Field activities have to collect information useful for users, planners, technicians and managers. This information concerns different topics:

1. vegetation;
2. paths network;
3. infrastructures;
4. place-names (toponym).

Field survey will be made using topographic map, on which different object will be drawn by using different colours and symbols and, just for vegetation matter, filling appropriate forms.

The Field survey aims to set a database functional to edit 3 types of map:

MAP 1 → Forest type and Line Formations

MAP 2 → Pathways network

MAP 3 → Infrastructures and Places name

As the map will be produced in digital way using a Geographic Information System (GIS), data have to be collected in a particular way by distinguishing among polygonal, linear and dot shape objects on the map.

A) VEGETATION INFORMATION COLLECTING → MAP 1

The data collected refer to:

- Forest types = areas with the same kind of vegetation → drawn by polygons
- Linear formations (i.e. Cupressus sempervirens line) → drawn by lines

For each object drawn on the map, the surveyor must fill a descriptive card.

![Survey card of Forest types](image-url)

**Fig. 1: Survey card of Forest types**
To join information gathered by survey cards with the corresponding graphic object on the map, it must be assigned the same **identificative code** twice: 1. to the Identificative Code window in the card and 2. to the object on the map (such method low down the possible error of overlapping or misconfusing objects).

On the map the identificative code of *Forest types* must be ahead by the letter “A” (i.e. A1, A2,…, A50), instead the code of *Line Formations* must be ahead by the letter “L” (i.e. L1, L2,…, L50).

**VERY IMPORTANT!!!**

It must not exist more than one “Forest Types” polygon with the same identificative code.

It must not exist more than one “Line Formations” line with the same identificative code.

To sum up, field survey will be carry out as follow:

1) To identify Forest Type (or Linear formation);
2) To draw the shape of the homogeneous vegetation to be assigned to the Forest type on the map;
3) To assign the univocal identificative code to the shape drawn on the map (writing on it);
4) To fill the survey card, giving it the same identificative code assigned on the map and compiling all others informative fields.

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**Neighbored Project**

*Survey Card of Line Formations of Ayazma Park in Sata Zagora*

|----------|--------------|

[3] Line: [Identificative: ]

<table>
<thead>
<tr>
<th>[4] Main Trees/Brushes Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadleaves</td>
</tr>
<tr>
<td>%</td>
</tr>
<tr>
<td>Acer pseudoplatanus</td>
</tr>
<tr>
<td>Aesculus sp.</td>
</tr>
<tr>
<td>Carya cordiformis</td>
</tr>
<tr>
<td>Cercis canadensis</td>
</tr>
<tr>
<td>Fagus sylvatica</td>
</tr>
<tr>
<td>Fraxinus excelsior</td>
</tr>
<tr>
<td>Fraxinus ornus</td>
</tr>
<tr>
<td>Humulus lupulus</td>
</tr>
<tr>
<td>Quercus xanthocarpa</td>
</tr>
<tr>
<td>Quercus pubescens</td>
</tr>
<tr>
<td>Robinia pseudoacacia</td>
</tr>
<tr>
<td>Tilia sp.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Others mosses/ground cover</td>
</tr>
<tr>
<td>Bryum sp.</td>
</tr>
<tr>
<td>Ceratodon sp.</td>
</tr>
<tr>
<td>Cyrtomium sp.</td>
</tr>
<tr>
<td>Ficus sp.</td>
</tr>
</tbody>
</table>

Notes:

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*Fig. 2: Survey card of Line Formations*
B) OTHER DATA COLLECTION (Pathways Network, Infrastructures, Place-Names)
Data collection activity concerning these kind of information, is different to the previous because it doesn’t need to fit any survey card. Aiming to a simplified field work, information are collected just reporting position (and shape for paths) on the map, using different colours and symbols according to the follow legends.

b.1) Paths network → MAP 2 → drown by lines

<table>
<thead>
<tr>
<th>CATEGORIES</th>
<th>SUB-CATEGORIES</th>
<th>VEHICLES TRANSIT</th>
<th>Colour line to be used on the map during field survey</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable for vehicles</td>
<td>Asphalated</td>
<td>Open</td>
<td><strong>Yellow</strong></td>
<td>Path with stoned ground or good pressed ground, indicatively large more than 1.5 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Close</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressed ground</td>
<td>Open</td>
<td><strong>Brown</strong></td>
<td>Path with pressed ground, indicatively large less of 1.5 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Close</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian Only</td>
<td>Primary</td>
<td></td>
<td><strong>Green</strong></td>
<td>Permanent path, grounded, indicatively large less than 1 m</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td></td>
<td><strong>Blue</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tertiary</td>
<td></td>
<td><strong>Red</strong></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 3: Suitable for vehicles - Asphalated

Fig. 4: Suitable for vehicles; Unpaved -Pressed Ground
b.2) Infrastructures → MAP 3 → drawn by points

<table>
<thead>
<tr>
<th>Legend of Infrastructures for field survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrances</td>
</tr>
<tr>
<td>Barriers</td>
</tr>
<tr>
<td>Fountains</td>
</tr>
<tr>
<td>Playground</td>
</tr>
<tr>
<td>Monuments</td>
</tr>
</tbody>
</table>

b.3) Place-names → MAP 3 → label on the map

Place-names usually used to define particularly zones of the park, or relevant infrastructures, have simply to be written on the map, in an easy way to read (i.e. using red colour, by indicating zones on which they refers).

VERY IMPORTANT !!!
Because people who will work after the field survey haven’t the same knowledge of the park as the surveyors, data should be collected in the clearest way possible.

