SIG AS A TOOL FOR THE ANALYSIS AND CARTOGRAPHIC OF THE LANDSCAPE EVOLUTION; APPLICATION TO A SPECIFIC AREA: THE LOZOYA HIGH VALLEY.

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Abstract.

The general aim of this paper is to present a cartographic study of changes happened during the thirty years on the Lozoya high valley. We will use the 1957 and 1987 occupation maps.

1. Introduction.

The Lozoya high valley is located to the northwestern part of Madrid Autonomic Community. It covers an area of 259 km² distributed unequally between four municipalities: Lozoya, Pinilla del Valle, Alameda del Valle and Rascafria.

From a natural view of point, the Lozoya constitutes a narrow and individualized valley. Its topography, topical of a graben, conjugate the almost plain terrain of the valley with the steeps slopes which surround it, mainly on the west. For its singularity Peñalara, the highest point on the Guadarrama Sierra, surpass all of them. In respect to the vegetal cover, it is very conditioned by litology and topography and it arranged in horizontal layers by altitude.

2. Methodology for landscape evolution analysis.

a) Justification.

To analyse the landscape changes it has been chosen to map the land occupation at some specific dates, at the end of the 50's and 80's (1957 and 1987 with 30 years span). The landscape occupation has been chose because it shows the natural ecosystems, the rural economy and the traditional use of forest. Man action has modify through history the natural ecosystems by the introduction of different ways of terrain explotation, agricultural and livestock use, followed, at the end, by a large pine-tree afforestation.

The traditional agricultural explotation was the cause of forest clearing, by cutting and burning the original oak forest to be used for the pasture or agriculture. In rocky or higher lands the oaks and other original forest remained. The wood was used mainly to make charcoal. Years after pine-trees and other species were introduced in these areas as been its use more profitable.

The traditional method of agricultural explotation came into crisis after the 60's rural exodus. The gradual abandonment of numerous practices gave a new impromptu to these landscapes: the values of some resources change and the abandonament generalizes allowing the start of very different processes of vegetal recolonization.

At present time we must take into account another factor, the use of this area as amusement land for Madrid citizens; the attractive landscape and the ski tracks have increased its value as leisure sporting and contact with nature place for Madrid population.

b) Technical specification.

The escale election was determined by the comarcal character of the study and because was considered interestin the use of the cartography generated by the CORINE LAND-COVER proyect. The planning of that proyect already is dinamic, because pretend, by use of remote sensing, to obtain cartographyc cover of European Union members states every fifteen years.That also conditioned the date of the second map to compare.
The occupation map of 1957 was made by the interpretation in accordance with CORINE. of aerial photographs at about 1/33,000 scale of the so called "american flight", the first flight of national coberure made over Spain between the years 1956 and 1957.

Once the pictures were interpreted, they were georeferenced and changing its scale to the 1/100,000 in accordance with the Army Geographical Service map, by means of a stereo transferer (Zoom transfer Scope of Cambridge Instruments).

Once the map in no deformable paper at the CORINE scale, it was introduced by its digitalization in PC ARC/INFO, the same software used with the 1987 map.

After the cartography was firstly compared and because the sources and scales used were too much different, aerial photographs for the first and Landsat imagery for the second, and the interpreters were different, it was aggregated into the CORINE these categories whose interpretation were possible in a different way, creating confusion and overvaluation of dinamic areas.

In the specific case of high Lozoya, that affected the thicket categories, with were grouped into one alone under that generic name, without type or density discrimination.

Once the covers were prepared in PC ARC/INFO format the information was transferred to SIG raster IDRISI for processing. The election of IDRISI was due to the easiness of the information crossing from a SIG raster in respect to a vectorial.

The program polygrid was used inside PC ARC/INFO for rasterization, generating a file in ERDAS format which can be imported by IDRISI by means of the ERDIDRIS module. Taken into account the scale and the minimum unit cartographiable, the 50 x 50 meters pixel size was stabilized for a coberure of 493 rows and 419 columns.

The automatic superposition by means of crossed tables and intersection inside SIG allow us to detect dinamic and stable occupation areas. In that sense it possible to establish a gain and loss matrix and to obtain a serie of maps which value the transformation.

There are different methods to measure the spatial change, depending if the variables are quantitative or nominative. If they are nominative, as in our study, the spatial change to determine is referred to the nature of the observed phenomenon in both times (1957-1987) and not to its numerical quantity, although some statistics can be obtained but they will be only indicatives.

The greater part of the area considered has suffer changes in more or less degree. The more stable type of occupation is the pine-tree mass located to the southwest of the area and the thickets.

Categories as pastures and thicker mantain more or less the same extension but not its locate. Respect the others, dry farming and prairies with farming was dissapears. In the other hand, Caducous trees and pine trees have an espectacular increaser.

New ways of ocupation, oriented toward the present social-economical orientation of the area as leisure areas, mainly ski tracks and some other related infrastructures have appear. They use the old high altitude pasture lands.

The valley is used to collect water for Madrid, the Pinilla dam is an example, it has flooded pasture and farming lands.

The category of forestal systems occupy a large area in 1987 but is scarce in 1957. That was because for the map of 1957 only were cartographed as that some areas resembling pasture lands but CORINE map of 1987 has included pasture and prairies separated by trees.
3. Conclusion

- Using a 1/100,000 scale map to study an area shows the use of terrain evolution, and from that the evolution of landscape, which is related with terrain occupation.

- In comparing maps made from different sources its legends have to be homogenized, losing some categories in order not to commit errors at the time when territorial changes are estimated.

- SIG is a useful tool for analysis of phenomena with spatial influence.
- SIG is a fast and economic way to elaborate and update thematic cartography of an area.

Maps obtained are included.

References

- ESRI, 1990, Understanding GIS. The ARC/INFO method, Redlands, USA.
LAND COVER IN THE LOZOYA HIGH VALLEY

1957

1987

Legend:
- Urban
- Urbanizable
- Leisure areas
- Dry farming
- Pines
- Pines and farming
- Agroforestry system
- Deciduous trees
- Pine trees
- Mixed forests
- High pastures
- Other pasture
- Thickets
- Rocks and scarce vegetation
- Corn

0 2 4 Kilometers
STABILITY AREAS

DINAMIC AREAS

LAND COVER IN THE LOZOYA HIGH VALLEY

- Urban
- Urbanization
- Parks
- Agroforested system
- Deciduous trees
- Pine trees
- High pasture
- Other pasture
- Thickets
- Rocks and scarce vegetation
- Dynamic areas

- Urban
- Urbanization
- Leisure areas
- Plains
- Agroforested systems
- Cardiovascular trees
- Pine trees
- Need forest
- High pasture
- Other pasture
- Thickets
- Rocks and scarce vegetation
- Dynamic areas

Scale: 2 4 Kilometers