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Global Change Impact – Projects in the National Park Berchtesgaden

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Abstract

The National Park Berchtesgaden was founded in 1978. Protection of nature, research focussed on observation and monitoring of biocoenoces and recreation as well as environmental education, are the most important tasks, defined by the Bavarian Parliament. Research and long term monitoring will support understanding of ecological processes. The natural und man made changes will be identified for the whole area. Research in National Park Berchtesgaden is applied research. It supports the management measures as well as the long term development tendencies. This is defined in the National Park plan and put into force by the Bavarian Ministry of Environment in 2001 (StMUGV 2001).

The tasks of the research and monitoring distinguish between topics in natural and near natural ecosystems of the core zone and topics in human influenced ecosystems in buffer zone. In addition to these topics, the development of ecosystems, which are no more used by human activities, should be worked out in core zone. The results of these synthesises should be compared to the present expectations.

Basics of long term monitoring in Berchtesgaden

A Geographic Information System (GIS) is the basis for research, planning and monitoring in Berchtesgaden. It was introduced in 1984 as a part of the UNESCO-MaB – Project 'Impact of human activities on high mountain ecosystems', which took place from 1981 – 1991. These data were consequently processed for the management plan from 1991 – 2001. At present, all data models are refined for long term monitoring.

Hierarchy of long term monitoring – the management projects

Basic of all the previous and present research projects, of the management plan and the long term monitoring is the interpretation of colour infra red (CIR) aerial photos at a map scale of about 1: 10000, combined with the digital elevation model. In Berchtesgaden, CIR-photos exist for the years 1980, 1985, 1990, 1997 and 2003. This method was adopted by 10 other protected areas within the HABITALP-project (LOTZ 2005).

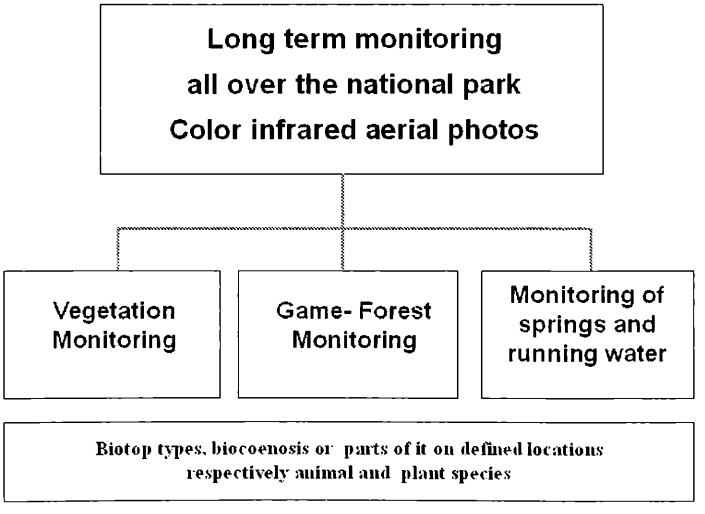

Fig. 1: Hierarchy of monitoring programmes in the National Park Berchtesgaden

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Temporary buffer zones are defined in the management plan. Exclusively measures for game management are taken in these zones. They will be change into buffer zone in ten years, if the measures for forest development will succeed. Methods for validation are

- monitoring of chamois
- comparative monitoring of vegetation inside and outside fences
- forest inventory

The data structures and the routines will be developed at the basics of the existing data models.

The Global Change Monitoring Projects

The projects on climate change are embed in this framework. The effects of global change will be worked out at present in three projects:

- Impact on global change on high alpine vegetation including contribution to the GLORIA-Project
- Phaenological monitoring
- Monitoring of water sources

Impact on global change on high alpine vegetation

A hypothesis assumes, that the plant species of alpine calcareous grasslands (Carex simpervirens-, Carex firma-community) have changed during the last 20 years. For this reason, historical plant mappings between 1984 and 1988 in the National Park Berchtesgaden were repeated in the year 2003 by Thomas Kudernatsch, Weihenstephan Center of Life and Food Sciences. Floristically changes between 1988 and 2003 were evident. The increase of temperature during the last two decades caused the changes of plant species. Since 1988 the average number of species per mapping site increased significantly by 11 species in the plant communities above 2000 m about sea level. This rise is not caused by the immigration of new species but by an increase in the frequency of species, which existed still 1988. A trait analysis showed that species which have clearly increased in their frequency are from small growth, preferably generative reproduction and have light seeds. In the Carex firma-community the species are also characterized by a late start of flowering time. Different exogenous and endogenous factors were discussed as possible reasons for the documented changes. The floristically changes should be explained by global warming. Natural succession, nitrogen deposition as well as changed land use practices obviously play not an important role (KUDERNATSCH 2005).

Phaenological Monitoring

Phaenology works on periodical returning phenomena of development of plants and animals. The appearance of flowering and leaf stages is documented for plants. It is closely linked to phenomena of weather and climate conditions. Phaenological data will be used more intensively for future analysis of trends of climate change. In the National Park Berchtesgaden, two international Phaenological gardens (cf. http://www.agrar.hu-berlin.de/pflanzenbau/agrarmet/ipg_de.html) are installed at Schapbach and Kühroint. In addition, the NP Berchtesgaden runs another 30 places for phaenological documentation in an altitude profile from 700 to 1400 m above sea level since 1994.

Monitoring of water sources

Water sources are very outstanding biocoenoces. Their temperature fluctuates in a very narrow range between 3 respectively 4 to 6 ° C. The fauna of water springs is adopted to this special condition. Till now, about 750 zoological species were identified. A third of these species, found in about 60 water sources of the NP Berchtesgaden, is strongly adopted to the conditions in water sources and might change with global warming. This special programme will be continued for next decades.

Integrated environmental monitoring

The approach to put integrated environmental monitoring into concrete terms, was developed in the Biosphere Reserve. It is based on development of a core set of parameters, corresponding with data collected in the process of integrated environmental monitoring or provided by existing measurement and monitoring programmes: the parameters of the core set are selected by a problem and a data oriented approach as well as a system theoretical approach, based on a runoff model.

The biggest development potential of environmental monitoring is to realise an integrative interpretation: by bringing together data sets, the value of the statements of the existing monitoring programmes and measurement networks can be significantly increased.

The exemplary implementation and assay of the methodological proposals in the Biosphere Reserve Rhön (SCHÖNTHALER et al. 2003) will be implemented in the National park and Biosphere Reserve Berchtesgaden on behalf of the management plan. The interpretation of colour-infrared aerial photos is the most important data layer for this monitoring.

Summary

1. Research and long term monitoring are central areas of responsibility of a national park (cf. decree of implementation of the national park, § 6(1))
2. On behalf of the NP Berchtesgaden, the Free State of Bavaria accepts responsibility for the alpine region within the scope of the national and international framework
3. National park administration will concentrate on long term monitoring, especially on the integrated environmental monitoring concept, developed in the biosphere reserve Rhön
4. At the same time, this work can support the duties for the Natura 2000 duties of the European Union
5. At last, the management measure will be validated by this concept of long term monitoring

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