



Nature restoration project inspired by the cultural land use practices and the environmental wellbeing in the Alps.

–A case study from Balderschwang, Germany.

Tea Križ-Posavec

Independent project • 30 hp

Swedish University of Agricultural Sciences, SLU

Department of Landscape Architecture, Planning and Management

Landscape Architecture Master's Programme

Alnarp 2026



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Credits: 30 hp

Level: A2E

Course title: Independent Project in Landscape Architecture

Course code: EX0852

Programme: Landscape Architecture Master's Programme

Course coordinating dept: Department of Landscape Architecture, Planning and Management

Place of publication: Alnarp, Sweden

Year of publication: 2026

Cover picture: **Tea Križ-Posavec**

Keywords: *Nature restoration, Alpine village Balderschwang (Bavaria, Germany), Alps,
Cultural land use practices, Environmental wellbeing, Recreational landscapes
& winter tourism*

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Fakulteten för landskapsarkitektur, trädgårds- och växtproduktionsvetenskap

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For my family who helped me fulfil my academic dreams
and for all the people who are working tirelessly to heal our planet and our
relationship to it,

Thank you

"How we approach restoration of land depends ... on what we believe that "land" means. If land is just real estate, then restoration looks very different than if land is the source of a subsistence economy and a spiritual home. Restoring land for production of natural resources is not the same as renewal of land as cultural identity."

— Robin Wall Kimmerer
(Braiding Sweetgrass: Indigenous Wisdom, Scientific
Knowledge, and the Teachings of Plants)

Abstracts

English

How can nature restoration proposals be developed for the Alpine rural landscapes? The focus of this study is on two central themes that inspired the development of nature restoration proposals: the cultural land-use practices and the environmental wellbeing. To develop these restoration proposals, a case study in a small Alpine village Balderschwang (Bavaria, Germany) was conducted. It applied various methods which were summarised under the acronym NATURE BACK. An important finding of the study is that tourism and the protection against gravity-driven natural hazards need to be considered in the restoration process of this cultural landscape. Among other things, it is suggested to establish a protective forest on the slopes above the village centre and to design an open-air museum in Balderschwang showcasing local culture and nature.

German

Wie lassen sich Vorschläge zur Renaturierung für die ruralen Landschaften der Alpen entwickeln? Im Mittelpunkt dieser Studie stehen zwei zentrale Themen, die die Entwicklung von Renaturierungsvorschlägen inspiriert haben: die kulturellen Landnutzungspraktiken und das „Umweltwohlbefinden“ (eng. environmental wellbeing). Zur Erarbeitung dieser Renaturierungsvorschläge wurde eine Fallstudie in dem kleinen *Alpdorf* Balderschwang (Bayern, Deutschland) durchgeführt. Dabei kamen verschiedene Methoden zum Einsatz, die unter dem Akronym NATURE BACK zusammengefasst wurden. Eine wichtige Erkenntnis der Studie ist, dass der Tourismus und der Schutz vor schwerkraftbedingten Naturgefahren bei der Renaturierung dieser Kulturlandschaft berücksichtigt werden müssen. Unter anderem wird vorgeschlagen, einen Schutzwald an den Hängen oberhalb des Dorfsentrums anzupflanzen und ein Freilichtmuseum in Balderschwang zu konzipieren, das die lokale Kultur und Natur präsentiert.

Swedish

Hur kan man utarbeta förslag till naturåterställning för de alpina landsbygdslandskapen? Denna studie fokuserar på två centrala teman som har inspirerat utvecklingen av förslag till naturåterställning: kulturella markanvändningsmetoder och miljömässigt välbefinnande (eng. environmental wellbeing). För att ta fram dessa återställningsförslag genomfördes en fallstudie i den lilla alpbyn Balderschwang (Bayern, Tyskland). I studien tillämpades olika metoder som sammanfattades under akronymen NATURE BACK. En viktig slutsats av studien är att turismen och skyddet mot naturkatastrofer som orsakas av tyngdkraften måste beaktas i återställningsarbetet av detta kulturlandskap. Bland annat föreslås att man anlägger en skyddande skog på sluttningarna ovanför byns centrum och utformar ett friluftsmuseum i Balderschwang som visar upp lokal kultur och natur.

Foreword

Nowadays, we are fast to keep up with the flood of notifications, but it seems like we are often too distracted to recognize the changes taking place in the landscapes we live in and those far away from us that are affected by our behaviour. The latter are occasionally our beloved holiday destinations.

However, even in our 'distracted world' with a potentially declining landscape literacy, the landscape changes caused by different land use practices and climate crisis are starting to become increasingly obvious. Hence, numerous different approaches are emerging to address these complex problems. Through the course of my education as a landscape architect, I got convinced that our discipline can address large societal and environmental questions on different geographical scales. We can act as 'knowledge generalists' and mediators for transdisciplinary work around landscape dynamics in urban, as well as rural settings. The following thesis is an endeavour to demonstrate the contribution that landscape architecture can make to the nature restoration efforts in rural areas, particularly in the case study example. In this work, I address complex topics such as the long-term effects of climate change on the local environment and the local community, the loss of biodiversity, as well as the changing landscape dynamics and culture in the Alpine region.

I chose the Alpine landscapes for my final individual project, because of their picturesque beauty and the mentioned complex challenges that are exacerbated there. As someone who enjoys spending time in the mountains, which, I must admit, includes skiing, I nevertheless see that major changes in these landscapes are undeniably going to take place - and that they are already happening as I am writing this. For me as a landscape architect, I see an opportunity to rethink the future of the Alpine rural spaces by trying to intentionally steer the landscape changes as much as possible in a regenerative direction. Nature restoration seems to be the contemporary attempt to heal the wounds we have (often unknowingly) inflicted on the landscapes and ecosystems that we share with other species as the foundation of our existence. Nature restoration (and the communication about it) is the focus point of this proposal envisioning our shared environmental wellbeing while respecting the cultural land-use practices. My hope is that this hypothetical project will inspire some spatial changes in the selected village and its surroundings, as well as in other rural areas facing similar difficulties. Let's explore together what landscape architecture can achieve in the context of a nature restoration project in a small Bavarian mountain village called Balderschwang.

Hope you enjoy your reading,
Tea (2026)

List of abbreviations

The following abbreviations were used in this thesis paper:

General abbreviations:

CO₂ Carbon dioxide

EU European Union

EUSALP The EU Strategy for the Alpine Region

ES Ecosystem Services

m.a.s.l. meters above sea level

NRR European Union Nature Restoration Regulation

UN United Nations

UNESCO The United Nations Educational, Scientific and Cultural Organisation

FAO Food and Agriculture Organisation of the United Nations

Thesis-specific abbreviations:

NR Nature Restoration

(used synonymously with the term *ecosystem restoration and ecological restoration*)

RQ Research question

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1. INTRODUCTION

The UN has declared the time we are currently living in to be the Decade on Ecosystem Restoration in order to support preventing, halting and reversing the degradation of various ecosystems in the period from 2021 to 2030 (United Nations n.d.). The ongoing climate change intertwined with the biodiversity crisis is causing serious consequences in Europe, where 81% of the habitats are either in a poor (45%) or bad (36%) condition according to their conservation status (EEA 2023). At the EU level, the Nature Restoration Regulation (or 'Nature Restoration Law') entered into force in August 2024 and reacted to these worrying trends by offering the first continent-wide, legally binding and ecosystem-specific targets which need to be respected by all Member States (European Union 2024; European Commission 2026). The Member States are obliged to create their own National Restoration Plans and submit them by September 2026 (European Commission 2026). According to the law, all ecosystems in a need of restoration should be restored by 2050 (ibid.).

During the period in which this thesis was written, the Member States still had some months left to present their National Restoration Plans and detailed explanations on how they intend to reach the restoration targets in their country (European Commission 2026). To reach these targets, interdisciplinary collaboration is a necessary component of the work process (e.g. Polas et al. 2025). As a landscape architect, I see a potential to contribute to this collaborative work, for example, by developing spatial proposals for nature restoration of different ecosystems within the EU. In this thesis, an exemplary project area in the Alpine region was selected as the focus for developing a nature restoration proposal.

1.1. Problem description

In the European Alps, the air temperatures are rising roughly twice as fast as the global average (e.g. Bayer et al. 2025), posing major challenges – including risks to human health - for many mountain communities and visiting tourists (Roveri et al. 2024). To illustrate this, the increasing temperatures together with the changes in the precipitation patterns are leading to changes in the snow cover and the melting of permafrost (ibid.). In turn, this could cause gravity-induced hazards such as avalanches or erosion which can directly threaten human health (even life) and material valuables (ibid.). Let's focus for a moment on the changes in the snow cover. In this context, it is important to mention the zero-degree line, defined as: *"(...) the threshold between air layers with temperatures above 0°C at lower altitudes and those with temperatures below freezing at higher altitudes"* (Zero-degree isotherm n.d.). The zero-degree line is not a static line, as it is changing daily according to the temperature and humidity of the air and soil (Bayer et al. 2025). However, its average value is steadily moving upwards since 1990 as an effect of climate change, and it will continue to do so in the next decades (ibid.). This is likely to change the snow occurrence in

the Alps (ibid.). If we imagine a scenario with global warming of 2°C, the zero-degree line will be at around 1500 m.a.s.l. in a few decades, which is 400 meters higher compared to the average values between 1961-1990 (ibid.). Importantly, the occurrence of the snow fall does not correspond 100% with the zero-degree line but rather depends on the precipitation and humidity rates (ibid.). However, the presented facts have serious environmental and societal consequences - for the natural habitats, fauna, flora, as well as for the local people and visitors in the Alpine region. There are currently different positions about whether skiing is still relevant in today's world due to its contribution to climate change and its own vulnerability to the consequences of it (e.g. WWF Deutschland 2026). Artificial snowmaking (figure 1) is an example of an adaptation strategy that has been introduced in the Alpine landscapes and widely practiced to create optimal conditions for winter sports – a strategy which often causes serious environmental problems (de Jong 2020). Regardless of what one personally thinks about the artificial snowmaking, the fact remains that many mountain communities often depend on winter tourism, in particular the ski season, for their income in winter (Bausch & Gartner 2020). The milder winters with less snow in the future, especially in the lower altitude ski resorts (ibid.; Duglio et al. 2025), could potentially lead to the closure of these resorts and the abandonment of the ski facilities and (in the worst case) of the entire villages. Buchner et al. are writing about *"the ruins of alpine winter sports infrastructure"* (2024) and stating that there are already more than 600 abandoned ski areas in the Alps as a whole (Buchner et al. 2024).

Interestingly, there are examples of ecological restoration in the practice of landscape architecture that are dealing with the "undoing" or the deconstruction of elements that no longer serve their purpose in the landscapes (e.g. Cap de Creus. Designed by EMF Landscape Architecture 2011). Could a similar approach of *undoing* be beneficial for the existing winter sports infrastructure and the restoration of damaged ecosystems in the Alps, particularly in the lower altitude ski resorts below 1500 m.a.s.l. which will inevitably face increasing environmental problems, such as the lack of snow, in the near future?



Figure 1: Artificial snowmaking uses resources such as water and electricity to create landscapes suitable for leisure time on skis. "6th of April 2026, 22°C in the car, Austria" (Romana Kriz-Posavec 2026).

1.2. Background

There are many future-oriented projects encompassing multiple Alpine countries, helping them to solve some of the difficulties caused by climate change and other complex issues (e.g. *Climate change* n.d.; *Biodiversity and nature conservation* n.d.). One example is the EU co-founded research project called BeyondSnow, which was a part of the Interreg Alpine Space programme (BeyondSnow 2021). As the name suggest, BeyondSnow aimed, to improve the future resilience *beyond snow*, in particular, of small to medium-altitude winter tourism destinations in the Alps that were the pilot sites of the project (EURAC n.d.). BeyondSnow was running from 2022-2025 and it developed various reports, digital tools and policy suggestions for the decision-makers on different levels (Alexandrowicz 2024; BeyondSnow 2021). Without any doubt, the mentioned project outcomes, especially the policy recommendations, are essential steps towards the urgent transformative changes that are currently needed in the Alpine communities and in the landscapes they manage. In addition, I saw a potential need of these communities in the pilot areas for spatial planning proposals to facilitate the sustainable landscape transformation on the ground.

1.3. Aim & research question

BeyondSnow had ten pilot sites, one of which was the municipality and village Balderschwang in Bavaria, Germany (BeyondSnow 2021). This pilot site was chosen to be the case study area of this thesis. The aim of this work is to develop a case study in Balderschwang in order to create a spatial proposal which combines nature restoration, the concept of environmental wellbeing and the cultural land use practices. This means that, as a part of the restoration proposal, cultural landscapes should be integrated into the efforts to 'bring nature back' or restore its equilibrium. Moreover, the nature restoration proposal should also include the concept of environmental wellbeing defined as "*localised counterpart to planetary wellbeing*" (Dobson & Redman 2025:6). Therefore, it is essential to acknowledge the experience of local people, tourists, as well as of "*the more-than-human world*" (ibid.: 2; see Whatmore 2006). The following research question (further abbreviated as RQ) is guiding this study:

How can a proposal for a nature restoration project in the Bavarian Alps - in this case study in the village of Balderschwang and its surroundings - be developed in a culturally sensitive way that includes the uniqueness of the local cultural landscapes and the concept of the environmental wellbeing?

The overarching purpose of this work is to contribute to the nature restoration discourse and to the spatial transformation of rural landscapes across the EU, particularly in the Alpine mountainous environments.

2. METHODS

In the field of landscape architecture, a **case study** is defined as: “a well-documented and systematic examination of the process, decision-making and outcomes of a project, which is undertaken for the purpose of informing future practice, policy, theory, and/or education” (Francis 2001 :16). In this thesis, a case study was developed to visualise nature restoration efforts in the rural landscapes around the Alpine village Balderschwang. To answer the RQ, it is necessary to develop a nature restoration proposal for the project area and to integrate the local land use heritage and the environmental wellbeing into the proposal. To achieve this, multiple methods were used. **A synthesis of the methodological steps**, that were used to conduct the case study is presented in a form of task descriptions or steps that build on one another (figure 2). These steps were summarized under the acronym NATURE. The fifth step ‘*Restore the selected project site(s)/ecosystem(s)*’ branches out into four additional steps that build on one another and are summarized under the acronym BACK. These ‘nature restoration steps’ were developed with a strong reference to the book *Restoration of Ecosystems – Bridging Nature and Humans. A Transdisciplinary Approach* by Prof. Dr. Zerbe (2023). Considered as a whole, this synthesis of the methodological steps through task descriptions can be abbreviated as NATURE BACK and it was guiding the work done throughout the 20 weeks of this project. The following subchapters explain each methodological step of the case study, i.e. each letter of the NATURE BACK idea, in detail.

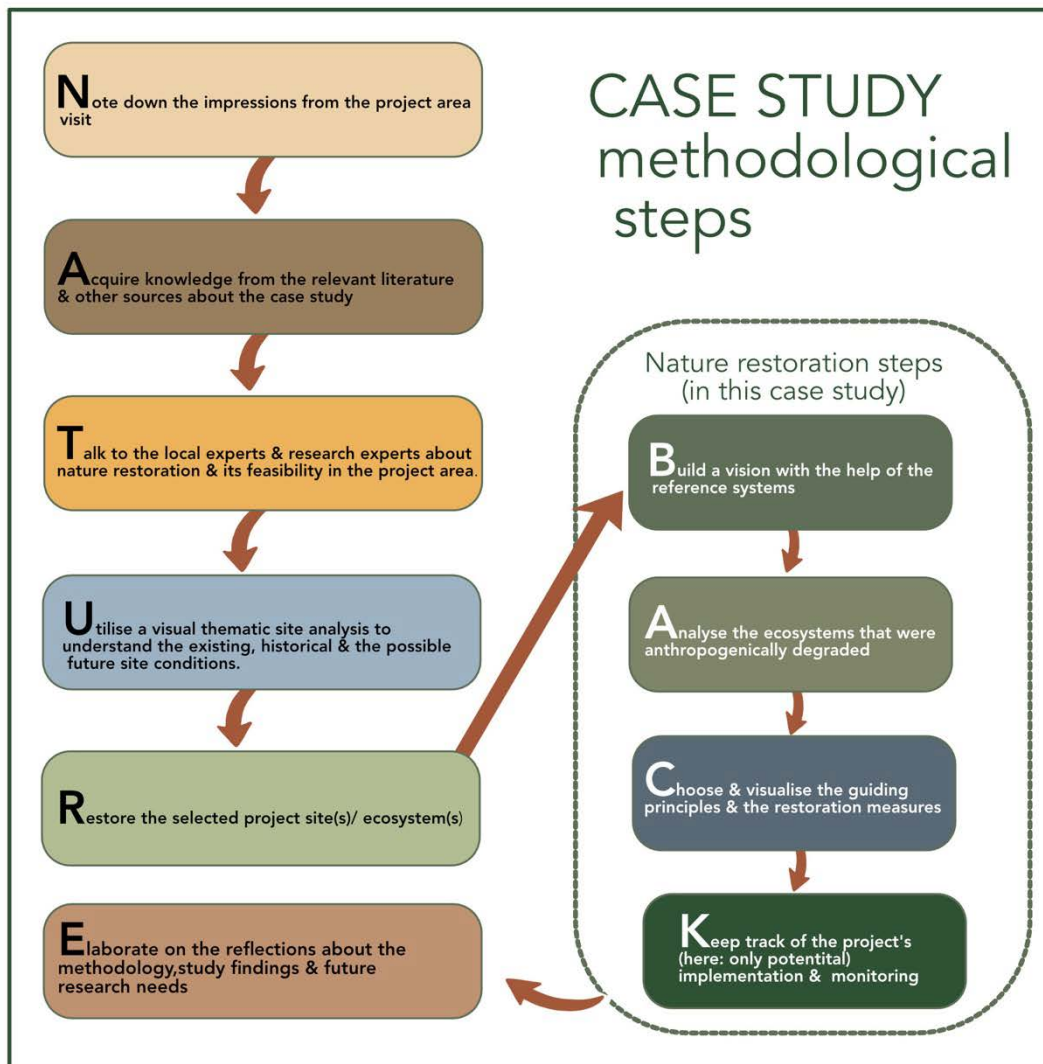


Figure 2: Core idea of this thesis work: to bring NATURE BACK through restoration.
The figure shows a synthesis of the methodological steps. (Own work).

