

Remote sensing based monitoring of the Natura 2000 site Nedere Tauern

Heinz Gallaun, Claudia Praschk, Peter Sackl, Mathias Schardt

Abstract

Information on alpine Natura 2000 sites frequently fails to meet decision-makers' requirements, since comprehensive, systematic and comparable data acquired over longer periods of time are available only in exceptional cases. The present project thus focused on developing remote sensing based methods tailored to the mapping and habitat assessment of large-scale alpine protection areas. These methods were implemented in the Natura 2000 site "Nedere Tauern" designated as a SPA according to the EU Birds Directive. The following results are now available:

- ◆ Criteria catalogue for comprehensive data coverage
- ◆ Colour infrared orthophoto mosaic
- ◆ Land cover map at 1:10,000 scale
- ◆ Knowledge-based habitat models for 13 bird species listed in Annex I of the EU Birds Directive
- ◆ Remote sensing based monitoring system for the assessment of habitat changes
- ◆ Natura 2000 decision support system for the Nedere Tauern protection area

The developed methods can easily be adapted for application in other alpine protection areas.

Keywords

Natura 2000, Nedere Tauern, alpine SPA, remote sensing, land-cover classification, monitoring changes, GIS, knowledge-based habitat models

Introduction

The Nedere Tauern range forms part of the Austrian Central Alps and rises between the Enns Valley in the north and the upper Mur Valley in the south. The region is characterised by the close vicinity of natural and cultural landscapes, which evolved in centuries of extensive agricultural and forestry use. The Natura 2000 "Nedere Tauern" region is classified a "Special Protected Area (SPA)" according to the EU Birds Directive. The region is home to a total of 16 breeding bird species listed in Annex 1 of the EU Birds Directive (SACKL & ZECHNER, 1995). Large parts of the Nedere Tauern bird protection area are also listed as protection areas in the Fauna, Flora and Habitats (FFH) Directive. Covering an area of 107,000 hectares, the Nedere Tauern region is the largest Natura 2000 protection area in Styria.

The project was commissioned by the Government of the Province of Styria within the EU-cofinanced **IPAM** (Integrative Protected Area Management) project. The multidisciplinary work was carried out by Joanneum Research (project management, remote sensing, geo-informatics) in cooperation with Landesmuseum Joanneum (ornithological aspects), the University of Graz (habitat assessment) and the Styrian Government (nature conservation specifications) (GALLAUN et al., 2005).

Criteria Catalogue

As basis for the work, a criteria catalogue with detailed specification of the nomenclature and the data sets to be derived was elaborated by the multidisciplinary project team where those parameters were selected, which

- ◆ are required for nature conservation work,
- ◆ can be mapped using remote sensing or can be derived from existing information,
- ◆ can be generated for the entire Natura 2000 Nedere Tauern area at justifiable expense (total area of 120,000 ha, including border areas).

For the detailed specification of the parameters, a comprehensive literature search of the habitat requirements of 13 Annex I bird species selected for the habitat assessments was performed (PRASCHK, 2004).

Use of remote sensing and geoinformatics for comprehensive data coverage

Flight missions with colour infrared (CIR) film were performed to create a colour infrared orthophoto mosaic. The land cover was classified by means of on-screen visual interpretation. All other parameters were automatically derived from the digital terrain model and the land cover data using geoinformatics methods. The following data sets were generated according to the specifications of the criteria catalogue:

- ◆ Colour infrared orthophoto mosaic with a spatial resolution of 0.5 m per pixel
- ◆ Land cover map at 1:10,000 scale
- ◆ Parameters derived from the digital terrain model
- ◆ Structural parameters derived from land cover mapping

The developed cost-effective methods are suitable for comprehensive data coverage and can be readily adapted to other alpine protection areas.

Landscape-level habitat suitability models

According to the requirements of the nature protection department of the Styrian Government, landscape-level habitat suitability models were developed for the following 13 species listed in Annex I of the EU Birds Directive:

- ◆ Dotterel
- ◆ Rock Partridge
- ◆ Ptarmigan
- ◆ Bluethroat
- ◆ Golden Eagle
- ◆ Black Grouse
- ◆ Capercaillie
- ◆ Tengmalm's Owl
- ◆ Pygmy Owl
- ◆ Three-toed Woodpecker
- ◆ Grey-headed Woodpecker
- ◆ Black Woodpecker
- ◆ Hazel Grouse

The habitat models were defined on the basis of literature searches and the expert ratings of the ornithologists involved in the project. Habitat suitability for all parameters was coded separately for the 13 bird species in matrix form. As opposed to case-based habitat models, which require comprehensive empirical observation data, the developed rule-based habitat models use empirical observation data only for the verification of the assessment results.

Habitat Monitoring

In order to monitor the implementation of the EU-birds and FFH directives, the member states are required to submit reports to the EU Commission at six year intervals. In view of these requirements, methods were developed to detect changes in land cover and to assess the resulting changes in habitat suitability. For detecting severe changes, which cause a significant change in reflection properties, semi-automatic classification of satellite imagery is applied. The implementation is much more cost-effective than the initial land cover mapping, since the existing land cover data are used as a basis and only the changes are classified. Areas affected by long term succession processes at the alpine tree-line which lead to only small changes in reflectance within the 6 year reporting period are not assessed by this change detection approach, but are mapped by visual interpretation. The effects of the land cover changes are then assessed through repeated application of the habitat models and comparison of the assessment results.

The developed methodologies thus allow to assess the presence of the habitat structures required, the location, size and distribution of potentially suitable habitats, and the temporal and spatial changes in habitat suitability for 13 annex I bird species. The methods do not, however, provide information about the population dynamics.

To allow efficient use of the comprehensive project results, a decision support system was implemented, which is based on the ArcMap and ArcReader software. The main functionalities of the system include on-screen visualisation, generation of cartographic output and database queries. All project results are integrated in this GIS based decision support system and can be directly linked with further data of the Styrian Government in order to support the management of the Natura 2000 Niedere Tauern protection area.

References

GALLAUN H., SACKL, P., PRASCHK, C., WACK, R., SCHARDT, M., TURK R. (2005): IPAM-Toolbox. Großflächige Inventur eines Alpinen Natura 2000 Gebietes mittels Fernerkundung in den Niederen Tauern / Steiermark. Hrsg. vom Amt der Kärntner Landesregierung, Klagenfurt. ISBN 3-9502026-4-1, 32pp.

PRASCHK C. (2004): Erstellung eines Habitatmerkmalskatalogs für 13 Vogelarten des Anhang I der EU-Vogelschutzrichtlinie. Diplomarbeit – Inst. für Zoologie der Universität Graz, 95pp.

SACKL, P. & ZECHNER, L. (1995): „Niedere Tauern“ in Dvorak, M. & Karner, E. (1995): „Important Bird Areas in Österreich“ – Umweltbundesamt Monogr. 71, Wien: 367-373.

Contact

Dipl.-Ing. Heinz Gallaun
heinz.gallaun@joanneum.at

Joanneum Research
Institut für Digitale Bildverarbeitung
Wastiangasse 6
A 8010 Graz
Austria

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Nationalpark Hohe Tauern - Conference Volume](#)

Jahr/Year: 2005

Band/Volume: [3](#)

Autor(en)/Author(s): Gallaun Heinz, Praschk Claudia, Sackl Peter, Schardt Matthias

Artikel/Article: [Remote sensing based monitoring of the Natura 2000 site Niedere Tauern 65-67](#)