

## Research concepts in protected areas in the Alps

Valerie Braun

### Abstract

This article aims to identify differences in the research concepts within protected areas. To this end, scientific concepts of protected areas available on the internet from Germany, Switzerland and Austria were selected and compared. To begin with, I present the accepted international terms of global conventions and regional agreements into which the chosen protected areas are integrated. To compare the different concepts, the key themes introduced in each concept are grouped into 15 short topics. Topics on management measures, biodiversity and global & climate change appear in almost all concepts. Conceptual differences can be found in research themes relating to regional development. This is mainly an issue in biosphere reserves and nature parks.

### Introduction

According to the Convention on Biological Diversity the “*in situ conservation, sustainable use of biological diversity and the fair and equitable sharing of benefits arising from the use of genetic resources are dependent upon properly maintaining sufficient natural habitat*” (CBD CoP7, 2004). Protected areas play an essential role for global biodiversity conservation strategies and for preserving natural and cultural heritage. The term “protected area” (PA) includes a variety of designations and there are diverse international PA systems created under global conventions (e.g. World Heritage Sites, IUCN PAs) and regional agreements (e.g. Natura 2000 sites in Europe) (Dudley 2008).

In recent decades, the concept of PAs has evolved from one of strictly separating nature from human impact into one of trying to integrate tourism and wilderness and the sustainable and rural development of the area (Mose 2009; Mose & Weixlbaumer 2007). This requires a specific form of management for each individual area, which not only depends on the laws and regulations that underpin the respective area but also on its size, location, remoteness, recreational value etc. There is a great need for information to understand and tackle the most pressing issues of the respective region using inter- as well as transdisciplinary approaches (Price 2007). This means involving scientists from different disciplines as well as stakeholders and people who live near or within these areas. Within recent years, some PAs in the Alps have stepped up their efforts to establish a research concept tailored to the needs of the area.

### Protected areas and their research concepts

Within the Alps PAs, cover about 25% of the Alpine Space as defined by the Alpine Convention (ALPARC 2008). They are among the most important categories – national parks, regional and/or nature parks, nature reserves, biosphere reserves, natural world heritage sites – and complemented by 500 areas listed under special protection, of-



Figure 1 – BR Großes Walsertal. © Günter Köck

ten overlapping with existing PAs (ALPARC 2008). In this paper I am going to introduce a total of six PAs in four categories from German-speaking Alpine countries (Figure 2). These regions were selected because their research concepts are available online. Some other PA administrators I have spoken to are in the course of establishing a research concept (Gesäuse National Park (NP) & Kalkalpen NP, both Austria) or have a research concept which is not available online (Dürrenstein Wilderness Area, Austria) and many websites of the PAs show a wide range of ongoing research activities (e.g. Gesäuse NP). PAs in France and Italy were not included. I shall start by presenting the designated categories of these areas and then the areas themselves with a special focus on their definition of research activities.

### International Union for Conservation of Nature (IUCN)

For the IUCN, a PA is “*an area of land and/ or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means*”. All areas should facilitate low-impact scientific research activities and ecological monitoring related to and consist-

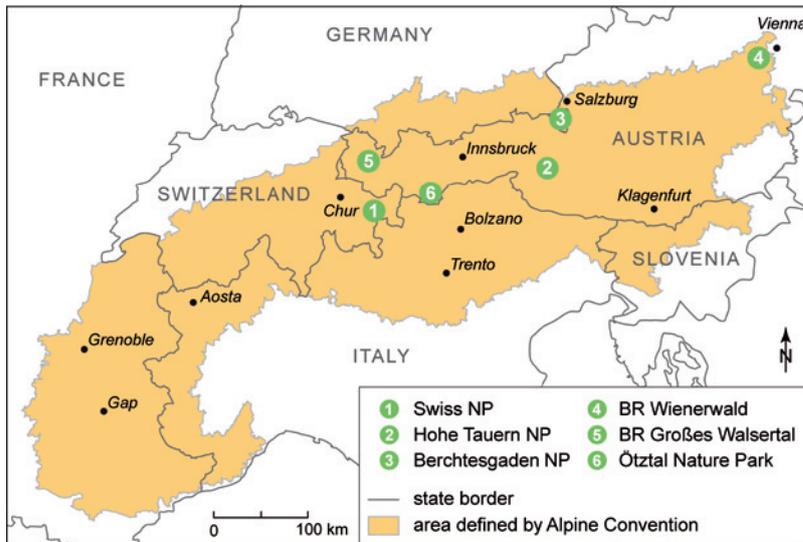


Figure 2 – The location of the introduced protected areas in the Alpine Arc. Design and graphics: Kati Heinrich & Valerie Braun.