2.1. About the choice & the visit of the project area

Balderschwang is the name of an Alpine village and of the municipality in the Oberallgäu district (ger. Landkreis) in the Free State of Bavaria, Germany (Bayerisches Staatsministerium für Digitales n.d.). This small village, located near the border with Austria, is a winter tourism destination in the Alps located in a valley at 1044 m.a.s.l. (Metzinger & Corradini 2025). Importantly, Balderschwang is facing noticeable climate change effects and it was chosen as one of the pilot areas of a research project BeyondSnow (BeyondSnow 2021). Among all the other pilot sites from that research project, Balderschwang was the most accessible one for me. Thus, the area was used in the case study. You can see the location of this municipality and the eight Alpine countries connected through the Alps in the illustrative map below (figure 3).



Figure 3: Alps as a connecting landscape element between eight different countries with a small indication of the location of the municipality of Balderschwang in Germany. (Own work).

The terms *project area* and *project site* have a distinct meaning in this case study. The *project site* is defined in this thesis as an ecosystem or multiple connected ecosystems that are included in the restoration proposal. In contrast to *the project area*, the project sites were not specified at the start of the project. The project area visit and the thematic project area analysis were done within the *project area*. The project area is defined as the village of Balderschwang and its immediate surroundings as shown on the map derived from Bayern Atlas (see figure 4 on the next page). The Bavarian online cartography portal Bayern Atlas was used as a main tool to create basis maps and to access information about the project area (BayernAtlas n.d.). The reason for choosing this map (figure 4) is that the village is placed relatively centrally, showing its topographical position in a valley surrounded by mountains to the north and south. In addition, the mountain peaks on 'both sides' are visible, which shows the nearest ski infrastructures on the southern slopes, as well as parts of the landscape conservation area (ger. Landschaftsschutzgebiet) on the northern slopes. This scale 1:10,000 made the spatial context of the village, its touristic attractiveness and the possible future land use challenges understandable. Thus, the 1:10,000 maps (with topography of the area, elevation lines and orthophoto) were brought with me during the project area visit in Balderschwang. The visit took place from 22nd to 25th of February 2026 and it was experienced through hikes and car driving. The visit included sketching, photographing, writing notes and observations, interviewing local experts and drinking tea to warm up from the hikes. Three out of five anticipated hikes were completed due to the snow conditions at the time. You can see the hiking and driving routes I took in the project area map below.

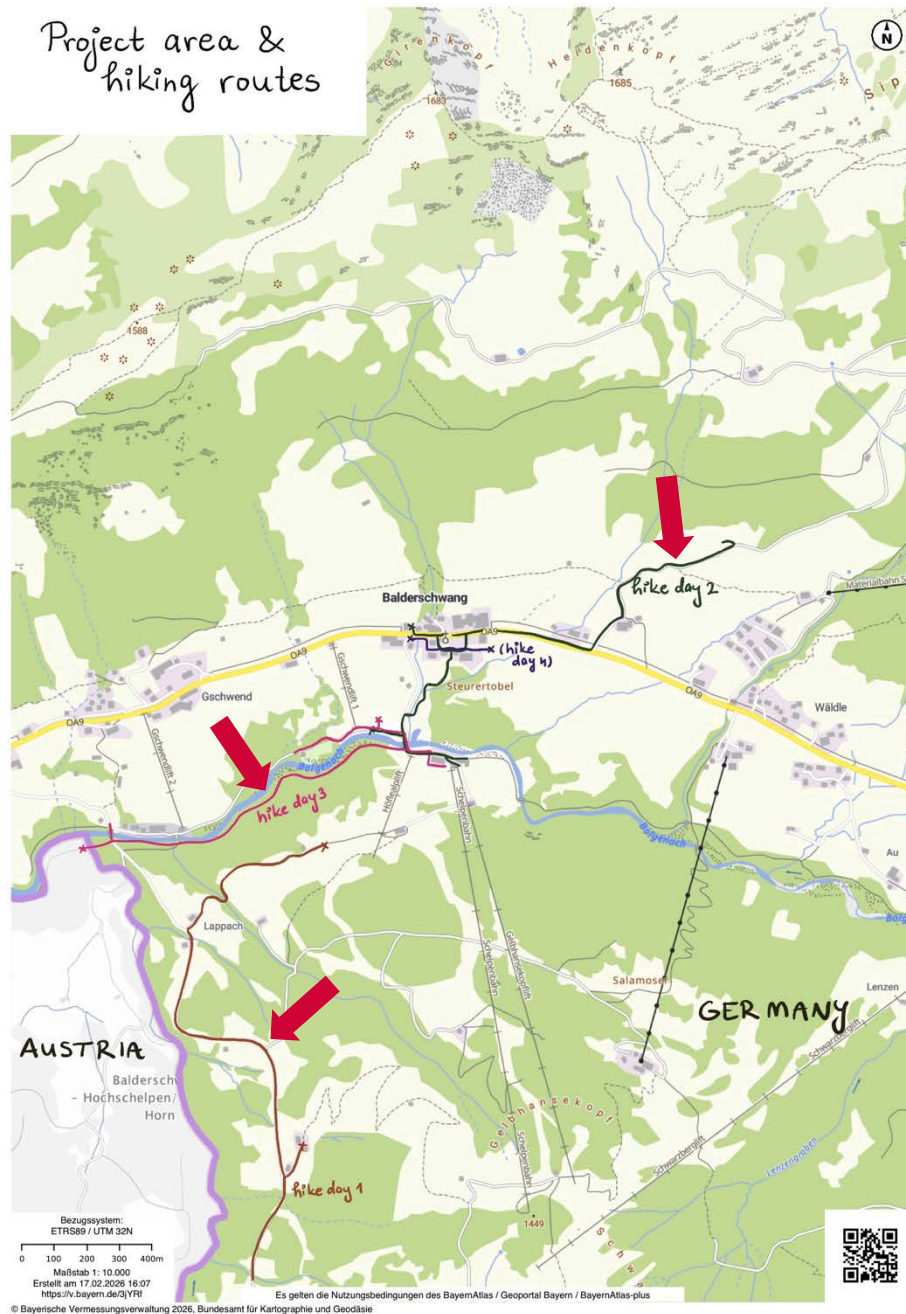


Figure 4: The map is showing the project area in Balderschwang. The hiking routes taken during the visit are indicated with arrows. It was possible to go hiking on these routes despite the snowy conditions.

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy]. Note: this map was modified by Tea Kriz-Posavec. (Not to scale).

2.2. Literature study & contextual sources evaluation

A literature review in the conventional sense was not conducted as a part of this study. Instead, an evaluation and study of the relevant literature and other contextually important sources was undertaken. For example, the outcome reports from the official BeyondSnow project page were found under the website's heading Resources (subtitle: Downloads) (BeyondSnow 2021) and evaluated based on their relevance for this thesis work. This meant that only the reports containing the search words "Balderschwang" or/and "restoration" or

“renaturation” were included in this work. Furthermore, most of the scientific literature was found using SLU library’s search tool Primo, which has access to different scientific databases. The general context of the case study was investigated on different levels and with the help of complimentary sources, especially context specific sources, e.g. tourism promotion websites. One of the most important sources to understand the main topic of nature restoration in this thesis was the book *“Restoration of Ecosystems – Bridging Nature and Humans. A Transdisciplinary Approach”* by Prof. Dr. Stefan Zerbe (2023). Prof. Dr. Zerbe currently holds two professorships in Germany – one at the Institute of Geography of the University of Hildesheim and a honorary one at the University of Applied Sciences and Arts in Göttingen (Prof. Dr. Stefan Zerbe 2026). His book has been very instructive for this thesis, as his research focus is on restoration ecology and ecosystem restoration, environment and health, landscape and vegetation history, just to name a few (ibid.).

In general, the sources were structured into the following ten categories:

- Laws, regulations & initiatives at the UN & EU- level concerning nature restoration
- Regulations, conventions & initiatives at the level of the Alpine region (e.g. EUSALP, Alpine Convention, etc.)
- Research project BeyondSnow (the official project website & sources about the project)
- Sources about Balderschwang: official website of the municipality, touristic representation websites, news reports about the village, articles, etc.
- Scientific literature & other sources understand the links between winter sports, climate change effects & nature degradation, especially for the case study context
- Literature on nature restoration in the Alpine ecosystems, with the focus on the book about *Restoration of Ecosystems* by Zerbe (2023)
- Literature & sources on the cultural land use heritage in the Alps
- Literature on environmental wellbeing, human health & gravity-driven natural hazards
- Sources on methodology in landscape architecture/planning
- Sources about the interviewees & some authors, whose work has had a profound impact on this thesis

2.3. Semi-structured interviews

The semi-structured, one-to one interviews were selected as a suitable method for a qualitative data collection in this thesis paper, particularly as they allow the interviewee to elaborate on their viewpoints and develop their ideas based on the open-ended questions. The objective of these interviews was to gain more insight into opinions, experiential knowledge and emotions (Denscombe 2010) of the research experts and local experts on the subject of nature restoration in the Alpine ecosystems in general and specifically on the issues related to the case study area. For instance, the feasibility of a restoration project in Balderschwang was discussed with the experts. Importantly, the interviews were not anonymised and they were recorded. Each interviewee was asked to give their written

consent to these conditions prior to the interview (see the consent form in the Appendix 10.1.). At the start of each interview, I shortly presented the project's RQ, aim and purpose. Thereafter, one introductory question, which was individually formulated, was asked to each interviewee. This was followed by four general questions about nature restoration and three specific questions regarding the interviewee's expertise, their context specific knowledge, experience and possible insight into relevant topics for this study. You can find the full list of questions in English (and where applicable German) in the appendix (10.2). Different versions of an A3 map 1:10,000 of the project area were brought to the interviews and formed a basis for the discussion and brainstorming of the possible *project site* locations within the *project area* together with the interviewees. In general, the interviewees were selected with the main target groups for this thesis in mind. Those groups are the local, municipal and regional authorities, local people living in the project area and students (at the university or anywhere else) interested in nature restoration projects and the Alpine landscapes. It could also be interesting for researchers in spatial planning, ecological restoration and related fields to read about the future research needs. Thus, both the research experts and *the local experts*, who have the experiential knowledge about the rural landscape they live in, were included in the interviews.

The first interview was conducted online via Zoom on the 17.2.2026 with the research expert Andrea Omizzolo, who is a spatial planner and a senior researcher working at the Institute for Regional Development of EURAC Research centre in Bolzano/Bozen, Italy (*Andrea Omizzolo n.d.*). His work focuses on the mountain environments and their spatial planning on different scales (*ibid.*). Omizzolo's main research interests, e.g., the property and land fragmentation, world natural heritage management, conflicts generated by human-environmental relationship and many more (*ibid.*) overlap considerably with the topics of interest for this thesis. Remarkably, he has worked on the Interreg Alpine Space BeyondSnow project as one of the leading project managers and co-authored many of the reports produced as a part of that research project. The second interview was conducted on 23.2.2026 in Balderschwang with Konrad Kienle, who is a central local expert in this study. He is the mayor of Balderschwang in the district (ger. Landkreis) of Oberallgäu (Bayerisches Staatsministerium für Digitales n.d.). Besides being a mayor, he is stakeholder in the tourism sector, as he owns a hotel in the centre of the village (*Kienle n.d.*). Kienle suggested that I interview Rolf Eberhardt, a geoscientist and managing director of the Nature Park Nagelfluhkette (WDR (Der Westdeutsche Rundfunk Köln) 2023). Eberhardt has worked, e.g., on adjusting the visitor guidance in the mentioned protected area to minimize the ecological degradation (Österreichische Naturparke 2020). I interviewed Eberhardt on the 24.2.2026 using the same questions I asked the mayor due to time constraints and the spontaneous opportunity to conduct this interview. Moreover, on the 25.2.2026, I interviewed Fabian Hartmann, who is a local hotel director in Balderschwang and a local expert in this study. The final interview was conducted on the 27.2.2026 with the Prof. Dr. Johannes Kollmann, who is an expert in questions around ecological restoration. He works at the Chair of Restoration Ecology at TUM School of Life Sciences (Technical University of

Munich) (*Prof. Dr. Johannes Kollmann* n.d.) and is a member of the Nature restoration network (own translation) (Netzwerk Renaturierung 2026).

In the subchapter 5.3 the main points stated by each interviewee are presented and subsequently compared to each other (subchapter 5.3.6.). These points were selected based on the information from the audio recordings, that were relevant for this case study and supplemented with the notes made during the interviews. None of the interviewees requested to see the notes made during the interview.

2.4. Thematic project area analysis

To answer the RQ and to develop a nature restoration proposal for the project site(s) in Balderschwang, it is important to first understand the spatial circumstances, especially the ecological and cultural aspects of the project area. In this case, the analysis was conducted with the use of three main themes: *the past, the present and the future spatial circumstances*. The analysis of these three temporal themes was guided by the *Landscape-system methodology* (Cunha & Magalhães 2026) that “*integrates ecological and cultural dimensions into a framework for landscape planning and management*” (ibid.: 23). This methodology enables a more holistic perspective on the analysed landscape, as it acknowledges its dynamic nature and the interconnectedness of landscape elements, its structures and processes – both at the ecological and anthropogenic level (ibid.). Thus, it facilitates the long-term, sustainable thinking and an informed decision making for the future landscape development “*in a way that respects both ecological and cultural integrity*” (ibid.: 28). In particular, the visual presentation of the theme *present spatial circumstances* was inspired by the methodology description by Cunha and Magalhães (ibid.). The thematic analysis of the themes *the past and the present* was carried out using the maps and information available at the Bavarian cartography portal Bayern Atlas (*BayernAtlas* n.d.). The visualisation of different themes was done (mostly) on the aforementioned base maps in a scale of 1:10,000, as well as through research on the relevant themes. The future projections for climate change in connection with the 2°C and the 3°C global warming scenario were visualised with the help of the interactive tool provided by Bayerischer Rundfunk - the Bavarian broadcasting service (own translation) (Bayer et al. 2025). The project site analysis was followed by the development of the restoration proposal, which is explained in the next subchapter.

2.5. Nature Restoration Proposal

The following quote from the book *LifePlace Bioregional Thought and Practice* (Thayer 2003), emphasizes the importance of developing spatial proposals at the local level: “*It makes little sense to discuss “sustainable development” at the global level if no thought*

is given to the local places and scales where human life actually takes place. The first step toward a regenerative future for humans is to reassess where we are." (ibid. 2003: 8). A proposal for nature restoration at the local scale is at the heart of this thesis work. All previous methodological steps (shortened as N, A, T and U) were undertaken to understand the unique context of the project area and to support a more informed decision-making during the development of the nature restoration proposal. After completing the project area visit (step N), the literature study and study of other relevant sources (step A), the semi-structured interviews with experts (step T) and the thematic area analysis (step U), the choice of suitable *project sites* for restoration purposes was made.

The ecological restoration is specific for each landscape context (Franco et al. 2026a). In short, nature restoration is a term which I interchangeably use with the term ecological restoration, that can be defined as *"a process designed to support the recovery of ecosystems that have been degraded, damaged, or destroyed"* (ibid.: 51). In accordance with the RQ, a nature restoration proposal is to be developed in a **culturally sensitive way**, which in this case study means: a way that respects the unique qualities of the local project area and includes the cultural land use heritage in the nature restoration proposal. In addition, the nature restoration proposal is to be developed with the focus on **the environmental wellbeing**. Both topics - cultural heritage and environmental wellbeing- were seen as an inspiration for the restoration proposal and they influenced the methodological steps for nature restoration taken during the development of this proposal. The four steps of nature restoration are summarized under the acronym BACK (see figure 2) and they were developed with a strong reference to the book *Restoration of Ecosystems – Bridging Nature and Humans. A Transdisciplinary Approach* by Prof. Dr. Zerbe (2023).

In general, nature restoration projects at the local level, usually focus on a selected ecosystem or a land use type as their target for restoration (Zerbe 2023a). In this case, after choosing project sites or ecosystems for restoration within the project area of Balderschwang, the first methodological step to achieve nature restoration was to: **Build a vision with the help of the reference systems**. The reference systems can be seen as *"the goal for restoration"* (Zerbe 2023b: 32). They often represent a state of the ecosystem to which one wants to 'return to', for instance based on a historical reference (ibid.). Moreover, the reference systems for restoration can also represent land use types and ecosystems of today's cultural landscapes (ibid.), which is especially important in the context of this case study. A potential or hypothetical state of the ecosystems can also serve as a reference system for restoration, representing the target of the nature restoration efforts (ibid.). As you might be guessing, the choice of the right reference systems is exactly that – a choice. This means that one should not forget the normative (rather than purely scientific) character of nature restoration, as Prof. Dr. Zerbe writes: *"For certain habitats, very specific and static targets can thus be set on the one hand, while for other restoration projects a range of possible target states emerges"* (2023b: 33). Meaning that for certain project sites or habitats, the scientific approach of nature restoration becomes less of a factor, as prioritization must be made: *"(...)the final decision in favour of a certain reference system and thus a specific restoration goal is then normative and the result of the prioritization of*

options and scenarios as well as the coordination between stakeholders and possible land-use and nature conservation conflicts” (Zerbe 2023b: 33). In short, this methodological step describes building a vision of the restoration project based on the chosen priorities and reference systems.

