its new CRS). Then we press "Next", and "All records" option, and we finally press "Export". We indicate that we want to add that layer to the View, and we close the Window.

A new layer is added to the View, and its CRS is the same than the View.

We can delete the old layer from the View, clicking on "graffiti\_complaints\_4326.shp", and with the secondary button a contextual menu is open, where we select "Delete layer".

## Exercise 19: Geoprocessing with gvSIG

At this point, after loading the cartography at the View, we are going to analyze if the situation of the skateparks have a relationship with the graffiti complaints.

We can use several geoprocesses for that.

For example, one way to check if there's a relationship is to create hot maps (density maps), where an image is create and pixel value is different when the density of points is higher.

At the current View, we are going to keep visible only the "complaints" and "skateparks" layers.

We can consider that skaters work in an area of 1,5 kilometers from the parks (it's an estimated area, but it will help to see if it affects. So we are to use the buffer geoprocess to create polygons the radio of which is 1500 meters from the skateparks.

Firstly we will open the Toolbox <sup>(2)</sup> (or from "Tools->Geoprocessing->Toolbox" menu). The geoprocessing manager will be opened.

Now we are going to open the "Buffer" geoprocess, inside "gvSIG Geoprocesses->Vector layer tools". A new window is opened. We will select "Skateparks\_26918.shp" as input layer, we mark the second option where distance for buffer is fixed (not by a field), and we write "1500". We also select "Dissolve entities" because if there are a skatepark close to other one we want an only polygon.

8 Buffer
Parameters \Output region \
Input
Skateparks_26918
Options
Area defined by a distance in meters
shape len 👻
Area defined by a distance in meters
1500.0
Selected geometries
✓ Dissolve entities
Round border
Outside the polygon
• •
< 0, "6", "true", "false", "0", "0", "#") > OK Cancel i

Figure 52. Buffer configuration

At the bottom of that window, in the "Outputs" option we access to the "..." button and we select the folder where it will be saved, and we call the file "buffer.shp". At the end we accept it and the buffer is created, and the new layer added to the view.

#### **Question 9:**

#### How many polygons have been created?

We are going to change its symbology, double-clicking on the rectangle with the color at the ToC. We will remove the fill, and increase the thickness of the line.

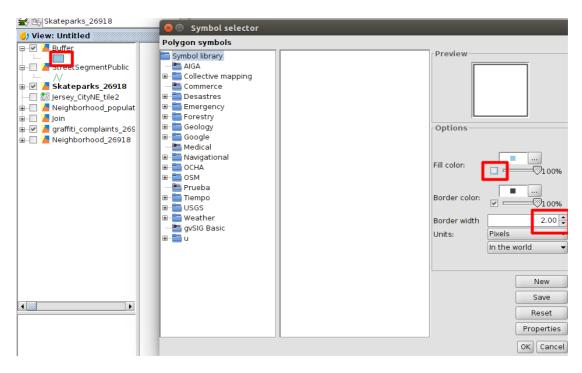


Figure 53. Changing symbology to a shapefile

Now we will use "Density (kernel)" geoprocess in order to get a density map, where areas with a high density of points (complaints) will have different colors.

We need a field at the attribute table with the weight to calculate the density. In our case the weight will be the same, so it will be the same value. We are going to put the graffiti\_complaints\_26918 layer active and start editing. Then we open its attribute table, and we access to "Table->Add column" menu. We will add a field called "Weight", and this settings: "type": Integer, "Size": 1, and "Default value": 1. At this way all the registers are filled in with "1".

	type	address	city	lat	lon		
1	Graffiti	140 BAXT	NEW YORK	40.719	-73.999		
2	Graffiti	1011 WE	BRONX	40.824	-73.893		
3	Graffiti	6323 17	BROOKLYN	40.621	-73.992		
4	Graffiti	25-98 ST	Actoria	40.700	72.01.2		
5	Graffiti	208 MALC	E 🤒 New fie	ld prope	rties		
6	Graffiti	201 CHRY	P				
7	Graffiti	1092 EAS	E Field name		Weight		
8	Graffiti	1001 TIFF	E		Integer		
9	Graffiti	1014A W	EType		integer	-	
10	Graffiti	1035 WE	E Length		1		
11	Graffiti	210 LEWI	F Precision			_	
12	Graffiti	418 LAFA	Precision		- 76		
13	Graffiti	2842 GR	E Default value		1		
	Graffiti	301 WES	P			_	
15	Graffiti	56-09 56	P.				
16	Graffiti	482 TOM	E				
17	Graffiti	23 POST	P				
	Graffiti	130 WES					
	Graffiti	53-14 11					
	Graffiti	555 EAST	53 C				
	Graffiti	595 EAST			OK Car	ncel	
	Graffiti	27-02 CR	110				
_	Graffiti	125 3 AV		101002	, 0,000	_	
-	Graffiti	1051 SO		40.824	-73.892		
	Graffiti	209 LEWI		40.689	-73.936		
26	Graffiti	581 MAC	BROOKLYN	40.640	-73.979		

Figure 54. Creating a new field on the table

Now we finish editing and we will have the new field.

And now we can start with the geoprocess. For that we open the Toolbox again, and we open Sextante geoprocesses, and "Rasterization and interpolation" option. We open "Density (kernel)".

At the geoprocess we will select "graffiti\_complaints\_26918" file for input layer. The field will be "Weight", and "Search radius" will be "100".