ent with the values of the area” (Dudley 2008). In 1994, an agreement was reached on a management-objective-based category system of six categories. Three of the introduced Alpine areas belong to the categories I and II:

- Category I means strict protection and is divided into category Ia) and Ib). Category Ia areas are strict nature reserves set aside to protect biodiversity and also possibly geological / geomorphologic features, where human visits, use and impacts are strictly controlled. Such PAs can serve as indispensable reference areas for scientific research and monitoring. To minimize disturbance, careful planning and implementation of research and other approved activities is necessary (Dudley 2008).
- Category II means the protection and conservation of ecosystems. The primary objective of this category is to protect natural biodiversity along with this underlying ecological structure, to support environmental processes and to promote education and recreation (Dudley 2008).

#### Swiss National Park (IUCN Cat. Ia) / UNESCO Biosphere Reserve Val Müstair – Parc Naziunal, Switzerland

The Swiss NP is situated in the easternmost corner of Switzerland. Contiguous to the Swiss NP is the Biosfera Val Müstair with 1600 inhabitants. In June 2010, the Swiss NP and the Biosfera Val Müstair were merged into a biosphere reserve that fulfils the UNESCO criteria.

In 1981, the Swiss Academy of Natural Sciences committed itself to leading and supporting research in the Swiss NP. In 2007, the Swiss NP research committee established for this purpose presented a research concept for the period 2008–2018, which integrates the Swiss NP and the Biosfera in its objectives (*Forschungskonzept 2008–2018*). It opens up many synergies and opportunities for comparisons of wilderness with

cultural landscape. Research projects in the Swiss NP must be approved by the management (research committee, national park director, research coordinators and GIS experts).

#### Nationalpark Hohe Tauern (IUCN Cat. II), Austria

Hohe Tauern NP stretches across three Austrian federal provinces. The PA includes key sections of the Central Alps with large virgin alpine landscapes as well as high mountain pastures.

In 2007, the NP council (the umbrella organization of the Hohe Tauern NP with representatives from all three federal provinces) presented a research concept to be implemented in stages until 2020 (*Forschungskonzept Nationalpark Hohe Tauern 2020*). In principle, research in the NP does not have to be approved by the park management, which is very interested in cooperation, exchange of data and results. Contract research and the park’s own research must be oriented on the objectives of the NP and is evaluated by the NP administration.

#### Nationalpark Berchtesgaden (IUCN Cat. II), Germany

Berchtesgaden NP is located in the south-east of Germany. It is part of the northern Calcareous Alps and specifically the Berchtesgaden Alps. Since 1991, the NP and its environs form a UNESCO approved biosphere reserve that was extended in June 2010 to include the entire administrative district Berchtesgaden Land. Berchtesgaden NP forms the core and buffer zones of the biosphere reserve, the surroundings of the NP making up the transition zone. The land of the NP has been used for centuries and is situated in the very densely populated central part of Europe (*Nationalparkplan 2001*). The research concept is part of the Nationalparkplan Berchtesgaden 2001. Research in the NP must be approved by the NP management.

#### UNESCO – Biosphere Reserves (BR): ensuring sustainable development

Biosphere reserves are sites recognized under the UNESCO Man and the Biosphere (MAB) Programme. They are under national sovereign jurisdiction. The biosphere concept was launched in 1976 by the UNESCO MAB programme as a purely scientific programme. In its Sevilla strategy (UNESCO 1996), the concept was reversed to fulfil three complementary functions: a conservation function, to preserve genetic resource, species, ecosystems and landscapes; a development function, to foster sustainable economic and human development, and a logistic support function, to support demonstration projects, environmental education and training, and research and monitoring related to local, national and global issues of conservation and sustainable development (UNESCO 1996). In the Madrid Action Plan, one of the overall goals was to strengthen research, training and capacity

building (UNESCO 2008). These different concepts are mirrored in BRs which were established before the Seville Strategy and after (Lange 2005).