The second methodological step to achieve nature restoration is about the need for a fundamental understanding of the degradation status and issues related to the project site(s): **Analyse the ecosystems that were anthropogenically degraded**. The project sites, often anthropogenically degraded ecosystems, need to be analysed in order to formulate suitable measures for restoration in the next step (Zerbe 2023a). The analysis is dealing with the most urgent aspects in the project sites in Balderschwang that need to be addressed.

The third methodological step to achieve nature restoration is: **Choose and visualise the guiding principles and the restoration measures**. In this step, the guiding principles of restoration for the year 2050 and the choice of suitable measures to reach the envisioned reference systems were presented. The year 2050 was chosen, as the EU Nature Restoration Regulation states that “all ecosystems in need of restoration” (European Union 2024: Art 72: 14) should be restored by that year (ibid.). The restoration mission statement or the guiding principles (ger. *Leitbilder*) can be described in general as a planning tool at the intersection of nature restoration, nature conservation and landscape planning (Zerbe 2023b). In Central Europe, the pre-industrial open landscapes, which are cultural landscapes developed by forest clearings and grazing, are often used as a guiding principle or reference for restoration (ibid.). The measures to reach the envisioned ecological state vary greatly, ranging from inaction to interventions involving various land-use practices or measures specifically developed for restoration purposes (Zerbe 2023c).

The final methodological step for nature restoration is referring to the hypothetical realisation of the thesis project: **Keep track of the project’s (here only potential) implementation and monitoring**. The implementation of selected measures and the monitoring of the project’s development over time, which includes the ecological, economic and social aspects, are necessary elements of every successful *non-hypothetical* ecosystem restoration project (Zerbe 2023d). In particular, the socio-economic aspects, that can be monitored, and the stakeholder’s acceptance of a restoration project are one of the key factors for a successful restoration (ibid.). In this thesis, this step K, as the final methodological step for nature restoration, brings us ‘BACK to nature’. However, it is important to emphasize that this step can only be imagined and critically reflected upon. This leads us to the final methodological step E, which completes the acronym NATURE.

2.6. Reflection as a methodological step

The final discussion (chapter 6) offers reflections on the chosen methods, the case study findings and the potential future research needs. Although this thesis project is not going to be implemented, it aims to contribute to the discourse on nature restoration and to test

the RQ. It could potentially inspire the people who have the power to decide about the possible spatial changes in Balderschwang to consider ecosystem restoration in the future. Ideally, other municipalities and villages of similar sizes facing the same or very similar challenges in the Alps and other mountainous landscapes could benefit from reading about the reflections on the possible developments in Balderschwang and acquire insights that can be adapted to their own specific context.

To sum up, this thesis is offering the first steps and considerations regarding the possibilities of nature restoration in the case study area. The methodological steps are summarized under the acronym NATURE BACK, where each letter represents a set of actions taken to develop the restoration proposal. The main aim of this acronym is to easily communicate the main idea of this thesis and to guide the structure of this paper. The chosen reference systems, guiding principles and measures for nature restoration were not tested on site or implemented in any other way as a part of this thesis work. Hence, all the methodological steps described in figure 2 can only be discussed and reflected upon, as they are purely hypothetical. In this thesis, the reflection is acknowledged as its own methodological step (E).

3. DELIMITATION OF THE STUDY

The limitations of this thesis were particularly important in terms of the scope of the topics that have been examined in depth. As Swaffield and Deming write: *"All research is a matter of compromise and of balancing of different demands and opportunities"* (Swaffield & Deming 2011: 42). Due to the timeframe of this individual project and the prioritization of answering the RQ, this study does not offer an overview over the related EU legislation, organisations, treaties and declarations on nature restoration, spatial planning and climate adaptation of the Alpine region. It also does not address in detail the governance structures, all initiatives and international projects around the implementation of nature restoration in the Alpine region. The outcomes of the research project BeyondSnow were used as a starting point of this case study. However, this study does not offer a comprehensive understanding of all the BeyondSnow project outcomes or the implications of their policy recommendations.

As mentioned in the previous chapter, the study was not planned to be implemented on sites in Balderschwang as a part of this thesis. The nature restoration proposals were developed on a conceptual level for the selected project sites. Due to the scope of the project, these proposals do not include the detailed considerations about the possible socio-economic issues, e.g. possible landownership issues and the economic implications of the proposed measures in case study area. I have decided not to use (as far as possible) the available support of AI (specifically the large language models (LLMs)), while researching, visualising and writing for the purpose of this thesis in order to demonstrate my own academic integrity. In addition, the sketches and visualisations were done by hand or digitally without the use of AI. Occasionally, DeepL was used (without the AI part) as a translation help from English to German and vice versa.

4. BACKGROUND & CASE STUDY CONTEXT

This chapter explores the background of this project and explains how the Alpine rural setting, in particular, the village of Balderschwang in the Bavarian Alps in Germany was chosen as a case study area. The subchapter 4.1. addresses the global crises such as climate change in the Alps and an international treaty between the Alpine countries and the EU. The following subchapter 4.2. focuses on the EU's legislation and looks at the EU Nature Restoration Regulation. It addresses the urgent need to take appropriate measures and actions towards achieving the binding targets for nature restoration of degraded ecosystems for all Member States (European Commission 2026). Furthermore, the subchapter 4.3. briefly presented the project BeyondSnow, which was a part of the Interreg Alpine Space programme and co-funded by the EU (BeyondSnow 2021). Coming from the global, the EU, and the Alpine countries perspective, lastly, in the subchapter 4.4., a mountain village Balderschwang is introduced.

4.1. Global crises, an international treaty & the Alps

The Alps, known as one of the highest and the most extensive European mountain ranges, provide a wide range of ecosystem services to *"more than 14 million people living in the Alps"* (Population and culture n.d.) and tourists visiting its picturesque mountainous landscapes (see figure 5). The Alps are a home to many different ecosystems inhabited by non-human species including *"more than 30.000 animal species and 13.000 plant species"* (Biodiversity and nature conservation n.d.). The global crises, such as the climate change and the biodiversity crisis, are strongly noticeable in the Alpine environment (Climate change n.d.). With a *"temperature rise of almost +2 °C since the late 19th century"* (ibid.), these changes lead, e.g., to pressure on the forest ecosystems, a decline in the habitats of endemic species, a higher risk of natural hazards, and so on (ibid.). To exemplify, the increasing temperatures together with the changing precipitation and extreme weather events can lead to ecological transformations, snow cover changes, glacier and permafrost melting (Roveri et al. 2024). For example, the latter can have a direct impact on the gravity-driven natural hazards and increase the risk of, e.g., landslides and avalanches (ibid.). All of this can negatively affect humans, since we are interconnected with the systems around us (ibid.). The World Health Organization explains: *"The health of humans, animals, and ecosystems are closely interlinked"* (WHO 2023).

The fact that this mountain range stretches across eight countries in Europe - Austria, Slovenia, France, Switzerland, Germany, Liechtenstein, Monaco and Italy - makes the global crises perceptible in the Alps into cross-border issues to tackle (Alpine Convention. Who we are n.d.). The Alpine convention, which has been in force since 1995, is an international treaty signed by the eight Alpine countries and the EU, expressing their commitment to

tackling the complex crises and to the sustainable development of the whole mountain range (ibid.). The history of this convention dates to 1952 when CIPRA - the International Commission for the Protection of the Alps - was established and appealed for an international treaty to protect the Alpine environment (*The history of the Alpine Convention* n.d.). This means that long before the UN presented the 17 Sustainable Development Goals (in 2015), the eight mentioned countries and the EU were already working together through the Alpine Convention on the sustainable development of this region (*SDGs in the Alps - Sustainable Development Goals* n.d.). Thus, this convention is an example of a transnational implementation of the SDG's (ibid.). Nowadays, the commitment to the sustainable development of the Alpine environment is perhaps more urgent than ever. In this very climate sensitive environment, the temperatures are expected to raise even more over the next decades, which will likely have ripple effects on the Alpine landscapes, ecosystems and people living and visiting the area (Roveri et al. 2024).



Figure 5: View from the highest peak in the German Alps – Die Zugspitze. At this altitude (over 2900 m.a.s.l.), we have passed the tree line. (Own photography).

4.2. EU Nature Restoration Regulation

Since the launch of the European Green Deal in 2019, the EU is striving to become “the first climate neutral continent by 2050” (European Commission n.d.) and “It aims to cut emissions by at least 50% by 2030, rising towards 55%, while legally binding the 2050 neutrality goal through the European Climate Law” (ibid.). Therefore, the EU is addressing complex challenges such as the climate change and the biodiversity crisis through its legislation and policies, for instance through the **Nature Restoration Regulation (NRR)** (Polas et al. 2025). The NRR is a law which entered into force in 2024 and is an essential part of the EU’s Biodiversity Strategy (European Commission 2026). This law has the aim to restore specific degraded ecosystems and species for the benefit of the planet, the climate, the biodiversity and humans (ibid.; European Union 2024). The significance of the NRR becomes clear when one considers that, in the EU, 81% of the habitats are either in a poor (45%) or even bad (36%) condition (EEA 2023). When considering the species within the EU, the

conservation trend is unclear for almost 1/3 of them, but it is known that 63% of species have either a poor or bad conservation status (ibid.). These numbers illustrate the urgency of the NRR which sets “the first continent-wide” (European Commission 2026) regulation with legally binding targets for nature restoration for all EU Member States (ibid.).

The importance of nature restoration has also been acknowledged from a global perspective, as the UN’s environment programme and the Food and Agriculture Organisation of the United Nations (FAO) has declared the current decade (2021-2030) to be the *Decade on Ecosystem Restoration* (United Nations n.d.). The EU has integrated this into its NRR with ambitious targets, which is why each Member State must develop its own National Restoration Plan and submit it to the European Commission by September of this year (2026) (European Commission 2026). The Article 72 of the NRR states that : “(...) *The Commission should assess whether the national restoration plans are adequate (...) for fulfilling the Union’s overarching objectives to jointly cover, as a Union target, throughout the areas and ecosystems within the scope of this Regulation, at least 20 % of land areas, and at least 20 % of sea areas by 2030, and all ecosystems in need of restoration by 2050, the objectives to restore at least 25 000 km of rivers into free-flowing rivers in the Union by 2030, as well as for contributing to the commitment of planting at least 3 billion additional trees in the Union by 2030*” (European Union 2024:14). As this thesis was written in 2026, the deadline to achieve the goals for 2030 (and even 2050) seems quite near, which indicates a sense of urgency to implement the NRR in various spatial contexts, for example, in the Alps. The nature restoration of the Alpine region, was addressed through both the work related to the EU Strategy for the Alpine Region (EUSALP) (e.g. EUSALP n.d.) and the Alpine Convention, e.g., in the Article 2.f. (*Framework Convention- Guiding principles for sustainable life in the Alps* n.d.). Moreover, the research about the Alpine Convention led me to an international project described briefly in the next subchapter.

4.3. Research project BeyondSnow

On the official website of the Alpine Convention, one of the recent projects mentioned under the overarching topic of climate change is the research project BeyondSnow, that was conducted from 2022 to 2025 (*Climate change* n.d.). It was co-funded by the EU and researched the ways how to improve “the Resilience of Alpine Space Snow Tourism Destinations and Communities to Climate Change” (BeyondSnow 2021). The project directly addressed communities living in small winter tourism destinations across six Alpine countries, with the intention to help them tackle problems brought by climate change, e.g. the diminishing snow cover, and to support them in a sustainable transition into a future ‘beyond snow’ (EURAC n.d.). The researchers collaborated with the local communities in ten chosen pilot sites, which were described as “snow tourism destinations at medium-low altitudes” (Omizzolo et al. 2024:7). The current or imminent lower presence of snow, especially in ski destinations at lower altitudes, will likely have far-reaching environmental

and socio-economic consequences for these communities (Duglio et al. 2025). The consequences are, e.g. the increased environmental stress, economic issues and exposure to natural hazards – all of which require new adaptation and transition strategies (Egger et al. 2025). These strategies were elaborated as a part of BeyondSnow (e.g. Omizzolo et al. 2024). The main objectives of the project were: firstly, collect indicators to understand pilot areas' resilience and vulnerability towards climate change, secondly, to produce helpful resources such as the mentioned strategies, and, thirdly, to disseminate the research results, e.g. the policy recommendations (Alexandrowicz 2024). One of the outcomes of the project was the report named *Policy recommendations for Alpine Convention, EUSALP & EU* (BeyondSnow 2021), that provided voluntary policy recommendations to support the existing work of the Alpine Convention, the EUSALP and the EU (Egger et al. 2025). This report gave orientation to the actors and decision-makers at the local, regional and national level (ibid.). For instance, it recommended that: *"National and regional authorities can align funding, spatial planning, and training by (...) updating spatial plans to designate year-round recreation corridors, nature-restoration/retention zones, (...) "* (ibid.: 16f.). Interestingly, other BeyondSnow reports also mention *nature restoration*, e.g., as *"renaturation activities"* (Corradini et al. 2024 :21) connected to a restoration project at Geschwender Horn in Germany (ibid.). Another example is the *"restoration of the rural landscape"* (Rinaldi et al. 2025: 13) of the pilot site Piani d'Erna in Italy (ibid.). In general, the project BeyondSnow acknowledges the importance of *"concrete place-based strategies"* (Omizzolo et al. 2024: 8) and *"ecosystem-based approaches"* (ibid. :9). However, according to my findings, there is a lack of spatial planning proposals (in a form of maps) for pilot areas suggesting changes at the local scale that would include nature restoration, the cultural landscapes or the environmental wellbeing as a part of the *"concrete place-based strategies"* (ibid.:8).

4.4. Balderschwang (Bavarian Alps, Germany)

From the UN and the EU level, the importance of nature restoration as a valuable and urgently needed concept to combat intertwined challenges, such as ecosystem degradation, biodiversity loss and climate change, is acknowledged (United Nations 2021; European Union 2024). Due to the rising global challenges, the loss of ecosystem services and intact ecosystems, a growing challenge is to consider nature restoration at the international and regional level, as well as at the local level (Zerbe 2023a). International research projects, such as BeyondSnow, address the current difficulties of our time with their own focus and in different spatial contexts. BeyondSnow included, among other things, participatory processes aimed at supporting local communities of ten Alpine project working areas in their transition into a future where less snow is likely to become the new normal (BeyondSnow 2021; Baumgartner 2024). The project results included transition strategies for the pilot sites, which also contained local's visions about the future development of their living environment (e.g. Kienle & Gemeinderat Balderschwang 2025).

An important starting point for this case study project is that BeyondSnow did not specifically offer spatial proposals that consider nature restoration for its pilot areas. This leads us to the idea that one out of ten BeyondSnow pilot areas could serve as a case study area for the nature restoration proposal: Balderschwang.

The village and the municipality of Balderschwang, which hold the same name, are located in the Oberallgäu district, which is a part of the administrative region of Swabia in the Bavarian Alps in southern Germany (Bavaria 2026) (see figure 6). It is the second-smallest municipality in the Free State of Bavaria and the highest municipality in Germany, as the village is located in a valley at 1044 m.a.s.l. (BeyondSnow 2021). Interestingly, this high elevation of the valley makes it almost free from pollen and fog (ibid.). In 2025, there were 352 people living in the village (Bayerisches Staatsministerium für Digitales n.d.) and many annual guests, who, according to the overnight stay figures, are quite evenly distributed during the winter and summer seasons (Metzinger & Corradini 2025). One of the BeyondSnow's reports presented changes in arrivals and overnight stays in Balderschwang related to the Covid pandemic: *"Comparing the pre-Covid-year 2019 with the post-Covid-year 2022 reveals an increase of 1.3% of the arrivals (from 46,353 in 2019 to 46,949 in 2022) and an increase of 6.5% of the overnight stays (from 179,733 in 2019 to 191,356 in 2022)"* (Corradini et al. 2023: 106). Balderschwang is attracting many tourists, mostly domestic tourists (ibid.: 109), who appreciate, e.g., the Nature Park Nagelfluhkette, old cheese-making traditions, farmer's festivals such as the Viehscheid (i.e. the cows returning to the farms) in the late summer and, of course, the winter sports (BeyondSnow 2021). The municipality is *"still one of the most snow-sure regions in the Bavarian Alps"* (ibid.). However, even this snow-rich region that used to be called 'Bavarian Siberia', is now dealing with the effects of climate change (Baumgartner 2024). For the first time during the Christmas period of 2022, Balderschwang did not have the right snow conditions to open the cross-country ski trails (ibid.). The difficulty is that the economy of the region strongly counts on the skiing season: *"From an economic standpoint, hikers cannot replace skiers"* (Baumgartner 2024). Hence, Balderschwang became a part of BeyondSnow to figure out different strategies for the future (BeyondSnow 2021).



Figure 6: Understanding the location of Balderschwang at the national, federal (indicated in grey), regional (indicated in pastel green), district (indicated in yellow) & municipal (indicated in dark green) level. Note the proximity of Balderschwang to the Austrian border. (Own work.)

5. RESULTS

This chapter presents the results divided according to the synthesis of the methodological steps, shortly referred to as the NATURE BACK idea (see figure 2). Firstly (step N), the project area visit is described and presented through visual material (subchapter 5.1.). Secondly (step A), the theoretical understanding of nature restoration, the environmental wellbeing and the cultural landscape heritage in the Alps is introduced (subchapter 5.2.). The emphasis is on the interconnectedness of these three main topics to explore the RQ. Thirdly (step T), to find out about opinions on nature restoration in the local context and to learn from the experts, five semi-structured interviews with the locals and researchers are conducted and summarized (subchapter 5.3). This is followed by a comparison of all the interviews (subchapter 5.3.6.). Fourthly (step U), a spatial analysis is conducted to deepen the understanding of the current state of the project area. This subchapter (5.4.) also contains a brief historical analysis and an outlook into the possible future projections for the area, concerning the snow occurrence. Fifthly (step R), two nature restoration proposals for the project sites in Balderschwang are presented (subchapter 5.5.). These proposals are based on the four methodological steps summarized under the acronym BACK. Lastly the final step E of the NATURE BACK-idea, is included into a discussion chapter named *Ending with reflections and discussion* (chapter 6), which follows this results chapter.



