Habitat mapping through remote sensing in Piemonte region: a methodological approach

[Fabio Giannetti]
[Piemonte Region – IPLA S.p.A.]
CREDITS

Author/s - Organisation /s

- Fabio Giannetti (IPLA S.p.A. - GIS and Remote Sensing Laboratory)
- Susanna Pia (Piemonte Region - Protected areas department)
- Veronica Guasco (Piemonte Region - Protected areas department)

Sources

http://www.floradoc.org
http://www.sistemapiemonte.it/ambiente/bdn/index.shtml
Outline

- Introduction
- Objectives
- Approach to habitat mapping
- Method - remote sensing data processing
- Method - field survey
- Method - Final revision and maps production
- Conclusions
Introduction

The Nature-SDI plus project
Best Practice Network for SDI in Nature Conservation

- Co-funded by the eContentplus Programme
- Project Coordinator: GISIG
- Starting date: 1 October, 2008 - duration 34 months
- Project web site: www.nature-sdi.eu

“Imagine how our life would be if we couldn't enjoy the beauty of nature, the presence of animals, the magnificence of the mountains and the expanse of the oceans” (Dalai Lama)
Introduction - Project background

- The INSPIRE Directive (2007/2/EC)
- The Natura 2000 Network (Habitat Dir. 92/43/EEC, Dir 2009/147EEC)
- New EU approach for nature management
- Necessity to link nature conservation and geoinformation
- Need for interoperable, accessible and harmonised datasets for nature conservation
- Support to environmental policies

The project contributes to the implementation of the INSPIRE Directive with reference to the following cluster of data themes of the INSPIRE Annexes:

- Protected Sites (Annex I)
- Biogeographical regions (Annex III)
- Habitats and biotopes (Annex III)
- Species distribution (Annex III)
Introduction - Project objectives

- To establish a Network on GI for nature conservation
- To share experiences and good practices
- To stimulate the community of nature conservation stakeholders at improving the harmonisation, the exploitation and the access to their datasets
- To evaluate common metadata profile and data model for the addressed data themes

In the framework of Nature-SDI plus project our approach for habitat mapping in Natura 2000 sites is proposed as a good practice.
Introduction - Habitat mapping

We consider habitat maps as key tools for adopting adequate management and planning strategies in the Natura 2000 sites.

“Natura 2000 - Site Management Plans. The insufficient development of such tools continues to be a limitation to ensuring adequate financing of the Natura 2000 network” (The 2010 assessment of implementing the EU biodiversity action plan)

We need a cost-effective method that can be easily applied for producing homogeneous habitat maps and for implementing Site management plans
Objectives

- To delineate and map vegetation habitats with the highest degree of accuracy
- To classify vegetation habitats with reference to the Corine Biotopes and Natura 2000 classifications
- To produce habitat maps that can be effectively used as a base for adopting management measures by the administrations at different levels (Site, Regional and National)

Problems to be tackled

- Corine biotopes classification has a hierarchical structure that can’t be directly correlated with mapping scales
- Highly variable composition of the habitat patches with reference both to their main vegetation characters and to their spatial distribution.
Approach to habitat mapping

Physiognomic - Floristic approach
Physiognomic system are easily applied and recognized in the field, permit generalization of vegetation patterns over larger areas (Outside Natura 2000 sites) and can be linked to remote sensing signals to facilitate vegetation mapping.
Floristic information are mostly used for a detailed site analysis about habitats, succession, disturbance, natural assemblages etc..
Combining physiognomic and floristic approaches allows the geographic orientation of physiognomic characters to be tied to the more local site specific information on the floristic characters.
Approach to habitat mapping

Adopted approach is based on the integration between remotely sensed data (polygons delineation), ancillary information and fieldwork (thematic attributes). In the resulting dataset geometric elements (polygons, lines or points) are mainly based on vegetation physiognomy (outward appearance) while thematic content (Up to three habitats for each feature) refers to Corine Biotopes and Natura 2000 classifications.
Method - remote sensing data processing

- Definition of a preliminary habitat check-list for each site.
- Acquisition and processing of remote sensing images (mainly Quickbird and Ikonos).

Preliminary processing applied on satellite images:
- Geometric rectification (RPC model)
- Fusion HSV procedure between panchromatic and multi-spectral bands

Images interpretation supported by experts knowledge and by a set of ancillary data (Geologic data, Dem, soils map etc.) allows producing a first polygons coverage mainly based on spectral and textural differences visible on the images.
Method - field survey

Habitats classification for each polygon derived by field surveys (floristic and phyto-sociologic) integrated by specific mapping observations (simplified approach based on recognition of key species). Each survey point, geo-referenced through GPS, was implemented in the GIS in order to compile the database associated to the features. Through field survey the geometric accuracy of polygons was also verified with possible amendments.
Method - Final revision and maps production

Final revision of thematic layers following survey data processing
Mosaic processing
Legend and graphical aspects definition both for the habitat and the management plan maps
Method - object oriented classification

A semiautomatic classification based on an object-oriented approach was also tested for habitat mapping.

Need for repeatability and standardization in order to meet European requirements in geo-information production and regular updating.

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## Method - object oriented classification

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Accuracy assessment for a classification at habitat components level useful for the identification of habitat type or other (non-habitat) land cover types.

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Accuracy assessment for a classification at broad landscape components.
Conclusions

To delineate and map vegetation habitats with the highest degree of accuracy
Integrating field survey (thematic accuracy) and VHRS images interpretation (geometric accuracy). Wide presence of mosaics.

To classify vegetation habitats with reference to the Corine Biotopes classification
Fieldwork, habitat checklist compilation, verification and updating through the process

To produce habitat maps that can be effectively used as a base for implementing management measures
Combining physiognomic and floristic approaches the resulting mapping units can be easily identified and used for management purposes
Thank you for your attention