In Austria, the Austrian MAB national committee advises and supports those responsible for the biosphere reserves by helping with scientific and technical issues and forms the link to the MAB office in Paris (Lange 2005). In 2004, an international workshop gave the Austrian MAB research three new perspectives: 1) to work inter- as well as transdisciplinarily; 2) national studies should be embedded in an international context; and 3) the work should focus on climate change, long-term environmental monitoring, more effective integration of the various interest groups into the management and to develop the areas according to the Seville Strategy (Lange 2005). In 2005, with the help of the Austrian MAB programme, a research and monitoring concept was created for the BR Wienerwald and the BR Großes Walsertal (ÖAW, MAB-Nationalkomitee 2005: *Leitfaden für Forschung und Monitoring im Biosphärenpark Wienerwald; Leitfaden für Forschung und Monitoring im Biosphärenpark Großes Walsertal*).

#### BR Wienerwald, Austria

The Wienerwald is a biodiversity hotspot in Central Europe. In its territory several bio-geographical regions come together. Various geological conditions, a considerable altitudinal range (from approx. 160 m to almost 900 m), different climatic zones and, last but not least, human impact have led to the emergence of a great variety of habitats (Köck et al. 2009).

#### BR Großes Walsertal, Austria

The Großes Walsertal is a thinly populated valley dominated by mountain agriculture. The area covers nearly 200 km<sup>2</sup> (19 200 ha), with six municipalities totalling ca. 3 400 inhabitants (BR Walsertal 2010). In this region, scientific research and monitoring has to support the management but also help to increase and sustain the typical identity of the region (mountain agriculture, everyday culture) (*Leitfaden für Forschung und Monitoring im Biosphärenpark Großes Walsertal*; see also Coy & Weixlbaumer 2009).

#### Nature parks, Austria

The objective of nature parks is the protection of a landscape in combination with land use. Nature parks are there to protect particularly valuable, characteristic landscapes against destruction and to develop them. The government of the relevant federal province issues the designation “nature park”, which requires these rural areas to conserve nature and landscape and to encourage recreation, research and regional development (Naturparke Österreich 2010).

#### Ötztal Nature Park, Austria

Ötztal Nature Park covers a mainly alpine and high-alpine area of ca. 390 km<sup>2</sup> in the southern part of the Ötztal valley and includes several areas of special

protection status: the two “Ruhegebiete” (wilderness areas) Ötztal Alps (also a Natura 2000 area) and Stubai Alps, the natural heritage Obergurgl Zirbenwald (Arolla pine forest), the virgin forest reserves in Windachtal and the UNESCO BR Gurgler Kamm. In addition, the Ötztal and Stubai Alps have been awarded the label “biogenetic reserve” (a designation of the Council of Europe). All PAs and conservation categories in the inner Ötztal are managed under the umbrella of Ötztal Nature Park (Naturpark Ötztal 2010). In 2010 a research concept was launched (*Zukunft Forschung Ötztal 2020*).

#### Comparison

Altogether I found six research concepts of PAs in German-speaking Alpine countries on the internet: 1 in Switzerland, 1 in Germany and 4 in Austria. In order to facilitate the comparison, only the key research themes of the concepts are listed (Table 1) and grouped into 15 short topics selected by the author to facilitate the comparison. The key research themes of the concepts include many research questions which are often similar between the six concepts but the key themes mirror the main concerns of the areas more clearly. For example, recreation is one of the key research themes for Berchtesgaden NP, which boasts a large catchment area for visitors. Other PAs may also allocate visitors a high priority but the relevant research questions are found under different key research themes (Swiss NP: regional development of the Swiss NP and the Biosfera / Hohe Tauern NP & BR Großes Walsertal: management measures). As the research questions are not listed in the table, some fields are empty.

The actors behind the scientific concepts also differ between the areas: in the BRs and in the nature park, stakeholders were involved to develop the concepts whereas in the other areas the management (Hohe Tauern NP, Berchtesgaden NP) or the scientific management (Swiss NP) were responsible (Table 2).

Table 2 – The actors behind the scientific concepts.