Figure 7: The snow-covered Balderschwang with the church marking the middle of the village. The photo was taken on the hike to the 2000-year-old yew tree in February 2026. (Own photography).

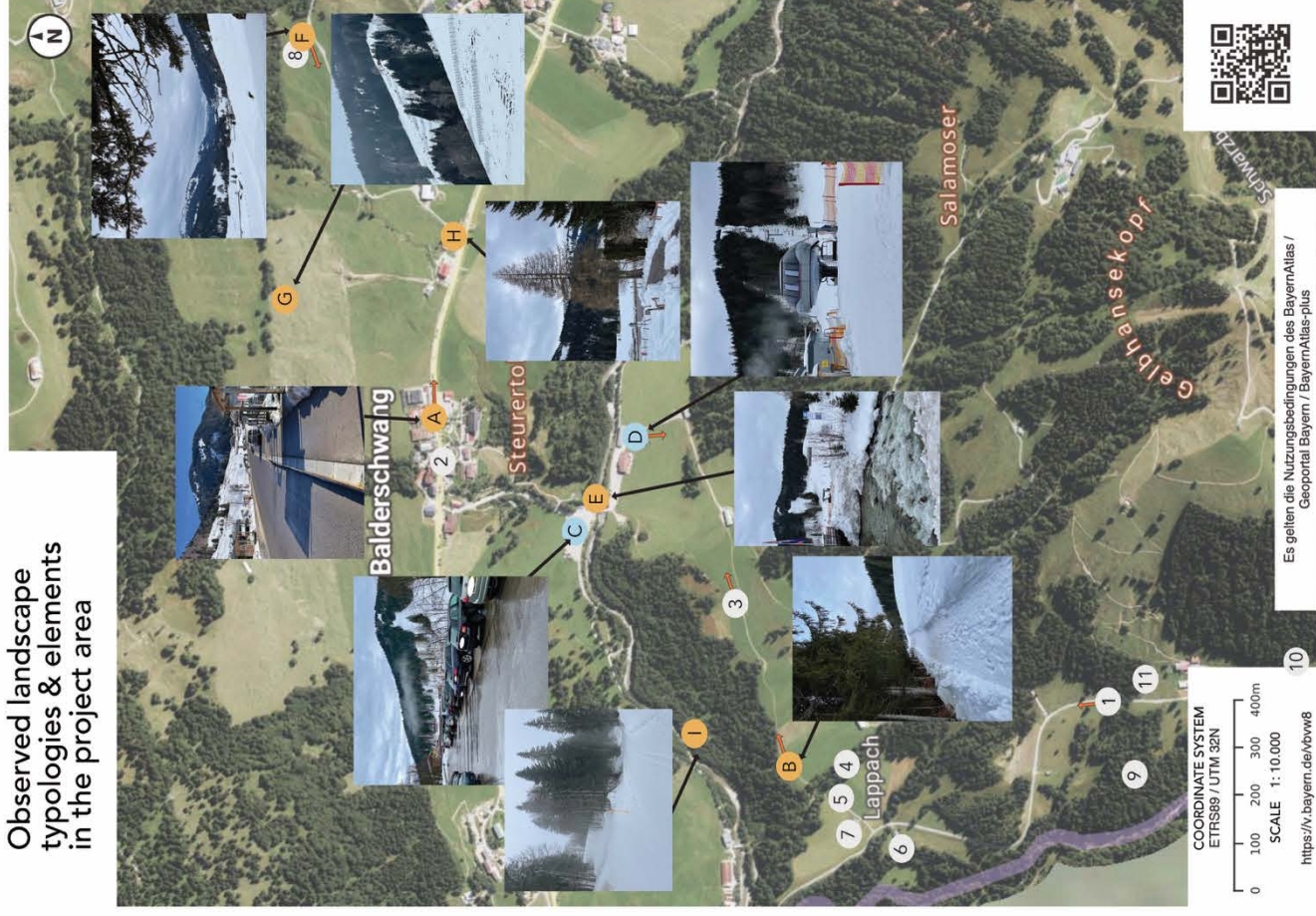
5.1. Notes from the project area visit

A four-day trip (from 22nd to 25th February 2026) to the village Balderschwang in the Alps (see figure 7) was undertaken by car and on foot. It was my first visit to Balderschwang, and I decided not to go skiing so that I could experience it as a winter tourist without skis. It turned out that none of the four lifts in Balderschwang's valley can be used without the ski equipment during winter. This meant that my access to the mountain slopes was quite limited. Besides this, I found myself a few times unintentionally walking on cross-country ski trails, e.g., on a trail stretching through a mixed alder forest alongside the river Bolgenach, because this trail was marked as a winter hiking trail on the map I got at a local hotel. Due to the winter conditions on site, three out of five anticipated hikes were completed. I originally planned to walk on routes that were 'in reality' not accessible (at least not without snowshoes or other equipment) or only meant to be used (and paid for) for the purpose of cross-country skiing. Without skis, it turned out that the range of motion for me as a winter hiker in 2026 was quite limited in the project area, primarily due to the large amounts of snow. There were, however, many interesting things to observe during the hikes that were realizable. One of the most interesting hikes led to an '2,000-year-old yew tree' at the northeastern slope surrounding the village (marked with number 8 on the figure 8). The village's dairy farming tradition was also particularly remarkable. I spotted cows inside a farm along the main road OA9 and came across multiple vending machines selling local produce, such as the traditional mountain cheese. Interestingly, there were many symbols of Christianity throughout the area. Very close to the church in the middle of the small village, there is a Catholic radio station called Horeb. Moreover, I observed private houses, large hotels (some of which appeared quite luxurious), local tourism office, small grocery shop, etc. You can see some of the impressions from the visit on the photographs (marked with letters) and on the ink sketches (marked with numbers) on the figure 8 showing an overview of observed landscape typologies and elements within the project area. This is not a full list, but rather a collection of impressions from my visit. The project area visit was also an opportunity to meet and talk to the local people, as well as the local experts and tourism stakeholders that I interviewed in Balderschwang.

Figure 8 (on the next page): The map shows the observed landscape typologies and elements in the project area. It is filled with photographs and sketches I made of the special features observed during my visit in Balderschwang. (The base map is not to scale).

Source of the base map: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy]. Note: this base map was modified with additional layers, photographs and sketches made by Tea Kriz-Posavec.

Observed landscape typologies & elements in the project area



LEGEND:

BUILT ELEMENTS & INFRASTRUCTURE

- A** road OA9 & bus stations
- 1** narrow (one-car-width) roads
- B** (winter) hiking trails
- 2** village center with residential area, hotels & the church
- C** parking lots
- D** 3 ski lifts

WATER ELEMENTS

- 4** mountain streams
- E** river Bolgenach

CULTURAL ELEMENTS

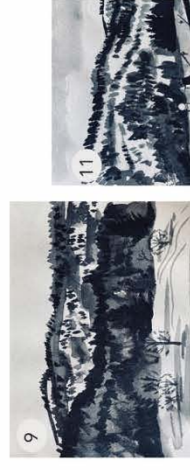
- 5** The crucifixion of Jesus
- 6** agricultural shacks
- 7** farm houses
- F** cultural landscapes
- 8** "2 000 year old common yew" (*Taxus baccata*)

VEGETATION

- 9** forests
- G** tree groups
- H** solitary trees

SITE-SPECIFIC & SEASONAL ELEMENTS

- 10** snowy slopes (winter months)/ pastures (summer months)
- 11** downhill ski pists
- I** cross-country trails



5.2. Alps, nature restoration, cultural heritage & environmental wellbeing

Understanding the three main themes: the nature restoration, the cultural heritage and the environmental wellbeing is essential to answer the RQ. In the Alps, particularly regarding mountain areas, which “(...) are characterized by a high share of near-natural ecosystems (...)” (Schirpke 2022:129), the question arises as to what is meant by the term *nature restoration*? How can *nature* be defined in this context? Alone this question about defining *nature* could be a topic for another thesis project. The following subchapters focus only on a brief introduction of the three main topics, regarding the case study context, and on the interconnectedness between them.

5.2.1. Nature restoration in the Alps– a brief introduction

The Federal Agency for Nature Conservation in Germany writes on their official website: “The eight states sharing the Alps are confronted with the need to put the Alpine nature on the pathway of recovery” (Bundesamt für Naturschutz 2024). According to the *State of the Territory Report for the Alpine Region*, the urbanisation and the infrastructure development in this region are causing increased ecological fragmentation, i.e. a reduction in the connections between different habitats (Dallhammer et al. 2025). Strengthening the ecological connectivity (or linking these habitats together) contributes to maintaining ecosystem services and biodiversity, which is comparatively high in the Alps (ibid.). However, the implementation of this is often limited due to the land use conflicts or/and the fragmented planning systems (ibid.). Remarkably, there are spatial patterns and different challenges faced by the areas at the higher altitudes compared to the areas at lower altitudes (Schirpke 2022). The mountainous or higher-altitude areas of the Alps are generally characterized by a high percentage of near-natural habitats and small-scale farming, whereas the valleys are dominated by large-scale agriculture, settlements and more artificial surfaces (ibid.). Some of the biggest threats to the Alpine biodiversity and nature, particularly in areas of higher altitudes and in protected areas, are related, e.g., to the growth of tourism and the unsustainable development of the infrastructure and settlements (blue! Advancing European projects GbR & German Federal Agency for Nature Conservation (BfN) 2025). In the lower-altitude areas, e.g., the decline in the traditional agricultural activities and the loss of the related mosaic of habitats and species adapted to these habitats is an urgent problem (ibid.). Another challenge in the valleys is the intensification of agriculture and monocultural practices (ibid.). This intensification does not encompass ‘just’ crop production, but also livestock farming. Many traditional mountain farms have been abandoned in the Alps, especially in areas that are harder to access – a process accompanied by the concentration of livestock farming in the valleys (Zerbe 2023e). This development often includes the abandonment of the traditional land-use types in the Alpine landscapes, for example, the larch meadows, grasslands and pastures (ibid.). Prof.Dr.

Zerbe highlights that the land-use changes are “(...) considered one of the most important causes of biodiversity change in mountain regions (...)”¹ (ibid.: 188).

Ecosystem restoration has been generally recognized as an approach to counteract the loss of biodiversity and the loss of ecosystem services, as well as to stop or reverse the degradation of ecosystems (Zerbe 2023a). The scientific foundation and the practice of ecosystem restoration have benefited greatly from restoration ecology, that is: “a sub-discipline of ecology and landscape ecology, respectively (...)” (ibid.: 4). Besides the scientific contribution from natural sciences, such as the restoration ecology, and the social sciences/humanities, the practical contribution to ecosystem restoration comes, e.g., from landscape architecture and landscape planning (ibid.).

To understand nature restoration or ecosystem restoration, it is essential to define the term ecosystem, which is, in this context, often used interchangeably with the terms *biotope* or *land-use type* (for example forest, meadow, etc.) (Zerbe 2023a). An ecosystem can be defined as: “a dynamic complex of communities of plants, animals, and microorganisms and their abiotic environment, which interact as a functional unit (via energy and material flows)”² (ibid.:16). The processes or the functional relationships between the organisms within an ecosystem are referred to as ecosystem functions (ibid.). Ecosystem functions are often anthropogenically influenced (ibid.). They can be influenced in such a way that they lead, for instance, to the degradation or to the restoration of ecosystems. Zerbe defines the latter as follows: “Ecosystem restoration assists, with ethically acceptable measures and by activating or re-activating natural processes, the development of an anthropogenically degraded ecosystem or land-use type towards a state which provides the target ecosystem services (provisioning, regulating, cultural) based on a functioning ecosystem, thus enhancing natural capital against the background of strong sustainability (...)” (Zerbe 2023a: 25). The concept of the strong sustainability is linked to the idea of preserving the natural capital for the future generations (Zerbe 2023i). Strong sustainability is based on the notion that the economic activity should preserve natural resources and contribute to the human wellbeing (Oliveira Neto et al. 2018). Natural capital refers to: “the value of everything that comes from nature — soil, air, water and all living creatures” (Knight 2023). This value is often communicated through the concept of ecosystem services. In general, the ecosystem services are divided into four categories – provisioning, regulating, cultural and supporting services- and they can be described as the benefits humans receive from functioning and healthy ecosystems (Zerbe 2023a). To illustrate, provisioning services include, e.g., food production and clean drinking water, while cultural services include, e.g., recreation and a sense of cultural identity (ibid.). Hence, ecosystem services are strongly focused on the basic human needs for survival, health and wellbeing on the physical, mental and spiritual level (VanDerZanden & Cook 2010). They are “one of the most important drivers for ecosystem

¹ Zerbe cites the following source: Grabherr G, Gottfried M, Pauli H (2011) Global change effects on alpine plant diversity. In: Zachos FE, Habel JC (eds) Biodiversity hotspots. Springer, Heidelberg, pp 149–163

² Zerbe cites the following sources: Patten BC, Odum EP (1981) The cybernetic nature of ecosystems. *Am Nat* 118:886–895 and Begon M, Howarth RW, Townsend CR (2016) *Ökologie*, 3rd edn. Springer Spektrum, Heidelberg.

restoration" (Zerbe 2023a: 22). Their loss is directly linked to the degradation of ecosystems³ (ibid.).

According to Zerbe, there are *"three main objectives of ecosystem restoration"* (Zerbe 2023a:26) and they focus on : (1) the natural landscapes (or a state closest to them), e.g., alpine grasslands or reed stands long rivers, (2) the traditional cultural landscapes, e.g., traditional orchards or grazed forests, or (3) the restoration of novel ecosystems, e.g., the former industrial sites (ibid.). However, one must note that there is hardly ever an 'original state' of an ecosystem that one aims to 'get back to' through restoration measures – particularly in Central Europe where ecosystems have been significantly altered and shaped anthropogenically over the centuries (Zerbe 2023b). This is especially important concerning the spatial context of this case study. Prof. Dr. Zerbe writes that: *"many regions north of the Alps and in particular the mountain ranges were transformed from natural to cultural landscapes with the medieval settlement expansions and forest clearings"* (ibid.: 34). This raises the question to which state of the landscape or the ecosystems does one want to 'return to' through nature restoration in the Alpine region?

There is no easy or universally applicable answer to that question. One needs to first analyse and understand the local conditions of a degraded ecosystem (Zerbe 2023a). Besides this, choosing a goal for a nature restoration project is rather difficult, because choosing a specific state of an ecosystem or the landscape for restoration purposes, i.e. a reference system, is a matter of prioritisation, rather than a clear scientific outcome (Zerbe 2023b). Thus, the goals of restoration can vary greatly from one project site to another, depending on the choice of the reference systems that could be linked to the historical state of the ecosystem, today's cultural landscapes or to a hypothetical reference system (ibid.). Importantly, another difficulty is that the reference systems are in general perceived as *static* states in nature. However, in the natural ecosystems, there are dynamic processes happening, which involve a level of uncertainty and difficulty (from a human perspective) (ibid.). The process-oriented approaches and a greater flexibility can therefore be of great benefit in the restoration of ecosystems (ibid.). The choice of a particular reference system is done to reach the target condition of a currently degraded ecosystem, and it influences the formulation of the guiding principles for restoration (ger. Leitbilder), as well as the selection of practical measures needed to restore and manage the project site (ibid.). The measures for nature restoration are usually either adopted from other land-use practices or they were developed specifically for the purpose of restoring degraded ecosystems (Zerbe 2023c). Some examples of these measures are mowing, grazing, using geo-textiles for erosion protection, rewetting, transplantation of vegetation, doing nothing (also known as passive restoration), etc. (ibid.). Improving the connectivity of the ecosystems and the removal of non-native species from a specific land-use types such as meadows are further examples of nature restoration measures (Franco et al. 2026a). A restoration proposal for

³ Zerbe cites the following source: WHO (2017a) Climate change and human health: land degradation and desertification. WHO, Geneva. <http://www.who.int/globalchange/ecosystems/desert/en/>. Accessed 1 Sep 2017

the village Balderschwang with the selected reference systems, guiding principles and measures is presented in chapter 5.5. This proposal focuses, among other aspects, on the cultural landscapes that are explained in the next subchapter.

5.2.2. Cultural landscapes as an inspiration for restoration in the Alps

Ecosystem restoration can be traced back to the Neolithic Period, when humans began to establish settlements and develop agricultural practices which, e.g., occasionally included 'not doing anything', meaning they created fallows on the farmland and enabled the abiotic resources to regenerate (Zerbe 2023a). Prof. Dr. Zerbe mentions the cultural landscapes in his definition of the ecosystem restoration, which: *"(...) takes into account the transformative dimension of restoration seen as human-nature interaction. Ecosystem restoration gives priority to the conservation of certain desired species and habitats at selected sites as well as resource protection and/or the conservation of the cultural landscape"* (ibid.: 25). Importantly, even if we intend to 'preserve' the cultural landscapes as a part of the restoration efforts, it is important to remember that these landscapes are not 'static' because they have evolved through dynamic processes in which humans have played, and continue to play, an important role. UNESCO offers a definition of the cultural heritage that includes, among other aspects, *"the combined works of nature and man"* (UNESCO 2026a), which are *"cultural properties"* known as the cultural landscapes (UNESCO 2026b). Thus, when considering the development of the cultural landscapes, it is important to find out and to understand which anthropogenic influences have shaped them (Bleicher 2016). Meaningfully, The Council of Europe Landscape Convention does not distinguish between the cultural landscapes and the natural landscapes (Council of Europe 2018). The reason for this is that, according to the experts: *"Central Europe is 'an ancient cultural landscape [boldface by author] in which literally no piece of land has been able to retain its natural state unchanged' "*⁴ (Zerbe 2023i: 514). It is therefore valuable to learn more about the historic anthropogenic impact on the natural landscapes and about today's cultural landscapes to better inform our choices of reference systems for nature restoration.