C) DIGITALIZATION OF DATA

To simplify the digitalisation of data collected by the Survey Card a simple Microsoft Access application has been developed. The application is made by a principal Menu with two bottom:
- the first one open the input data form for Forest Types;
- the second one open the input data form for Line Formations.
D) SURVEY CARDS DESCRIPTION

1) CARD SURVEY OF FOREST TYPES

Hereby it follows the description of the fields present on the card.

[1] **Date**: date of survey

[2] **Surveyor**: who fill the card during field work

[3] **Area Identificative**: code used to link any survey cards with the related forest types drawn on the map by polygons. The identificative code of forest type, must be ahead by letter “A” to distinguish it, to the identificative code of Line Formation drowned on the same map.

[4] **Three/Shrubs vegetation categories**

It’s a table containing several different forest type categories.

[4].1 **Stands**: wooded surfaces with the aspects of “natural” forest, with good mix of species (planted and/or naturally grown), without perception of tree geometrical arrangement and with presence of tree natural regeneration.

[4].1.1 **Types**: stands can be in 3 different *Types* based on vertical space occupancy of trees foliages: multi-layered, two-layered and mono-layered. Only tree species are considered to define *Types* model; shrubs are not considered (see par.d.1.2).

[4].1.1.1 **Multi-layerd stands**: trees foliages occupy all vertical profile without any interruption. Obviously, trees of the same specie could be in different layers.

[4].1.1.2 **Two-layered stands**: trees foliages are in two different and well defined layers along the vertical profile. Trees of the same specie could be in each one of the two layers.
[4].1.3 Mono-layered stands: all trees foliage are in the same layer of the vertical profile.

[4].1.2 Underwood shrubs (%): this field contain information about shrub cover. Information will be expressed in term of percentage of surface filled by a particularly forest type (100%) covered by shrubs.

[4].1.3 Natural regeneration (%): this field deals with information about the presence of natural regeneration of trees species. Also in this case, the information will be expressed as a percentage of regeneration referred to the entire surface covered by a particularly forest type.

[4].1.4 Enrichment plantings (%): this field contain information about presence of artificial plantation. The information will be expressed as the two previous fields.

[4].2 Formal Plantations: vegetation elements planted by man with hornamental goals, that need heavy management during the time to maintain their characteristics.

[4].3 Mono-specific reforestation stands: wooded surface clearly planted by man because the geometric arrangement, composed only by one or few species, without natural regeneration, usually mono-layared. By the time, and without any exceptional event (i.e. fire), this forestry category evolve to Stand category.

[4].4 Post-fire shrub/trees formations: vegetation category coming from reforestation of surfaces recently crossed by wildfires.

[4].5 Meadows with semi-natural trees/shrubs vegetation: category composed by occasional trees and shrubs, single standing or grouped, derived from plantation or natural dissemination on meadows or neglected fields.

[4].6 Clearing/Meadows: grasslands inside wooded surface (clearing), or in residual situation (i.e. close to roads), or expressly designed and managed as hornamental element.

[4a] Main Trees/Brushes Species
It’s a table by which is possible to give indications about species presents in each vegetation categories (except “Clearing/Meadows”). The table is divided by trees species major groups (Broadleaves and Conifers) and shrubs. It reports the name of the main species present in Ayazmo Park. Some rows are empty to input species not listed above. Broadleaves and Conifers have separate columns to be filled in. The relative frequency of each species present has to be reported. The frequency will be always expressed as
percentage of the total canopy cover. In the case of multi-layered (or two-layered) stands, as some species could be present in more than one layer, it’s necessary to indicate first the reference layer of the species and then the percentage of the specie referred to 100% of canopy cover.

So, for instance, if one specie is present in the first layer and in the third we need to indicate two times, one per each layer, the relative frequency of that specie as referred, each time, to 100% of canopy cover.

That’s in the most complex situations. On the other hand, in case of mono-layered stands, formal plantation, mono-specific reforestation, post-fire formations and meadows with semi-natural vegetation, it’s only necessary to fill once the relative frequency of each specie present (using indifferently one of the free field for the species) but always referred to the 100% of canopy cover.

The same method is valid for shrubs.

It gives an indication of the accessibility and transparency to the sight of the wooded profile. It’s related to the presence of shrubs, natural regeneration or artificial plantation from the ground level to, indicatively, 2.5m of height. Obviously, this field have not to be filled for “Clearing/Meadows” categories.

[6] Tree cover
It’s an indicator of the amount of the sun light that come to the ground through canopy. The information will be expressed in term of relative frequency (percent) of surface covered by the forest canopy. Extreme examples are: a 100% tree cover means that walking under forestry canopy we don’t see the sky; 0% tree cover means that we are walking on a meadows (or any other open space). This field have not to be fill for “Clearing/Meadows” categories.

[7] Dominant height
In our case it’s the medium height of the upper layer of vegetation. This field have not to be fill for “Clearing/Meadows” categories.

Notes
This is a open input field. The surveyor can use it for any relevant information that otherwise can’t to be detected by the survey card.

2) SURVEY CARDS OF LINEAR FORMATIONS
[1] Date: date of survey
[2] Surveyor: who fills the card during field work
[3] Line Identificative: code used to link any survey cards with the related Line formations drown on the map by lines. The identificative code of line formations, must be ahead by letter “L”.
[4] Main Trees/Shrub Species: the meaning of this table is the same explained for the Forest Type table and the application is more simple because it’s sufficient to indicate the percentage in which each specie contribute to the linear population of trees and/or shrubs: as simplified example tree line composed by 100 trees, 60 Cupressus sempervirens and 40 Thuja orientalis, the relative frequency is 60% Cupressus and 40% Thuja.
Examples

MULTY-LAYERED STANDS

TWO-LAYERED STANDS
MONO-LAYERED STANDS
FORMAL PLANTATIONS
MEADOWS WITH SEMI-NATURAL TREES/SHRUBS VEGETATION

CLEARINGS/MEADOWS