Protected areas	Actors involved in designing the scientific concept
<b>Swiss NP &amp; Biosfera Val Müstair</b> ( <i>Forschungskonzept 2008–2018</i> )	- Research commission
<b>Hohe Tauern NP</b> ( <i>Forschungskonzept Nationalpark Hohe Tauern 2020</i> )	- Research staff of the NP; - directors; - research partners coordination with other large protected areas.
<b>Berchtesgaden NP</b> ( <i>Nationalparkplan 2001</i> )	- National park administration; - planners Bosch & Partner.
<b>BR Wienerwald</b> ( <i>Leitfaden für Forschung und Monitoring 2005</i> )	- expert workshops; - working group meetings of stakeholder groups; - management.
<b>BR Großes Walsertal</b> ( <i>Leitfaden für Forschung und Monitoring 2005</i> )	- expert workshops; - internet survey and working group meeting of stakeholder groups; - management.
<b>Ötztal Nature Park</b> ( <i>Zukunft Forschung Ötztal 2020</i> )	- workshops; - expert interviews.

Short topics that include the key research themes

**1. Management measures:** Fundamental research and applied research in order to support management purposes is an issue for all presented areas. Research questions centre on visitor-management, tourism, agriculture, involvement of the public in decisions and finding indicators to measure quality, efficiency and success of the management.

**2. Inventory and monitoring** of biodiversity: Mountain ranges have a variety of climatic conditions and ecosystems and their biodiversity richness is a result of different combinations of physiographic factors (variation in topography and altitude, steep gradients in temperature, wind exposure, snow cover, geological substrata, soil and cryological processes etc.) and human management effects (Grabherr et al. 2003). Inventory and monitoring of biodiversity are tasks which are part of all PAs mentioned, either as key research theme or as research questions (Swiss NP and Ötztal Nature Park).

**3. Climate and global change:** According to the European Environment Agency (EEA 2009), the Alps have undergone an exceptionally high temperature increase of around 2°C. A slight trend towards more precipitation in the Northern and less in the Southern Alps has been identified. The challenge facing the PAs is met by a high number of related research questions. The GLOCHAMORE strategy (2005), a research strategy for global change developed within the 6<sup>th</sup> EU Framework Programme, is listed as a basis for the concepts of Swiss NP, BR Großes Walsertal, Ötztal Nature Park and Hohe Tauern NP. Berchtesgaden NP supports a wide range of projects on this topic introduced elsewhere in this issue.

**4. Long-term research,** aimed at the development of processes and structures over decades, appears in some of the concepts. The topics show a wide range of variations (Table 1), from the importance of disturbances on the development of alpine ecosystems (Swiss NP) to long-term research on local issues (BR Großes Walsertal).

**5. Land-use change** summarizes a wide range of main themes within the concepts. Land-use and land-cover change are general terms for the human modification of the terrestrial surface, driving unprecedented changes in ecosystems and environmental processes at local, regional and global level (Ellis & Pontius 2010). Key research themes in Berchtesgaden NP, e.g., are measures on grazed meadows and on abandoned areas.

**6. Regional development** as a main theme in PAs best reflects the differences in the legal background of the presented areas. In PAs where people live and work within or in close vicinity to the PA itself, research questions addressing regional development are of great importance (BR Wienerwald, Ötztal Nature Park and Swiss NP with its neighbouring BR Val Müstair). The BR Großes Walsertal addresses this issue as research topics under the main theme of management measures and long-term monitoring.

**7. Environmental education and public relations** seem to be especially important for the national parks (Swiss NP, Hohe Tauern NP & Berchtesgaden NP), either to raise acceptance for the national park idea amongst the public (Berchtesgaden NP) or to optimize the social functionality of the national park (Hohe Tauern NP).

**8. Research on ungulates,** which includes the interaction of ungulates with vegetation, population dynamics and development is an issue in the national parks: either as key research question (Swiss NP and Berchtesgaden NP) or as part of research questions (Hohe Tauern NP).

**9. Abiotic conditions:** According to the Hohe Tauern NP, abiotic conditions such as permafrost, hydrology, geomorphology and soil conditions need to be evaluated for modelling, programming and further studies.

**10. Visitors:** With the rise of tourism in Pas, the areas are confronted with a pressing need for effective visitor management. Many of the PAs do not only protect natural and cultural values or biodiversity, they are also important points of attraction for tourism and recreation (Siegrist et al. 2008).

**12. The historical development** of the area is important for the Swiss NP, which can look back on 100 years of natural development and for Ötztal Nature Park, where people have been living for thousands of years.

**13. Forest maintenance** is a main theme for Berchtesgaden NP, where the development of the forest and the bark beetle are being monitored.