In general, the term *landscape* is a very complex one and there are different definitions of it, including the following: *"Landscape is the result of an overall approach to the interaction between natural and human factors, between people and their territory, between past, present and future"* (Council of Europe 2018: 31). This interaction is particularly readable in the Alpine landscapes, where humans have co-created their living environment with the forces of nature for longer than 2,000 years (Zerbe 2023e). This explains the rich heritage in the Alpine region, for instance, in a form of the traditional (agri-)cultural

⁴ Zerbe directly cites: Ellenberg and Leuschner 2010, p. 23. The full reference is: Ellenberg H, Leuschner C (2010) Vegetation Mitteleuropas mit den Alpen in ökologischer, dynamischer und historischer Sicht, 6th edn. Ulmer, Stuttgart.

landscapes. The authors Rewitzer et. al. refer to this heritage as the “*agricultural heritage*” (2017: 200) and emphasize the need to acknowledge the value of the cultural ecosystem services provided by the Alpine agricultural landscapes that are traditionally managed (ibid.).

To give an example of a specific cultural landscape in the Alps, one can mention the traditional agroforestry systems with the European larch (*Larix decidua*) (Zerbe 2023f). This land-use type includes larch meadows and pastures located at altitudes between 1000 and 2000 m.a.s.l.(ibid.). This agroforestry system used to be widespread across various Alpine countries, but today it is under threat due to the intensification of the Alpine pastures and tree cuttings, etc. (ibid.). Further examples of the traditional land-use practices in the Alps include the alpine pastures and grasslands, provided they are not practiced intensively (Zerbe 2023e). The German terms “Alm” or “Alpe” refer to the alpine pastures and can be translated as “*a summer mountain farm*” (Wanner et al. 2021 :1). These pastures have a long history in the Alps, having first been established in the Middle Ages to improve the grazing opportunities for animals by moving them to the higher altitude areas, whilst the valley meadows were used for hay production (ibid.). This is linked to the historical practice known as “*transhumance*” (Zerbe 2023e :187) defined as: “*a pastoral practice consisting of the seasonal movement of groups of animals between two geographical and climatic regions along steady routes*” (Di Noto 2018: min 00:49). Noteworthy, transhumance is “*one of the most efficient and sustainable livestock farming systems in terms of natural resource use and land management*” (ibid.: min 6:55).

Could these and further examples of the cultural landscapes and traditional practices be an inspiration for the nature restoration projects in the Alps, e.g., by serving as reference systems or guiding principles for restoration? Zerbe responds affirmatively to this by writing that “*the pre-industrial cultural landscape*” (Zerbe 2023b: 35) can be used as a reference system or guiding principle for nature restoration (ibid.) However, the expert also emphasizes that if we choose reference systems and guiding principles based on the elements from the traditional cultural landscapes, i.e. from the past, we must ensure that these can be adapted to today’s landscape and site conditions. In addition, they need to be tailored to current needs and the ecosystem’s development processes (ibid.). In other words, our vision of nature restoration, particularly when inspired by cultural landscapes, must be adapted to today’s world and its complexity.

Today, one of the largest economic sectors in the Alpine region, besides agriculture, is tourism (Zerbe 2023e). As is well known, the winter tourist season, which currently focuses primarily on the winter sports (skiing, snowboarding, etc.), is the main source of income for local communities living in the Alpine destinations (Bausch & Gartner 2020; Witting & Schmude 2019). In many places, the environments around these communities have been severely altered to meet the requirements of these winter sports. For example, in some ski resorts, substantial investments in the ski facilities, ski slope construction and maintenance have led to major spatial changes to the landscapes and affected the mountain ecosystems (Ringler 2017). Considering the human impacts in the Alpine rural landscapes, one can ask if the Alpine winter sport landscapes, such as the ski slopes, can be regarded as the cultural

landscapes of *our modern time*? What are the environmental, social and economic consequences of maintaining this *tradition* over the next decades, particularly in the low-altitude ski resorts?

These are highly complex issues to answer and they cannot be examined in their entire scope. One can say that many Alpine communities are emotionally attached to their identity as winter tourism destinations and at the same time they also recognize the imminent need to adapt to climate change effects (e.g. *Wintersport trotz Schneemangel: So könnte die Zukunft gelingen* 2025). Notable, the effects of winter sports on Alpine landscapes and ecosystems are scientifically researched since the 1970s (Ringler 2017). Nowadays, it is well known that the climate change together with the demographic changes are having profound impacts on the winter tourism industry and that they will likely negatively affect its future (Witting & Schmude 2019), particularly in the low-altitude ski resorts (Bausch & Gartner 2020). If the ski industry wants to maintain its *tradition* the society at large needs to be aware of the negative consequences, especially from an environmental point of view. The ski industry's investments, e.g., in the production of artificial snow has multiple side effects, including the landscape degradation, water balance changes, etc. (Bausch & Gartner 2020). The conservationist and nature restoration expert Alfred Ringler (2017) mentions many other factors (besides artificial snowmaking) in an overview of the ecological consequences of the technical measures required to sustain winter sports (ibid.: 36 - 47). Ringler mentions, e.g., the measures required for the ski slope construction: the removal and replacement of the native flora, clearings of the forests, leveling of the surface ground, blasting, integrating pipes into the ski resorts, etc. (ibid.). Even if we ignore for a moment Prof. Dr. Zerbe's emphasis on the "*the pre-industrial cultural landscape*" (Zerbe 2023b: 35) that can be used to guide nature restoration (ibid.) and consider looking at the ski slopes as 'cultural landscapes of our time', these past few examples already illustrate the heavy impacts of the winter sports industry on the mountain ecosystems from an environmental perspective. If one were to prioritise an economic perspective instead, different conclusions might be drawn. Prioritising the ski resorts in landscapes' (re)development affects not only the landscape appearance (ger.Landschaftsbild), but also its capacity to support fauna and flora in their natural habitats (Ringler 2017). In the light of climate change and biodiversity crisis, it is therefore important to broaden our perspective and consider more than just the anthropocentric perspective.

5.2.3. Environmental wellbeing as the ultimate goal of nature restoration

When using the term 'landscape', there is a tendency to focus exclusively on human perceptions of the environment and our interactions with it, whilst overlooking the "*more-than-human*" perspective (Whatmore 2006). Environmental wellbeing, as defined by Dobson and Redman, is a concept that respects and includes both the human and non-human perspective (2025). This concept is rooted in the regional and local scale (ibid.). It

builds on the concepts that address the global scale, for example, the “*planetary health*”⁵ and “*planetary boundaries*”⁶ (Dobson & Redman 2025: 2,7). Environmental wellbeing can be defined as: “*a co-constituted state in which humans and nonhumans, both as individuals and as parts of larger ecosystems and communities (which also involve relationships with inorganic matter), can thrive within an equitable balancing of resources and uses within their local built and natural environments*” (Dobson & Redman 2025: 7). This place-sensitive concept considers both the wellbeing of humans and of the non-human species within a local context (ibid.: 6). Dobson and Redman (2025) describe four requirements to achieve the environmental wellbeing. First: “*An acknowledgement of the existing state of local environments as heavily modified by humans, vulnerable to ecological and social harms and characterised by injustices*” (ibid.:7). This requirement, in particular noticing the anthropogenic ecosystem degradation, marks the beginning of research and practical measures aimed at restoring ecosystems (Zerbe 2023a). The second requirement is: “*Recognition that the more-than-human world is not only foundational to human wellbeing, but has its own capacities for wellbeing that are interdependent with (but also independent of) those of humans*” (Dobson & Redman 2025: 7). This can be interpreted as a motivation for carrying out nature restoration projects. The third requirement to reach the environmental wellbeing is: “*Recognition that both wellbeing and the conditions that give rise to it are dynamic and fluid, locally differentiated, and subject to negotiation and contestation (...)*” (ibid.:7). And lastly the fourth: “*Situated action both to reduce social and ecological harms and to enhance the quality of existence for both human and nonhuman species*” (ibid.:7). After reading these requirements, it becomes obvious that there are many overlaps with the attempts and actions to restore degraded ecosystems. In general, I argue that this definition pictures environmental wellbeing as the ultimate goal of nature restoration projects, which can be helpful when communicating with stakeholders about the value of restoration projects. One can argue that, whilst ecosystem restoration projects are carried out with the aim of restoring the wellbeing of the ecosystems or the ecosystem functions in “*more-than-human world*” (Whatmore 2006), they also have a positive impact on the human health and wellbeing through the restored ecosystem services (Zerbe 2023a). In other words, by restoring nature, humans positively influence not ‘only’ the ecosystems or the non-human world, but also their own survival. Prof. Dr. Zerbe concluded: “*Nature can undoubtedly exist without humans, but humans are imperatively dependent on a functioning environment*” (Zerbe 2023j: 539).

Besides ecosystem restoration, nature conservation and sustainable land use have, according to this argument, the same *ultimate goal* of establishing environmental wellbeing. When restoring ecosystems, it is not only important to contact associations that are working with the nature conservation and related topics, but also to actively engage with the

⁵ Dobson & Redman (2025) cite the following “key text” (ibid.: 7): Horton, R., R. Beaglehole, R. Bonita, J. Raeburn, M. McKee, and S. Wall. 2014. “From Public to Planetary Health: A Manifesto.” *The Lancet* (British Edition) 383 (9920): 847–847. [https://doi.org/10.1016/S0140-6736\(14\)60409-8](https://doi.org/10.1016/S0140-6736(14)60409-8).

⁶ Dobson & Redman (2025) cite the following “key text” (ibid.: 7): Rockström, J., W. Steffen, K. Noone, Å Persson, F. S. Chapin, E. Lambin, T. M. Lenton, et al. 2009. “Planetary Boundaries: Exploring the Safe Operating Space for Humanity.” *Ecology and Society* 14 (2): 32. <https://doi.org/10.5751/ES-03180-140232>.

landowners and local farmers who have the experiential knowledge and often the power to decide about the physical changes in the ecosystems they manage (Naturnahe Weidelandschaften e.V. 2026; Wanner et al. 2021). The landowners' motives for landscape changes "(...)can be motivated by values beyond income(...)" (Franco et al. 2026b: 64). In the German Alps, a study by Wanner et al. (2021), showed that the farmers, who manage the Alpine pastures, do not always want to prioritize tourism development over agriculture, even if this means they do not prioritise economic growth. Landowners and land users, e.g. local farmers, are important actors that can enable or hinder restoration on the ground (Zerbe 2023g). Thus, it can be very important to exchange knowledge, as well as to share the concept of environmental wellbeing with them. In the case of this thesis project, the following questions arise: What do the residents of Balderschwang think about nature restoration in their local area? What concerns do researchers have regarding nature restoration in Alpine environments?

5.3. Talks (semi-structured interviews) with local & research experts

This chapter presents the findings from the semi-structured interviews conducted with two research experts and three local experts. Only the first interview with the researcher Omizzolo, took place online and was conducted in English. All other interviews were conducted in person in German and subsequently translated into English. First, the results of the individual interviews are summarized focusing on the specific questions, which were designed to gain a deeper understanding of the expert's individual knowledge related to this project. Second, a comparison of the responses to general questions about nature restoration, that were posed to every expert, are presented in subchapter 5.3.6. The list of the interview questions can be found in the Appendix (10.2).

5.3.1. Andrea Omizzolo (EURAC)- researcher

"We need Restoration Law in the Alps. We need restoration actions and not only law in the Alps as soon as possible." – A. Omizzolo

During the interview, EURAC researcher Omizzolo, who was one of the project managers in the research project BeyondSnow (BeyondSnow 2021), was talking about the lack of snow in relation to the current winter activities in the Alpine areas at lower altitudes (up to 1500 m.a.s.l.). When asked specifically, why did the project BeyondSnow chose Balderschwang as its pilot working area, he answered that this community is experiencing challenges related to the lack of snow and less "skiable" days. Further recurring themes during the interview were: the obsolescence and closure (or even the possible abandonment) of some ski infrastructure, the significant economic importance of the ski industry for small local

communities and the funding opportunities for nature restoration. The economic and emotional challenges faced by the small communities in the Alps, such as Balderschwang, were addressed by the researcher in a very rational and calm manner, as he has no strong personal connection to Balderschwang. When we talked about the landscape development of the project area and similar ski areas at lower altitudes, he explained that it is necessary to dismantle parts of the existing ski infrastructure, whilst retaining some that could also operate during the warmer months. This would enable people to reach and experience the mountain tops during different seasons. Developing new visions for tourism and land use, was emphasized by the researcher, as well as the importance of maintaining parts of the open landscape. One could think of various innovative ways how to offer new touristic activities, Omizzolo explained. Regarding land use changes in connection with the nature restoration efforts, he suggested, e.g., focusing on the agricultural areas of the valley and on the forestry sector. The latter should strive to leave behind the monocultures and adapt a more sustainable practice. Omizzolo emphasized that his expertise during BeyondSnow was not strongly related to Balderschwang, but nonetheless his insights are a very valuable contribution to this thesis project.

5.3.2. Konrad Kienle (Mayor of Balderschwang) – local expert

"My grandfather used to say: 'You have TO GO with time, otherwise YOU go with time'"
– K. Kienle⁷

From the local administrative structure to the weather peculiarities in Balderschwang, Kienle shared much of his broad knowledge about the local uniqueness of his home in the Alps. The reoccurring topics he mentioned were the ecological compensation areas, biodiversity, man-made or cultural landscapes, tourism, skiing, guests vs. locals, artificial snowmaking, green roofs and other greening measures, etc. Kienle emphasized the importance of appreciating nature, which, as he explained, is developed in the childhood if the contact with nature is provided. *"Protect, use and value nature"*⁸, he repeated a few times. The mayor showed a strong interest in the environmental issues as he talked about, e.g., deadwood, invasive species and valuable Alpine resources such as the drinking water.

In the rural areas, it is essential to avoid thoughtlessly sealing the ground with impermeable surfaces, as he pointed out: *"even we in the mountains must dare to build tall buildings"*⁹ and should reconsider large parking areas. We discussed the financial aspects of this issue, as it is often cheaper and easier to opt for the unsustainable solution. The mayor often included economic aspects into the interview discussion, for example by addressing the agricultural subsidies for grasslands. The project BeyondSnow was *"a great*

⁷ Own translation from the original German quote by Kienle: *"Mein Großvater hat immer gesagt: 'Du musst mit der Zeit gehen, weil sonst gehst du mit der Zeit. '"*

⁸ Own translation from the original German quote by Kienle: *"Schützen, Nutzen und Schätzen der Natur"*

⁹ Own translation from the original German quote by Kienle: *"Auch wir in den Bergen müssen uns trauen hohe Häuser zu bauen"*

blessing", according to Kienle, as it offered an opportunity to exchange information with other rural communities facing similar difficulties related to climate change. His recognition of the environmental crises, especially the climate change, was very evident during the whole conversation. Kienle described, e.g., the changes in the duration of the winter months regarding the days suitable for skiing or grazing livestock on the ski slopes. The same slopes are used as pastures during summer months and ski slopes in winter. When Kienle started his business there were approximately 250 days in which the ski lifts were operating. In comparison, today there are 90-100 days. Even if these changes might seem negative for the local tourism at first, the mayor is aware that the touristic summer season is very important for Balderschwang, in particular because of the climate change effects. The mayor pictured, that the city dwellers want to visit the Alpine rural region in a search for "fresh air" and cooler places away from their urban homes during hot summers. Besides the environmental and economic aspects, Kienle addressed the social topics relevant for his village. Some young inhabitants of Balderschwang see their future in the village they perceive as their "*place of retreat*"¹⁰, the mayor proudly shared. He said that the "nothingness" in the village (compared to other loud and crowded touristic places) is something that both the locals and tourists appreciate. The focus on the local's life quality, rather than prioritising changes to improve the tourism sector, is something that he encouraged.

When asked about the typical or traditional land use practices in Balderschwang or the surrounding area, he gave an example of the horse-drawn sleighs used in forestry during the winter months in the 1960s. With less snow (and modern machines) this practice becomes irrelevant. Less snow also brings other contemporary difficulties. Creating paths on the snow-free ground is one of them. It takes much less effort to groom the snow to create a desired path, e.g. for cross-country skiing, than to create stable paths for all year round, the mayor explained. The thawing of the permafrost and associated issues such as the risk of avalanches, are besides the lack of snow, very problematic issues, as Kienle emphasized. The risk of avalanches is currently addressed with technical measures on the northern slopes framing the village. Moreover, the Alpine farming, as well as the tourism, are for Kienle further examples of the traditional land-use practices. Interestingly, he explained that tourism has a very long history in Balderschwang and used to involve hunting tourists. Today, since the 1960s - 70s, it has revolved around skiing in winter and hiking in summer. Skiing appears to be a relatively new tradition, compared to the historic land-use changes, which took place over several generations who transformed the forest covered slopes into open landscapes suitable for Alpine farming. Perhaps this is the main reason for his scepticism towards nature restoration which might bring changes into the open landscapes or the dismantling of the existing ski infrastructure. The necessity of a balance between the valuable cultural landscapes and the rewilding efforts, was mentioned several times. When asked to imagine a scenario in the future where the "*qualitative artificial snow making*"¹¹, which he defined as improving of the already existing snow conditions, is not

¹⁰ Own translation from the original German quote by Kienle: "*Rückzugsort*"

¹¹ Own translation from the original German quote by Kienle: "*Qualitätsbeschneigung*"

possible anymore and if a current ski slope could be repurposed as a part of a restoration project, Kienle clearly disagreed. His explanation was that these slopes are already intensively used during the snow-free months for Alpine agricultural purposes as pastures and green meadows with rich flora and fauna biodiversity. Hence, according to the mayor, nature restoration cannot take place there. I suspect that by 'nature restoration' he imagined 'rewilding', afforestation or letting the natural succession take over the open landscapes. Thus, I suggested during the interview, that the alpine agriculture could be a part of a nature restoration proposal, if it is practiced extensively, in a traditional way. Before this specific question, Kienle gave 10/10 as a score to express that nature restoration can hypothetically take place in Balderschawng, stating that it is an extremely important issue to tackle. This interview made me realise how essential it is to clearly convey what nature or ecosystem restoration is. This clarification is not only necessary for the benefit of the ecosystems, but also for the benefit of keeping the dynamic local cultural heritage, such as the pastoral farming on the open mountain slopes, alive. This would also help to avoid the miscommunication between stakeholders when planning and implementing nature restoration projects.

