

Mapping of habitat type and quality with the Natura 2000 habitat monitoring service of North Rhine-Westphalia (Germany)

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1. Introduction

In the last decade, numerous studies (e.g. Bock et al. 2005, Förster et al. 2008, Vanden Borre et al. 2011, Spanhove et al. 2012) and related international projects (e.g. MS.MONINA, BIO_SOS) have shown that remote sensing (RS) data can be used for habitat mapping. At present though, there is no systematic use and integration of RS in the Natura 2000 habitat monitoring procedures in most of the German Federal States. This fact is due to the discontinuous availability of cost-efficient RS data for Federal authorities and a lack of standardized procedures. Moreover, Federal authorities often do not have the technical knowledge for RS data analysis.

The European Copernicus program, and especially the Sentinel satellite missions, will provide earth observation data from different sensors with high revisiting times under a free and open data policy. To facilitate a systematic integration of earth observation data and analysis into federal Natura 2000 habitat monitoring procedures in Germany, the North Rhine Westphalian State Agency for Nature, Environment and Consumer Protection is developing in collaboration with the technical partner EFTAS the pilot service “Natura 2000 habitat monitoring North Rhine-Westphalia”. This service will be able to analyse RS data and combine the resulting information with available geodata (e.g. Digital Surface Model, Digital Terrain Model, Soil Type) to provide useful information for subsequent terrestrial habitat mapping. Upon completion, the pilot service will be made available to all other German Federal States.

2. The pilot service

The core of the pilot service is the application and further implementation of the Information Layer Concept, which was developed by the MS.MONINA project (Buck et al. 2013, Lang et al. 2013). Within known segments, e.g. cadastral areas or areas delimited in former terrestrial habitat mapping campaigns, the analysis tool searches for information indicators. These indicators may be for example the portion of the segment covered by woody species, the height of vegetation or the variability of biomass throughout the year. Every indicator is then expressed as a separate raster information layer based on the input RS data or other ancillary geodata. These information layers are the first output of the service and may then be directly used for supporting terrestrial mapping.

Moreover, the tool combines all created information to give indications on the habitat type and quality present in the analysed segments. This is done by the application of pre-defined expert class models.

3. Indicators for habitat type and quality

The pilot service will include a set of information indicators for both habitat type and habitat quality evaluation. To determine relevant indicators a first screening was carried out of all criteria and sub-criteria currently used by national and regional authorities to classify habitats and to evaluate their quality. This screening checked which of these criteria and sub-criteria could be described by indicators for interpretation derivable from RS data analysis.

Second, from the remote sensing perspective we identified additional indicators for interpretation which up to today have not been used by terrestrial habitat mapping. For this a first user workshop was held in April 2014, bringing together monitoring experts from eleven Federal States in Germany. This led to a set of indicators, that is currently assessed for their inclusion in the above mentioned information layer approach.

4. Perspectives

With a successful development of the monitoring service, the Federal States of Germany will be able to reduce the costs of Natura 2000 monitoring because RS-derived information on habitat type and quality can reduce terrestrial mapping efforts. Especially the use of change detection analyses tools should enable focussed terrestrial mapping campaigns on those areas where changes in habitat type and/or quality actually occurred. In addition, RS-derived information can be used for data quality control.

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References

- BIO_SOS, URL <http://www.biosos.eu>, Last Access: 25.04.2014.
- Bock M, Panteleimon X, Mitchley J, Rossner G and Wissen M, 2005, Object-oriented methods for habitat mapping at multiple scales – Case studies from Northern Germany and Wye Downs, UK. *Journal for Nature Conservation*, 13:75-89.
- Buck O, Klink A, Elena García Millán V, Pakzad K and Mütterthies A, 2013, Image analysis methods to monitor NATURA 2000 habitats at regional scales – the MS.MONINA state service example in Schleswig-Holstein, Germany. *Photogrammetrie Fernerkundung Geoinformation*, 5:415–426.
- Förster M, Frick A, Walentowski H and Kleinschmit B, 2008, Approaches to utilising QuickBird data for the monitoring of NATURA 2000 habitats. *Community Ecology*, 9(2):155-168.
- Lang S, Vanden Borre J, Haest B, Pernkopf L, Buck O, Pakzad P, Förster M and Hendrix R, 2012, Multi-scale service for monitoring Natura 2000 habitats of European Community interest (MS.MONINA). - Let's embrace space 11: 82-90, European Commission, Luxembourg , ISBN: 978 -92-79-22207-8 .
- MS.MONINA, URL <http://www.ms-monina.eu>, Last Access: 25.04.2014.
- Spanhove T, Vanden Borre J, Delalieux S, Haest B and Paelinckx D, 2012, Can remote sensing estimate fine-scale quality indicators of natural habitats?. *Ecological Indicators*, 18:403-412.
- Vanden Borre J, Paelinckx D, Múcher CA, Lammert K, Haest B, De Blust G and Schmidt AM, 2011, Integrating remote sensing in Natura 2000 habitat monitoring: Prospects on the way forward. *Journal for Nature Conservation*, 19(2):116-125.