**14. The valuation of ecosystem services:** According to Stolton and Dudley (2010), most PAs are managed to provide multiple ecosystem services to diverse communities. The Swiss NP wants to evaluate the added value of the park and the adjacent Biosfera Val Müstair for economy and society in order to raise acceptance and use it as an instrument for monitoring-success.

**15. & 16. Data and know-how management and gaining up-to-date scientific knowledge** are key research themes for the Swiss NP and the Hohe Tauern NP.

## Conclusion

Science in PAs plays an important role in guaranteeing the fulfilment of the aims of these areas. Management, protection and science are strongly correlated and one without the other is not possible. The presented areas mirror common themes for PAs regardless of their legal framework as well as highlighting the differences which can be seen, for example, in research on regional development. For Hohe Tauern NP, science should contribute to recognizing problems at an early stage and to evaluating them through external observation, different point of views as well as appropriate development of methods and strategies (Bauch et al. 2007). However, the integration of the research into man-

Table 1 – Key research themes of the concepts from the protected areas grouped into 15 short topics selected by the author. The key research themes of the concepts include many research questions which are often similar between the six concepts. The “x” indicates that the key research themes and the short topic are identical. As the research questions are not listed in the table, some fields are empty.

Short topics	Protected areas	Swiss NP & Biosfera Val Müstair (Forschungskonzept 2008–2018)	Hohe Tauern NP (Forschungskonzept Nationalpark Hohe Tauern 2020)	Berchtesgaden NP (Nationalparkplan 2001)	BR Wienerwald (Leifaden für Forschung und Monitoring 2005)	BR Großes Walsertal (Leifaden für Forschung und Monitoring 2005)	Ötztal Nature Park (Zukunft Forschung Ötztal 2020)
1	management measures	x	x	x	x	x	x
2	biodiversity monitoring and inventory		x	x	x	x	
3	climate and global change	regional development under conditions of globalization and climate change	associated themes: dealing proactively and comprehensively with global change	long-term monitoring of global climate change and their effect on alpine ecosystems		climate change & natural hazards climate change & high-mountain pasture management	adaptation of alpine species to climate and land-use changes
4	long-term research	- long-term monitoring and modelling - impact of disturbances on the long-term development of ecosystems	systematic research into ecosystem processes and long-term research	long-term monitoring of the effects of cross-regional pollutant immissions on alpine ecosystems	long-term research for establishing competence in the area of 'spatial development between natural landscape and metropolises'	long-term research on everyday practices high-mountain pastures natural hazards	
5	land-use change		associated themes: interaction of humans and nature	grazed areas and abandoned pastures	(beech) forest ecosystems and how to manage them sustainably		x
6	regional development	success factors of sustainable regional development involving SNP and Biosfera			development and communication of regional identity		socio-economic development
7	environmental education & public relations	dialogue, communication and education	socio-economic and cultural-educational national park research	enhancing acceptance and marketing			
8	ungulates	x		x			
9	abiotic conditions		capturing and evaluation of abiotic resources				geology, palaeoclimatology and glaciology
10	visitors			recreational use			
11	history	100 years of natural dynamics in SNP					- history of land use - cultural studies: German language and literature and ethnology
12	forest maintenance			x			
13	valuation of ecosystem services	contributions of protected ecosystems and sustainably used resources for society					
14	data & know-how management	x	developing of technologies and methods tailored to the requirements of PAs				
15	deepening scientific knowledge	x					

agement and protection requires good communication between management, scientists and stakeholders to ensure a successful outcome (see Mitchell-Banks & Price 2007).

## References

ALPARC 2008. Some figures about Alpine PAs. Available at: <http://de.alparc.org/die-schutzgebiete/zahlen-der-asg> (access: 30/07/2010)

CBD CoP7, 2004: Convention on Biological Diversity, COP 7 Decision VII/28. 2004. *Programme of work on PAs*.

Coy, M. & N. Weixlbaumer (eds.) 2009. *Der Biosphärenpark als regionales Leitinstrument. Das Große Walsertal im Spiegel der Nutzer*. Alpine Space – man & environment, volume 10. Innsbruck.

Dudley, N. (ed.) 2008. *Guidelines for applying PA management categories*. IUCN, Gland.

EEA 2009. *Regional climate change and adaptation: The Alps facing the challenge of changing water resources*. EEA Report No 8/2009, European Environment Agency.

Ellis, E. & R. Pontius 2010. "Land-use and land-cover change". In: Cutler, J. (ed.), *Encyclopedia of Earth*. Environmental Information Coalition, National Council for Science and the Environment.