5.3.3. Rolf Eberhardt (Nagelfluhkette Nature Park) – local expert

*"If the renaturation of a ski slope results in an alpine meadow, this is certainly open for discussion and not seen as a problem in itself. I mean, that's just the way it is - if it's no longer viable to run the ski lift, as we've seen in various places, (...) and if no wilderness emerges there (...) then I don't suppose anyone will make a big issue of it."*¹² - R. Eberhardt

Eberhardt is the managing director of the Nature Park Nagelfluhkette, geoscientist and a member of the Oberallgäu Cultural Landscape Alliance¹³. He is a very knowledgeable local expert, who works with the landscape-scale conservation and the visitor guidance in the nature park. During the interview, he talked about the deep clay soils, the spreading of the poisonous plant *Jacobaea vulgaris* in the valley and the relatively high precipitation levels in summer and mentioned many other interesting local environmental features in Balderschwang. We discussed different ecosystems where he sees the potential for nature restoration measures in general, e.g., reestablishing wet meadows or rewetting the moors. He quickly named the Alpine farming¹⁴, remarking that it should be practiced in an extensive way, when asked about the typical or traditional land use practices in Balderschwang or the surrounding area. Eberhardt described that the cattle are grazing on the open landscape for around 100 days of the year. This is very beneficial for the biodiversity and the ecosystem

¹² Own translation from the original German quote by Eberhardt: *"Wenn nach der Renaturierung der Skipiste eine Alpweide entsteht, ist es durchaus diskussionswürdig und wird nicht per se als Problem gesehen. Ich meine, dann ist es halt so, da ist der Skilift nicht mehr rentabel zu betreiben, das haben wir ja an verschiedenen Stellen (...) und wenn da keine Wildnis entsteht (...) dann wird da niemand groß dagegen agieren, vermute ich."*

¹³ Own translation from the German: *"Allianz Kulturlandschaft Oberallgäu"*

¹⁴ Own translation from the German: *"Alpwirtschaft"*

services, such as hummus formation, CO₂ storage, etc. *"When alpine farming is practised in the traditional way, so to speak, it is undoubtedly one of the most sustainable forms of farming we know of"*¹⁵, said the local expert. It goes without saying that there are varying degrees of intensity in this agricultural practice, which subsequently have different environmental impacts.

When asked the same question to which the mayor clearly disagreed, Eberhardt pointed out that the local farmers and landowners would be more reluctant to accept the restoration measures which could include dismantling of some ski lifts, in case they were working on these lifts themselves during the winter months. However, if various economic, ecological and social factors are considered, nature restoration might be possible in this context according to the local expert. Eberhardt gave an example from his professional experience where they successfully combined nature restoration efforts with tourism. They restored some degraded areas around the hiking paths, e.g. at Riedberger Horn, a mountain top near the project area. Here, the nature restoration measures considered not only the revitalizing of specific nutrient-poor meadows (ger. *Borstgrasrasen*) around the paths but also included renovating the hiking trails. The expert says that the visitor guidance is extremely important, e.g., to shield the habitats of some fauna species like the black grouse (*Lyrurus tetrix*) against human disturbances. The synergy effects of nature restoration projects are something to think about, Eberhardt highlighted, as these can include some positive impacts on tourism, habitat conservation and species protection. He emphasized how important it is to exactly define which ecosystems should be restored, how to do it in a financially viable way (e.g. to subsidise the landowners) and how to communicate about the vision of nature restoration. The latter is especially important to consider in order to avoid misunderstandings with the landowners and other stakeholders about the restoration project's vision and goals.

5.3.4. Fabian Hartmann (tourism stakeholder) - local expert

*"Well, I'd say that mountain farmers wouldn't survive without tourism. That's just the way it is. Meaning, it is important to have both."*¹⁶ – F. Hartman

Hartmann, a local expert in this thesis, is a director of a local hotel in Balderschwang with a background in marketing, event management and gastronomy, who grew up in the Oberallgäu region. When asked about the links between human wellbeing and the Alps, he named the positive feeling of being surrounded by nature and a sense of peace or quietness that can be found in Balderschwang. The importance of skiing for the wellbeing, not only of

¹⁵ Own translation from the original German quote by Eberhardt: *"Wenn die Alpwirtschaft, sag ich mal, traditionell betrieben wird, ist sie mit Sicherheit, eine der nachhaltigsten Bewirtschaftungsformen die wir überhaupt kennen."*

¹⁶ Own translation from the original German quote by Hartmann: *"Also ich würde sagen, der Bergbauer ohne den Tourismus würde auch nicht überleben. Das ist einfach so. Das heißt, es ist schon wichtig, dass man beides hat."*

the tourists, but also of the locals, who have grown up with this winter sport, was something he highlighted and seemed enthusiastic about. The interviewee has shown a generally positive attitude towards nature restoration and already heard of some example projects carried out in the region. He offered an example where nature restoration project also benefited people, e.g., in a stream restoration project designed to provide flood protection. The local expert emphasized the necessity of finding a balance between nature and tourism, which brought wealth to the region: *"(...) people here sometimes say that the mountain farmers are the landscape gardeners of the Allgäu or the Alps. But I must add that they wouldn't be here at all if it weren't for tourism, which supports (...) the whole thing"*¹⁷. However, the situation had changed during the Corona pandemic. Hartmann was asked about his opinion on the future development of the outdoor recreational tourism in the region. Since Corona, he described, more domestic tourists are exploring their local or regional nature and trying out different outdoor sports, such as mountain biking. As far as skiing is concerned, he finds it unfortunate to see a decrease in the industry, as skiing is an important part of the local culture. He shared an example from Oberallgäu, where the ski infrastructure at the mountain Grünten was abandoned due to protests against their modernisation and financial difficulties. When it comes to possible dismantling of some ski facilities as a part of the nature restoration projects, he expressed that this is a very hard topic to discuss and that lifts could be modernised instead of dismantled. Hartmann also named the alpine farming, with the grazing of cattle and sheep on the slopes around the village, as a typical cultural land use practice in Balderschwang and the Allgäu region. Interestingly, he pointed out the Allgäu cheese tradition which includes, e.g., the German *"Allgäuer Bergkäse"* with the protected designation of origin. Besides farming, he mentioned the forestry sector and talked about the traditional professions, e.g., the carpenters and woodworkers. What I personally appreciated during the interview was that the local expert asked about my understanding of nature restoration, which was an opportunity to explain that cultural landscapes could be a part of a proposal for ecosystem restoration.

5.3.5. Prof. Dr. Johannes Kollmann (TUM)- researcher

*"The task is to recognise [the cultural landscape] and to respect what has developed there over the last 1000–2000 years. And then to transform it into a functional cultural landscape. Meaning, instead of leaving it to chance as to what is now open [grassland] or closed [forests], one needs to consider how best to integrate it into a overall plan and then develop the cultural landscape further."*¹⁸ – Prof. Dr. J. Kollmann

¹⁷ Own translation from the original German quote by Hartmann: *"(...) man sagt hier manchmal auch, die Bergbauer wären die Landschaftsgärtner des Allgäus oder der Alpen. Ich muss aber dazusagen, die würd' es halt auch nicht geben an sich, wenn man den Tourismus nicht hat, der das Ganze (...) unterstützt."*

¹⁸ Own translation from the original German quote by Kollmann: *"Die Aufgabe ist eben, das zu erkennen [die Kulturlandschaft] und zu respektieren was sich da entwickelt hat über die 1000–2000 Jahre. Und sie*

Prof. Dr. Kollmann is an expert in research about restoration ecology, who has collected professional experience from his days at the University of Cambridge, the Swiss Federal Institute of Technology in Zürich (ETH Zürich) and the University of Copenhagen. Since 2010, when he was appointed as the Chair of Restoration Ecology at the Technical University of Munich (Germany), he works there as a researcher and lecturer. The key topics he addresses in his research are the sequence of different reference systems, followed by an analysis of the ecosystems that were degraded by human activities, then the methods for restoring them, and finally, the monitoring. During the interview, the professor explained that the Alpine region is particularly vulnerable to climate change effects. He mentioned the albedo effect, which, simply put, refers to the reflection of sunlight off surfaces. In this context, less snow-covered surfaces lead to a lower degree of the reflection of solar radiation, which means that the surface ground is warming even quicker. This effect can locally lead to other problematic outcomes such as the CO₂ decomposition, changes in the hydrology and slope stability, etc. According to Prof. Dr. Kollmann, nature restoration is one of the approaches to address these complex problems. The researcher was familiar with the project area in Balderschwang as he had heard about the dispute over the Riedberger Horn (for further information see Metzinger & Corradini 2025). The landscapes are going to change in the long term, the expert explained, and this area will not have the snow cover it used to have. This will make it necessary to dismantle some ski facilities, which could be done as a part of the nature restoration efforts. Prof. Dr. Kollmann emphasized the importance of the *"functional cultural landscape"*, meaning that the cultural landscapes need to primarily fulfil the function of protecting people and their material valuables from the natural disasters, such as the avalanches, rockfalls, landslides, etc. As a possible measure to increase safety within the project area, the research expert suggested establishing and strengthening *"protection forests"* (ger. Schutzwald), that could help to mitigate or prevent damage by the mentioned natural hazards. Different possible future scenarios concerning climate change effects in the area were discussed during the interview. In case of a heavy rainfall, e.g., large quantities of water and ground material could be carried down from the mountain slopes through the open parts of the landscape. Subsequently, this material could block the river Bolgenach, potentially leading to flooding of it and thereby endangering residential areas and infrastructure such as bridges. A *"closed strip of forest above the village"*¹⁹ is one idea to help preventing this scenario, as well as to slow down potential avalanches. In addition, he suggests that the higher-altitude grasslands, such as those around the top Gelbhansekopf, with a high biodiversity value, e.g. dwarf shrub heath (ger. Zwergstrauchheide), should be maintained by continuing the grazing tradition to ensure species conservation.

dann eben umzubauen in eine funktionale Kulturlandschaft. Also dass man das jetzt nicht dem Zufall überlässt, was jetzt wo offen ist [Grünland] oder geschlossen ist [Wälder], sondern dass man sich Gedanken macht, wie man das am besten in den Gesamtplan einbettet und dann eben die Kulturlandschaft weiterentwickelt."

¹⁹ Own translation from the original German quote by Kollmann: *"geschlossener Waldgürtel über die Ortschaft"*

As the previous interviewees, he named the Alpine farming as an example of how nature restoration can be combined with the traditional land use practices in the Alps. He pointed out that this practice has already been subsidized for many decades. When asked about which ecosystems in the Alps should be restored first, Prof. Dr. Kollmann explains that it is important to consider *the ecosystem services* that we want to achieve. Here: the defence from natural hazards that could be extremely expensive or lethal in the worst case. To reach this, the focus needs to be, according to Kollmann, on protection forests. According to the researcher, the biggest challenges to the nature restoration of these forests are, firstly, the finances, including the technical feasibility, and secondly, the often-lacking exchange between different planning sectors. He described that landscape planning should be designed to be adaptable and modular, as we cannot predict what is going to be the exact suitable landscape development for the next 20 or 30 years. Over time, e.g., new sports and outdoor activities, new aesthetic ideals and new priorities could emerge and shape the local landscapes. Hence, his advice is to choose a collaborative and adaptable planning approach, working towards the desired goal in small steps whilst always keeping the flexibility in mind.

5.3.6. Comparison of the interview results

This subchapter presents the answers to the four general questions about nature restoration that every interviewee was asked. The summarized results in the table 1 below are based on the interviewees statements *and* my interpretation of the qualitative data that the interviews offered. In the table, LE is the abbreviation for the local experts, RE for the research experts that were interviewed. The full version of the fourth question in the table 1 is: *Imagining a scenario where (your/the) village has the financial means allocated for nature restoration, for example through EU funding, where would the project site be located? You can explain your choice on the map(s).* As an answer to this question only two examples per each interviewee were given in the table 1.

Table 1: Comparison of the general questions about nature restoration (abbreviated as NR). (Own work.)

Interviewees:	Interview questions:
	1) Do you have any experience with nature restoration projects?
Eberhardt (LE) & Kollmann (RE)	yes, I was directly involved.
Hartmann (LE) & Omizzolo (RE)	yes, I heard about it, but I wasn't directly involved.
Kienle (LE)	unsure, perhaps indirectly involved, e.g. as a part of the construction permits
	2) What do you personally think about nature restoration (NR) in the Alpine region?
Omizzolo (RE), Eberhardt (LE), Kollmann (RE)	the emphasis was on the necessity of NR
Kienle (LE), Hartmann (LE)	It is seen as important, but the emphasis was on the need to balance out different aspects
	3) On a scale of 1 to 10*: How likely is it that NR can take place in Balderschwang? * where 1 is the lowest score and 10 is the highest score for the most likely scenario
Omizzolo (RE)	8
Kienle (LE)	10
Eberhardt (LE)	10
Hartmann (LE)	7 or potentially higher
Kollmann (RE)	9
	4) Where would the project site be located? (short version of the question)
Omizzolo (RE)	restoring the agricultural part of the valley; diversify the forestry
Kienle (LE)	street and paths greening projects, e.g. "tree islands"; Bolgenach
Eberhardt (LE)	moor area around Gelbhansekopf (& south from it); hay meadow in the valley
Hartmann (LE)	the area around Schwabenhof and Schelpenbahn; Bolgenach
Kollmann (RE)	<i>protection forest</i> on the slopes around the village; grazing on pastures in higher altitudes

Most of the interviewees heard about nature restoration and some were directly involved in restoration projects. Judging from the interview results, the general attitudes towards nature restoration in the Alps, and particularly in Balderschwang, are very positive as the answers to the second and third question show (see Table 1). Interestingly, in the context of a discussion about suitable project sites for nature restoration, research experts Kollmann and Omizzolo, as well as the local nature park manager Eberhardt agree that it is necessary to dismantle some of the existing ski infrastructure, as reduced snowfall and other effects of climate change will be inevitable in the future. On the contrary, local experts Kienle and Hartmann gave me the impression that they didn't fully support this idea, as they rather emphasized the importance of the regional ski culture and the heritage of the open landscapes used for pastures. However, both local experts are also tourism stakeholders, which could have an impact on their viewpoint regarding the future of the ski industry and the importance of ski facilities in the village.

All interviews contributed to a deeper understanding of the attitudes towards nature restoration in the Alpine landscapes, as the interviewees often shared their extensive

knowledge and intertwined the ecological, economic and social dimension of their experience related to nature restoration projects. Their knowledge and ideas influenced the results presented in the following chapters.

5.4. Understanding the project area through spatial analysis

Before starting a nature restoration project of an ecological site, it is essential to understand its abiotic and biotic characteristics. The abiotic site factors, e.g. the climate, topography, water and soil, are often influenced as a part of the restoration efforts to bring the degraded ecosystem into a desired target condition and to support its biodiversity (Zerbe 2023a). In this step, to understand the abiotic and biotic conditions of the project area in Balderschwang and to make an informed choice of the ecological sites that need nature restoration the most, a spatial analysis was utilised. The following subchapters present the analysis divided into three temporal themes: a brief historical analysis (subchapter 5.4.1.), an analysis of the present state of the area (subchapter 5.4.2.) and of the possible future challenges of the area (subchapter 5.4.3.). The analysis of the present state of the project area focuses on the ecological and cultural structures.

5.4.1. Historical state of the project area

The traces of the first people to live in Balderschwang all year round lead back to a monastic alpine steward who was living there in 1684 (Balderschwang 2026). Until the 18th century, this village was mainly functioning as a mountain pasture village or “*Almdorf*” (ibid.). Around the year 1800, there were 16 families living in Balderschwang valley and they, according to Wikipedia, produced around 1400 tons of cheese each year, which is relatively high compared to the 300 tones produced annually in the 21st century (ibid.).

The oldest map of Balderschwang available at BayernAtlas is a historical map dating back to the year 1860 (figure 9). It shows (in the scale 1:50.000) Balderschwang as a small settlement surrounded by the hills which were presumably almost completely covered with forests. The historical map next to it (in the scale 1:10.000) is from the year 1926 (figure 10). It shows that the forests surrounding the village have been pushed back over time creating open landscapes, which is particularly noticeable on the slopes to the north of the river Bolgenach. A dark blue line has been added to this historical map, indicating today’s flow of the river Bolgenach in order to enable a comparison between the changing river course and its riverbed over last 100 years.



Figure 11: Historical map of Balderschwang from 1976 with material lifts circled. (Not to scale.)

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy].

According to the website *Bergbahnen Balderschwang* (Cabe cars Balderschwang (own translation)), the investment in the ski facilities in Balderschwang began as early as in 1962 (*Geschichte [History]* 2026). Heinz Fischer was mentioned as one of the skiers with big dreams for Balderschwang as a ski resort. Thus, he initiated the construction of the Gelbhansekopf T-bar lift (*ibid.*). You can see this lift named "Schlepplift" (eng. T-bar lift) indicated in red on the map from 1996 (figure 12), which also shows some new ski infrastructure indicated with red lines. Today, this dream of Balderschwang as a ski resort has come true, as the *Bergbahnen Balderschwang* website proudly reports: the area features many ski lodges, 40 km of ski slopes and 12 ski lifts (*ibid.*). In 2016, a six-seater chairlift called Schelpenbahn was constructed almost alongside the existing Gelbhansekopf T-bar lift (*ibid.*). This winter tourism promotion website highlights the abundance of snow in Balderschwang and states: "If you can't ski in Balderschwang, you can't ski anywhere else in Allgäu"²⁰ (own translation)" (*ibid.*).