For output layer we access to "..." button and we select the folder. We can call the file "Density". It will be a raster file.

At the "Output region" tab we will select:

- Use extent from layer: graffiti\_complaints\_26918

And cell size will be 20.

After accepting, the process will start, and it will take several minutes, depending on the computer.

We'll see an image, with several areas in different colors. We can apply a Color table in order to see it easily.

For that, we put the new layer active, and with secondary button of the mouse we access to "Color table". Then we have to mark "Activate color table", and we can select one of the color tables with a scale (from light color to dark one), for example "Deep Azure (256)". Then we change the "Alpha" value of the first register to 0. At this way pixels with no value will be transparent.

able \ (	Gradient \					Preview
Color:	Class	RGB	Value	Final _	Alpha	
	1	0, 127, 255	0	0.36	0	
	2	0, 127, 254	0.369	0.737	200 🕺	
	3	0, 126, 253	0.737	1.106	255	1
	4	0, 126, 252	1.106	1.475	255	
	5	0, 125, 251	1.475	1.844		
	6	0, 125, 250	1.844	2.212	255	
	7	0, 124, 249	2.212	2.581	255	200 C 200
	8	0, 124, 248	2.581	2.95	255	
	9	0, 123, 247	2.95	3.318	255	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	10	0, 123, 246	3.318	3.687		
	11	0, 122, 245	3.687	4.056		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	12	0, 122, 244	4.056	4.425	255	
	13	0, 121, 243	4.425	4.793		Library
	14	0, 121, 242	4.793	5.162		
	15	0, 120, 241	5.162	5.531		
	16	0, 120, 240	5.531	5.9		Candy (9)
	17	0, 119, 239	5.9	6.268		Color Wheel Long (36)
	18	0, 119, 238	6.268	6.637	255 👻	Color Wheel Short (5)
Re	gister: 🚺	◀ 256 ▼	▶ <b>▶I ▶</b> ₩d	e 256 🥭	×	Deep Azure (256)
nimum:	0	Maximum: 94.0	)24	Recalc	statistics	Deep Chartreuse (256
🗹 🖊	vate color	table 🛛 🗹 Inter	polated	🗌 Limits	s adjust	🔁 🏚 🎦 🔀

Figure 55. Applying a color table to a raster file

After applying and accepting we will be the image, where the dark blue areas will be the

areas with more graffiti complaints.

If we put the Buffer layer active and with secondary button of the mouse we select "Bring to front".

At this way we can see the skateparks and the areas with high number of complaints.

# Conclusions

To analyze the skatepark location in New York city in relation with complaints about requests on graffiti cleaning, some geoprocesses have been applied.

For this analysis, a density method has been used to get the areas where there are more graffiti complaints. It has been a first method. The situation of the skateparks has been taken into account too, calculating an estimated distance from them where the skaters can move.

Seeing the results we can interpret that only in one of the areas where there are some skateparks can have a direct relationship with the number of complaints. That area is one of the most populated areas in New York, where there's a high density of population, so it can be related too.

At the other locations of skateparks the density of graffiti complaints is not as much high as in the other case, so in general we can't deduce that they are related directly.

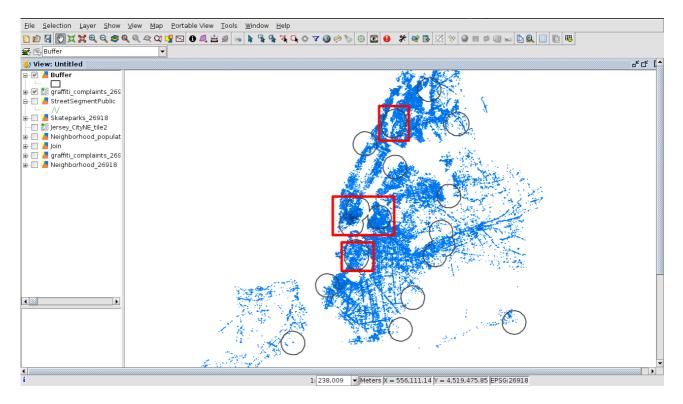


Figure 56. Results of the analysis

We can see in red color the areas where skateparks can be related to graffiti complaints, but at the other ones it's not very noteworthy.

## Answers

**Warning:** These values are for August 2016. Data can be uploaded at the website, so they can change a little bit.

Question 1: After ordering neighborhood field, look for the value "Manhattanville" and select it. Which is the area of that neighborhood (the value of the "shape\_area" field)? Take into account that the three last numbers are the decimal ones.

10647077,452

Question 2: After applying symbology and adding labels, and zooming to the specified point, which is the neighborhood under that point? Kew Gardens Hills

Question 3:

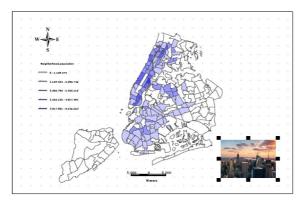
After ordering neighborhood field, look for the value "Erasmus" and select it. How many population does it have?

31392

Question 4: After ordering neighborhood field again, look for the value "Hollis" and select it. How much density does it have? 906467

Question 5: What's the media of the population density in New York? 1496.6845418722953

Question 6: Create a PDF file with the map of densities in New York neighborhoods. It can be like this one:



**Question 7:** 

How many neighborhoods have big skateparks (the records that have been selected)?

8 neighborhoods

*Question 8:* Which is the country with "postal" = "DZ"? Algerie

Question 9: How many polygons have been created? 14 polygons