Grabherr, G. 2003: Alpine vegetation dynamics and climate change: A synthesis of long-term studies and observations. In: Nagy, L., G. Grabherr, Ch. Körner & D.B.A. Thompson (eds.), *Alpine Biodiversity in Europe*. Berlin, Heidelberg.

Köck, G., G. Koch, C. Diry 2009. The UNESCO Biosphere Reserve „Biosphärenpark Wienerwald“ (Vienna Woods) – a Long History of Conservation. *eco.mont* 1/1.

Lange, S. 2005. *Inspired by diversity. UNESCO's biosphere reserve as model regions for a sustainable interaction between human and nature*. Vienna.

Mitchell-Banks, P. & M. Price 2007. Integrated approaches to research and management in mountain areas: synthesis and lessons for the future. In: Price, M. (ed.), *Mountain Area Research & Management. Integrated approaches*: 272–292.

Mose, I. 2009. Perception and acceptance –key factors for participatory planning of PAs in Europe. In: *Conference Volume 4<sup>th</sup> Symposium of the Hobe Tauern National Park for Research in PAs* (September 17–19, 2009, Kaprun Castle): 229–231. Kaprun.

Mose, I & N. Weixlbaumer 2007. A new paradigm for PAs in Europe? In: Mose, I (ed.), *PAs and regional development in Europe. Towards a new model for the 21st century*: 3–20.

MRI (eds.) 2005. *GLOCHAMORE – Global Change and Mountain. Regions Research Strategy*.

Naturpark Ötztal. Available at: <http://www.naturpark-oetztal.at/naturpark.html> (access: 15/09/2010).

Naturparke Österreich. Available at: [http://www.naturparke.at/de/VNOe/Was\\_ist\\_ein\\_Naturpark](http://www.naturparke.at/de/VNOe/Was_ist_ein_Naturpark) (access: 15/09/2010).

Price, M. (ed.) 2007. *Mountain Area Research & Management. Integrated approaches*.

Siegrist, D., C. Clivaz, M. Hunziker & S. Iten (eds.) 2008. *Visitor management in nature-based tourism. Strategies and success factors for recreational and PAs*. Series of the Institute for Landscape and Open Space, HSR University of Applied Sciences Rapperswil.

Stolton, S. & N. Dudley (eds.) 2010. *Arguments for PAs*. London.

UNESCO 1996. *Biosphere reserves: The Seville Strategy and the Statutory Framework of the World Network*. UNESCO, Paris.

UNESCO 2008. *Madrid Action Plan for Biosphere Reserves (2008–2013)*.

## Scientific concepts:

Naturpark Ötztal, Alpine Forschungstelle Obergurgl & Elmauer Instut (eds.) 2010. *Zukunft Forschung Ötztal 2020*. Available at: : <http://www.naturpark-oetztal.at/natur-kultur/wissenschaft-forschung.html> (access: 15/09/2010).

ÖAW, MAB-Nationalkomitee (eds.) 2005. *Leitfaden für Forschung und Monitoring im Biosphärenpark Großes Walsertal*. e.c.o.-Klagenfurt. <http://www.austriaca.at/> (access: 25/07/2010)

ÖAW, MAB-Nationalkomitee (eds.) 2005. *Leitfaden für Forschung und Monitoring im Biosphärenpark Wienerwald*. e.c.o.-Klagenfurt. <http://www.austriaca.at/> (access: 30/07/2010)

Bayerisches Staatsministerium für Landesentwicklung und Umweltfragen (ed.) 2001. *Nationalparkplan 2001*. Available at: <http://www.nationalpark-berchtesgaden.bayern.de/nationalparkplan/index.htm> (access: 5/07/2010)

Bauch, K., M. Jungmeier, S. Lieb 2007. *Forschungskonzept Nationalpark Hobe Tauern 2020*. Available at: <http://www.hohetauern.at/de/forschung.html> (access: 01/07/2010)

Forschungskommission des Schweizerischen Nationalparks 2007 (eds.). *Schweizerischer Nationalpark & Biosfera Val Müstair: Forschungskonzept 2008–2018*. Available at: <http://www.nationalpark.ch/go/de/forschung/organisation/forschungskonzept/> (access: 01/07/2010)

## Author

### Valerie Braun

has a PhD in eco-physiology of alpine plants and is now responsible for the smooth implementation of eco.mont.