Interestingly, the historical map of the project area from 1995 shows only the forest clearings as the preparatory work for the T-bar lift heading towards the mountain top Gelbhansekopf. There are no cable car lifts for skiing visible in the project area in the map

²⁰ Own translation from the German quote: „Kann man in Balderschwang nicht Skifahren- geht es nirgendwo im Allgäu!“ (*Geschichte [History]* 2026).

from 1995 (figure 13), apart from the material lift to Köpfle-Alpe. On the one hand, it is easy to assume that the construction of the ski infrastructure and the associated landscape changes took a few decades and that the investments started already in the year 1962. On the other hand, when reading the information on the *Bergbahnen Balderschwang* website, one might easily believe that Balderschwang's downhill skiing tradition has a very long history. If one is to judge by the maps from the 1990s (figures 12 and 13), only 30 years have passed since the T-bar lifts were installed and marked on the maps as operational infrastructure. One possible explanation could be that people used to ski even without the ski infrastructure back in time.



Figure 12: Historical map of Balderschwang from 1996 shows the ski lifts in the project area. The arrow is pointing to the Gelbhansekopf T-bar lift. (Not to scale.)

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy].

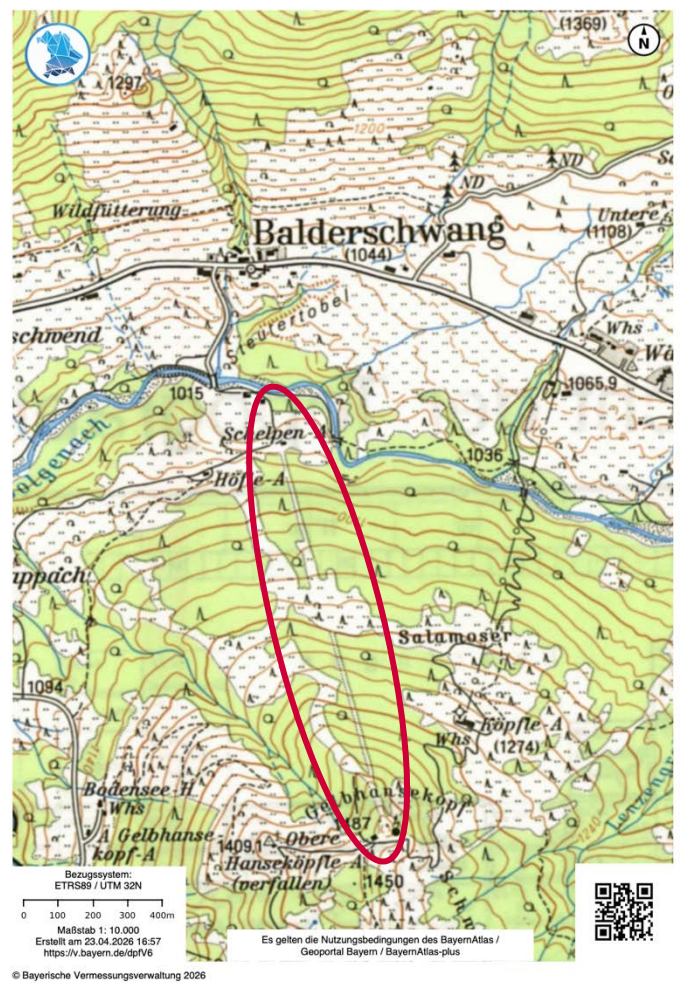


Figure 13: Historical map of Balderschwang from 1995. The circle indicated the forest clearing. Before 1995 there were no lifts leading to Gelbhansekopf peak. (Not to scale.)

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy].

5.4.2. Present state of the project area

This analysis is guided by a holistic approach described in the book *Planning Rural Landscapes* by Cunha and Magalhães as the Landscape-system methodology (2026). It acknowledges the ecological structure and the cultural structure as two fundamental and interacting networks in the landscape (ibid.). Cunha and Magalhães explained: “*The ecological structure is driven by natural processes and ecosystems, while the cultural structure reflects human values, history, and practices*” (2026: 24). A spatial analysis of both structures helps to build a more holistic overview of the project area (ibid.). In total, three synthesis figures of the ecological structures and one of the cultural structures of the project area were visualised. All figures are influenced through my own interpretation of the relevant information and maps available at BayernAtlas.

Firstly, a synthesis of the topography and water features was conducted (see figure 14). It shows, for example, a drinking water protection area on the slopes to the northwest of Balderschwang and the water sensitive areas, which are strongly influenced by the presence of water and where, e.g., waterlogging or flooding may occur. The influence of water is strongly linked to the different soil types visualised in the figure 15. Secondly, this figure shows that the steep slopes to the north of the village predominantly share the same soil complex type. You can find the detailed legend accompanying this map in the appendix (10.3.). Thirdly, figure 16 visualises a synthesis of the ecological structures related to the protected areas, particularly to the Alpine biotope mapping that is marked with pink colour. In addition to the data from BayernAtlas, this synthesis included the information about the main habitat types (ger. Hauptbiotoptyp) of the Alpine biotopes provided by the Bavarian State Office for the Environment and the *Umwelt Atlas Bayern* [Bavarian Environmental Atlas (own translation)] (Bayerisches Landesamt für Umwelt (The Bavarian State Office for the Environment) LfU n.d.). Interestingly, often found main habitats in Balderschwang’s valley are wet ecosystems such as swamp forests, fens, wet meadows, etc. (see figure 16). The whole project area is a part of the German-Austrian Nature Park Nagelfluhkette named after a special sedimentary rock called Nagelfluh (*Nagelfluhkette Nature Park* 2026). Remarkably, a natural monument, also classified as a historical cultural landscape element (see figure 17), is 2,000 years old tree *Taxus baccata*. To see further elements of the cultural structures within the project area see figure 17. This synthesis shows, besides, e.g. the architectural monuments such as the Alpine huts, also the infrastructures for tourism (ski lifts, hiking paths, etc.), which have an enormous role in affecting the Alpine ecosystems. Arguably, the concept of *compensation or replacement areas* (ger. Ausgleichs- und Ersatzflächen) is also a part of today’s culture and was included into the synthesis of the cultural structures in the project area. You can see all of the mentioned synthesis figures on the next pages.

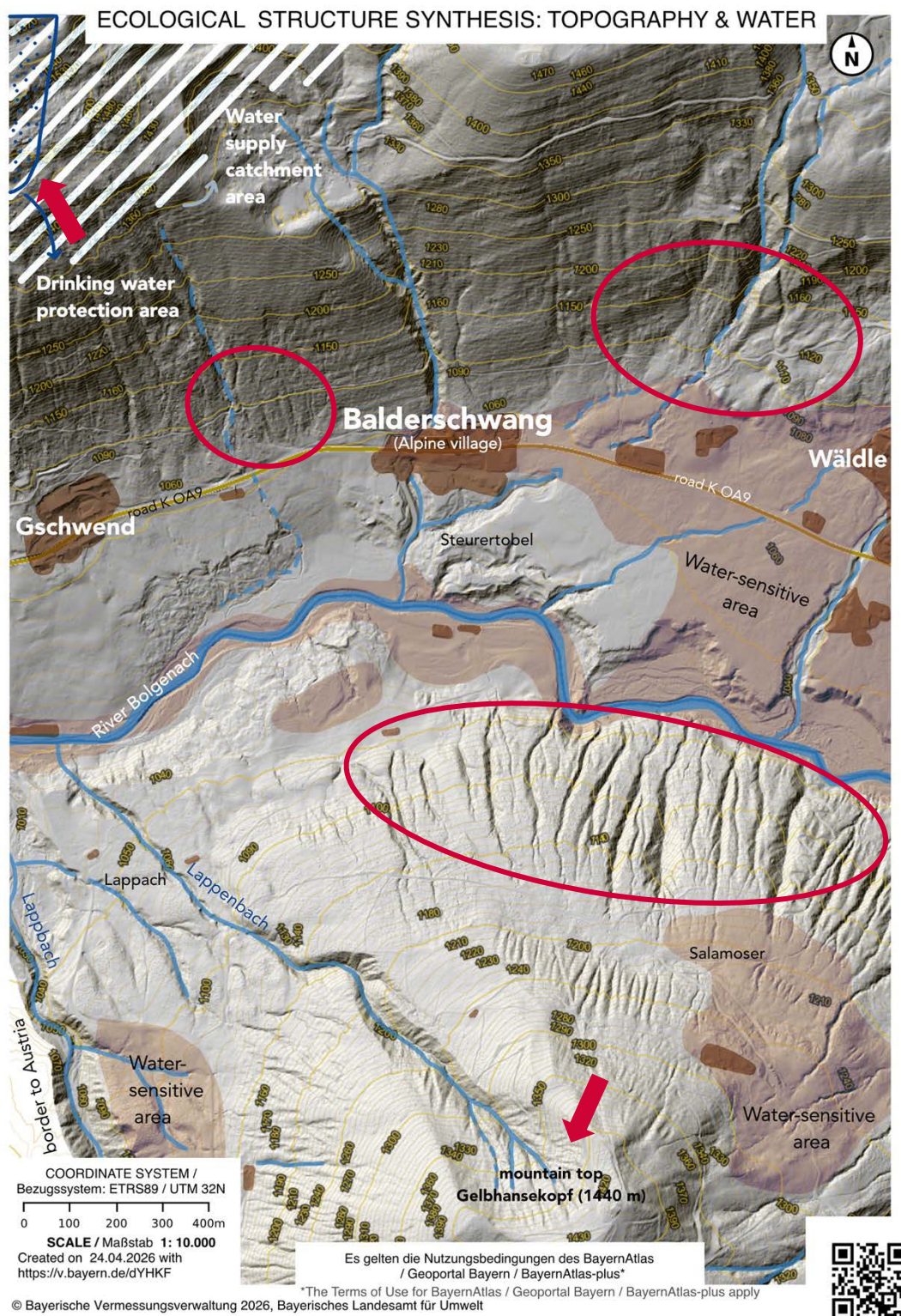


Figure 14: Ecological Structure Synthesis: TOPOGRAPHY & WATER. Examples of erosion signs are circled. (Not to scale.)

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] + own synthesis of the data.

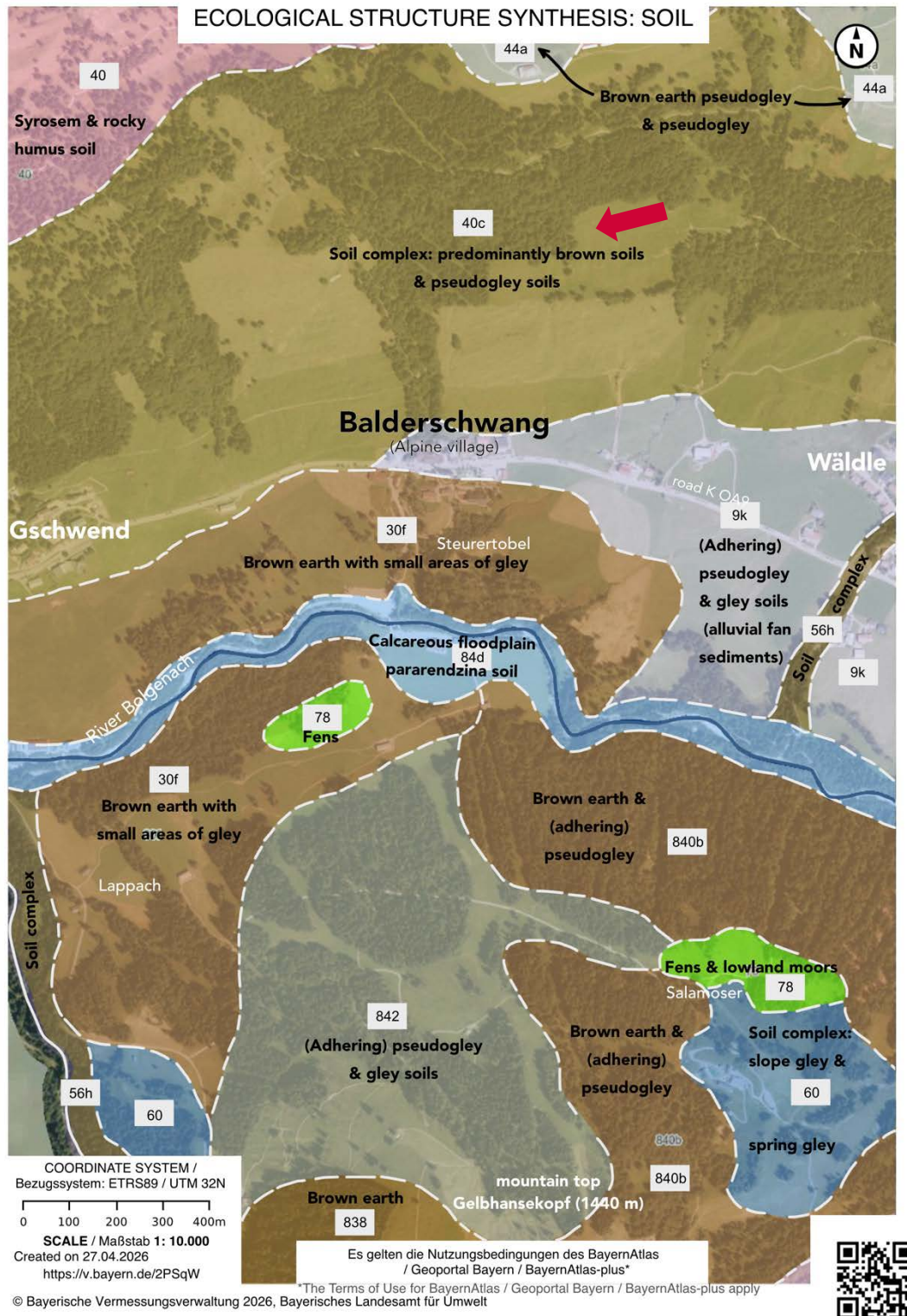


Figure 15 : Ecological Structure Synthesis: SOIL. (Not to scale.)

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] + own synthesis of the data.

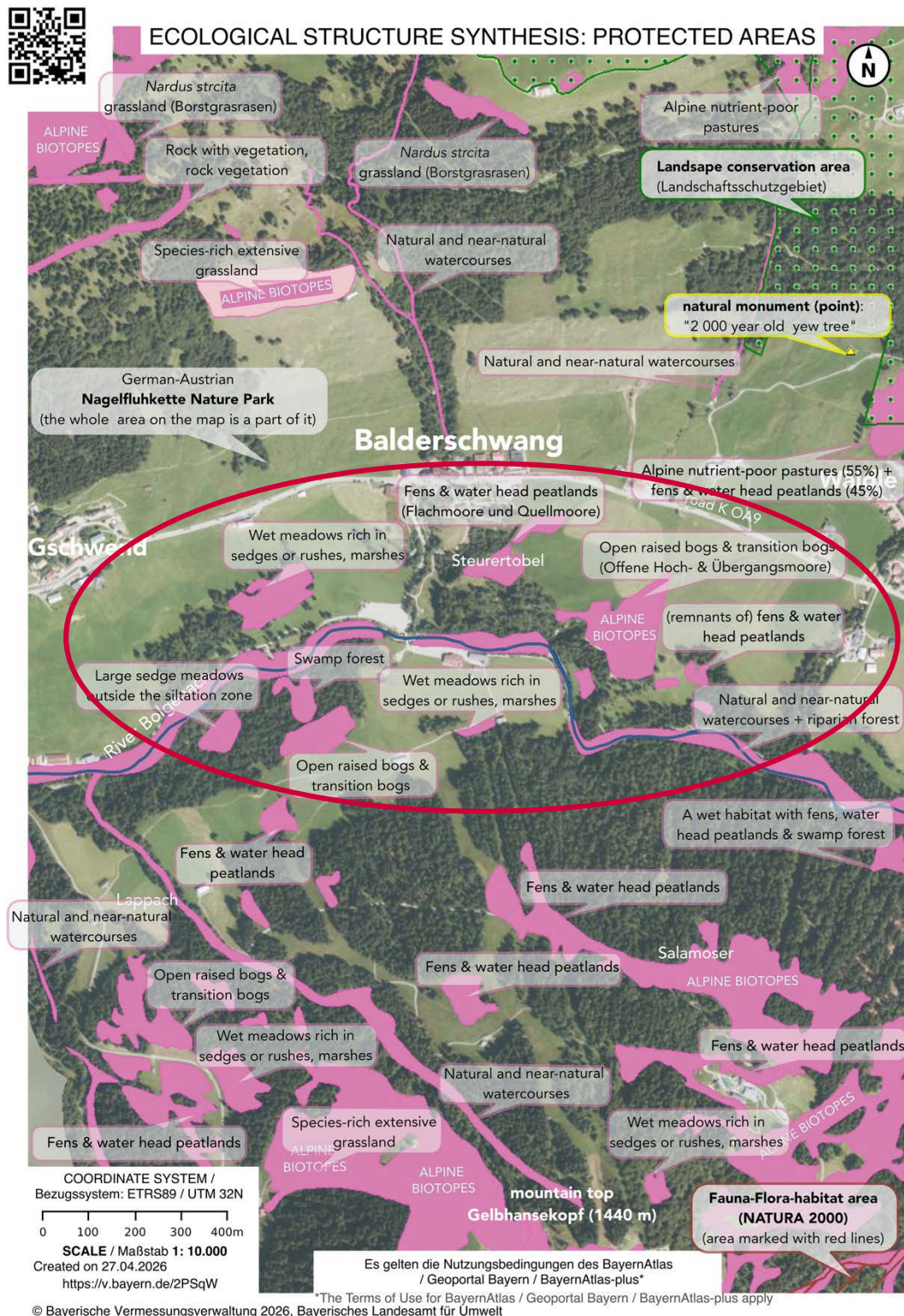


Figure 16: Ecological Structure Synthesis: PROTECTED AREAS. The diversity of wetlands in the valley is circled. (Not to scale.)

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy]; Bayerisches Landesamt für Umwelt (The Bavarian State Office for the Environment) LfU n.d.) +own synthesis of the data.



THE CULTURAL STRUCTURE SYNTHESIS

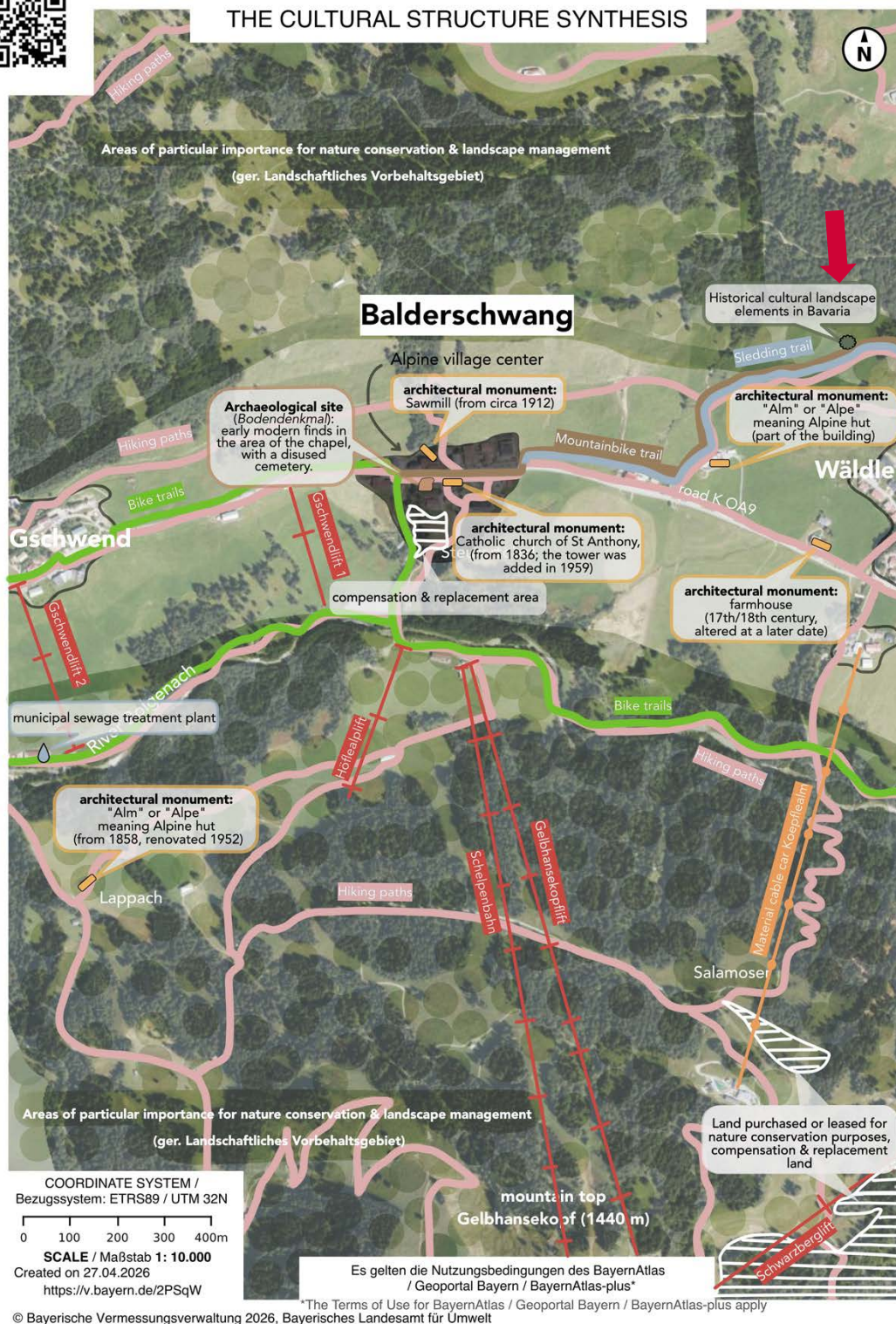


Figure 17: The cultural structure synthesis. (Not to scale.) The arrow points to the old yew tree.

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] + own synthesis of the data.

5.4.3. Possible future state of the project area

As is well known, climate change is leading to rising air temperatures and is contributing to reduced snow occurrence in the low-altitude ski resorts (Duglio et al. 2025) to which the project area belongs to. This is true, even if the area is known as 'Bavarian Siberia' or a ski resort with 'guaranteed snowfall' (Kienle & Gemeinderat Balderschwang 2025). To understand the possible future state of the project area, it is necessary to look at the zero-degree line or the zero-degree isotherm, which is: " (...) *the threshold between air layers with temperatures above 0°C at lower altitudes and those with temperatures below freezing at higher altitudes*" (Zero-degree isotherm n.d.). In the Alps, the zero-degree line, which affects (among other things) the snow fall limit, has been rising since the 1990s (Bayer et al. 2025). This is likely to have an impact on the opportunities for winter sports in Balderschwang - a community that sees itself primarily as a winter sports destination (Kienle & Gemeinderat Balderschwang 2025). In general, between the years 1961 and 1990, during the months of Dezember, January and February, the zero-degree line has been at around 1100 m.a.s.l. in the Alps (Bayer et al. 2025). Already today, this zero-degree line has moved upwards to higher altitudes, causing problems to the ski industry and forcing adaptation measures and enormous investments (ibid.). Today, there is 80% of artificial snow on the slopes of the ski resort Balderschwang (ibid.). Is the ski industry investing in an uncertain future which is not reasonable from an ecological and from an economic standpoint?

Based on the historical data for the Alpine environments, Bayer et al. have presented the effects of the 2 °C and 3 °C global warming scenarios for different ski resorts in southern Germany (2025). The data and related interactive maps on the news website BR24 (Bayerischer Rundfunk) show that Balderschwang will be below the zero-degree isotherm in case of a 2 °C global warming, meaning it presumably will not have (natural) snow in this case (ibid.). The same is true for the 3 °C global warming scenario (ibid.). How can this be true for the 'Bavarian Siberia'?

The answer can be illustrated as follows: "*Because of climate change, the future of many Alpine destinations will be recurrently faced with landscapes characterized by snowless valleys and only high- altitude snow-capped peaks*" (Bausch & Unseld 2017: 214). In case of a 2°C warming scenario, according to Bayer et al., the zero-degree line will move upwards to around 1500 m.a.s.l. (2025) (see figure 18). In a case of a 3°C scenario, which might happen at the end of the century, the zero-degree line will move up to the circa 1700 m.a.s.l. (ibid.). It is important to keep in mind that: "*The current climate mean is already 2.8°C above the pre-industrial average of 1871-1900 (as of 2024)*" (Zero-degree isotherm n.d.). Moreover, one of the highest mountain peaks within the project area, to which currently a chairlift and a T-bar lift lead during the winter months, is Gelbhansekopf – a mountain peak located at 'only' 1440 m.a.s.l. (see figure 14).

As mentioned previously, the zero-degree line does not correspond 100% with the snowfall limit, as the latter cannot be sharply defined (Snowfall limit n.d.). However, the rise of the zero-degree line is caused mainly by the anthropogenic climate warming and it affects the habitats of humans and other living beings (Zero-degree isotherm n.d.). This can be

observed, e.g., during the summer months, when the melting of ice and snow on the Alpine peaks accelerates due to the significant rise of the zero-degree line (ibid.). Against this background, it is understandable that the landscape and ecosystem changes are inevitable, also in Balderschwang, where the panoramic white landscapes attracting many winter sports enthusiasts today may no longer be a realistic prospect in the future. The global warming is not the only reason for changing trends - the demographic change and changes in the tourist behaviours also affect the attractiveness of winter sports (e.g. Witting & Schmude 2019). These facts have been acknowledged in Balderschwang and new ideas for future development were elaborated, e.g., as a part of the BeyondSnow project (Weiß 2025). With the concept "Balderschwang 2040" (see Kienle & Gemeinderat Balderschwang 2025), the project area aims to become a sustainable destination with tourism attractions all year round and independent from the snow fall (ibid.). For example, hiking could be a stronger focus of the future landscape management and tourism promotion during all seasons (ibid.: Weiß 2025). Besides hiking, Alpine destinations could shift their focus in the future away from the winter sports dependent on snow towards: "wellness or MICE (Meetings, Incentives, Conventions and Exhibitions)- tourism" (Soboll & Dingeldey 2011: p. 117) – already quite present in the area - or to " (...) nature and culture-based experience" (Bausch & Unseld 2017: 204), just to name a few ideas. When it comes to the ski infrastructure, the interviewed researchers and some research papers agree that: "Future research should concentrate the attention on assessing and identifying actions for converting these installations to other purposes or to dismantling them" (Duglio et al. 2025: 4788).

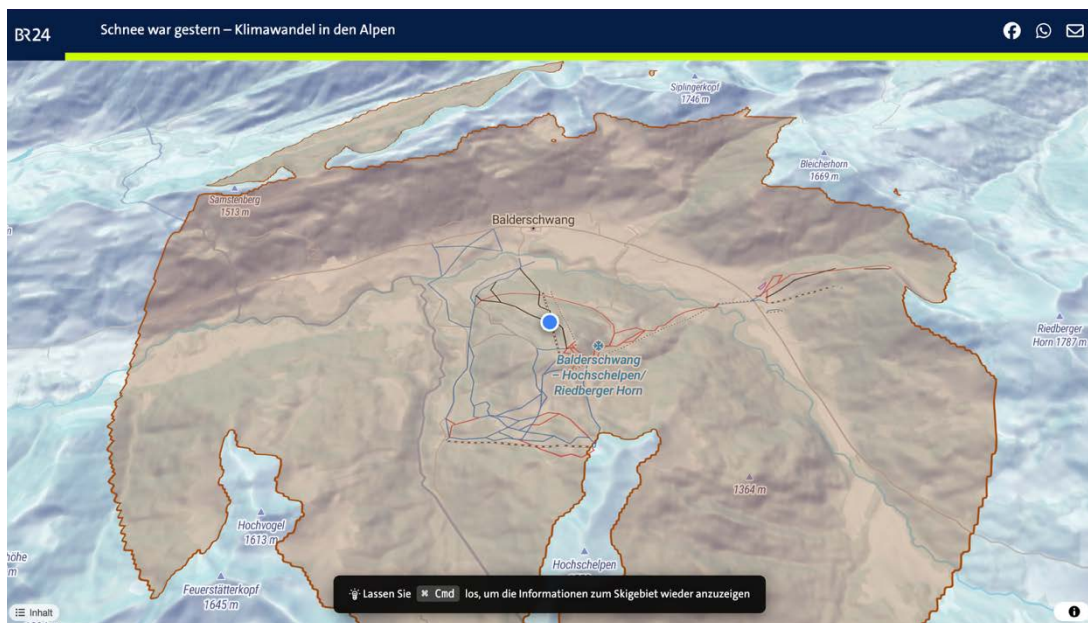


Figure 18: The screenshot shows the orange-coloured surface as an area below the zero-degree line under the 2°C warming scenario in Balderschwang, Allgäu

Source: Bayer et al. 2025.

5.5. Restoration proposal in Balderschwang

Should the ski infrastructure in Balderschwang be dismantled as a part of a nature restoration project? It is difficult to answer this question in this context in terms of the practical feasibility and the local's acceptance of the removal of (at least some) ski lifts, as they continue to benefit economically from the ski season. In addition, there is an unanswered question about the ownership of these infrastructures and the land that could potentially be used for nature restoration purposes. The cable cars owners are solely responsible for the operation of their facilities in Balderschwang (Kienle & Gemeinderat Balderschwang 2025). This is perceived as a weakness in the vision booklet "Balderschwang 2040", as the cable cars are closed in summer and autumn, yet the community aims to become a four-season destination (ibid.). The locals attach major importance to being a *"mountain community that is connected to nature"*²¹ (ibid.:12) and aspire to become *"a role model for sustainable tourism"*²² (ibid.:13). To achieve this, Balderschwang aims, e.g., to offer sustainable nature experiences and to give tourists the opportunity to discover the *"(...) culture and the living traditions of the region"* (ibid.:14).

With all this in mind, the following chapter offers different suggestions to implement nature restoration measures - including the dismantling of some ski facilities, even if this might not be realistic at the moment. In general, this project aims to explore freely what *could* be possible, if the cultural land use practices and the concept of the environmental wellbeing are included in the nature restoration proposal. To 'explore freely', means to create a proposal on a conceptual level without an in- depth analysis of the problems related to, e.g., the land ownerships or costs, as the scope of the case study does not allow for it. Instead, the focus is on exploring the possibilities of nature restoration that could benefit the (local) people (and go along with Balderschwang's vision for 2040) and the *"more-than-human world"* (Whatmore 2006). The following subchapters will examine each nature restoration step – B (subchapter 5.5.1.), A (subchapter 5.5.2.), C (subchapter 5.5.3.) and K (subchapter 5.5.4.) – in more detail, to bring *nature back* by imagining how ecosystem restoration might look like at the selected project sites.

5.5.1. Step 'B': Building a vision with reference systems

In the interview, Prof. Dr. Kollman spoke about the need to respect the cultural landscapes and to further develop them into *"functional cultural landscapes"* that fit the needs of today's society and are adaptable to future changes. He emphasized the importance of selecting the ecosystem services that we want to restore in this case rather

²¹ Own translation from the original quote by Kienle & Gemeinderat Balderschwang: *"Balderschwang – eine naturverbundene Berggemeinschaft"* (2025:12)

²² Own translation from the original quote by Kienle & Gemeinderat Balderschwang: *"Balderschwang ist ein Vorbild für nachhaltigen Tourismus"* (2025:12)

than solely focusing on the ecosystems. Table 2 outlines the vision of this nature restoration (thesis) project in Balderschwang by presenting the potential project sites, ecosystem services that are in the focus of the restoration efforts and the chosen reference systems. The choice of the project sites is based on the previous methodological steps. For example, the choice of the erosion-prone slopes surrounding the village was pointed out by Prof. Dr. Kollmann during the interview and in the spatial analysis of the area's topography and water (figure 14). His answers during the interview regarding the potential sites for nature restoration had a great influence on the results presented in table 2. While selecting the project sites and desired ecosystem services, I aimed to consider the nature restoration benefits for the ecosystems, non-human species and *"(...) to restore habitats in the economic and cultural interests of the local population"* (Zerbe 2023h: 469). To achieve this, the choice of the ecosystem services is strongly supported by Uta Schirpke's chapter on *"Ecosystem Services and Sustainable Development in the European Alps (...)"* (2022). Moreover, priorities are made. Firstly, the reference systems for nature restoration are selected with the intention of primarily protecting the health and material valuables of the locals and tourists from natural hazards. Secondly, the intention is to enhance the environmental wellbeing, including the human wellbeing as this would contribute to the life-quality and touristic attractiveness of the area. Thirdly, the aim is to select references that respect the cultural land use practices and the *"living traditions"* where possible. Figure 19 shows an illustrative overview of the selected project sites that are identified as ecosystems in a need of restoration. In the next step A, (only) two of these ecosystems are further analysed in more detail due to the scope of the project.

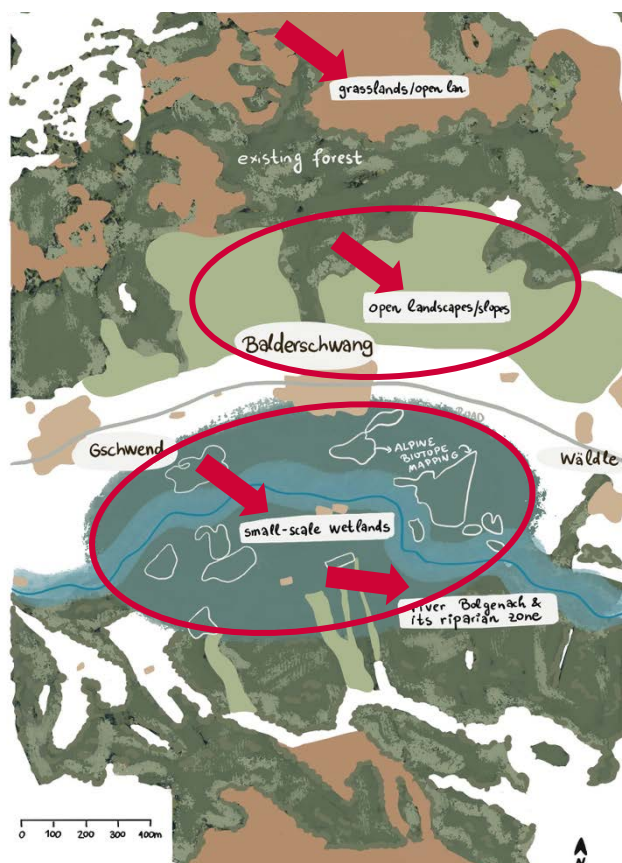


Figure 19: The illustration shows four potential sites for nature restoration (indicated by arrows). The areas in red circles are the project sites that are analysed in the next step. The colours in the illustration are related to the descriptions in Table 2. (Own work).

Table 2: Building a vision for four different nature restoration sites. ES is the abbreviation for ecosystem services. (Own work).

PROJECT SITES/ ECOSYSTEMS IN A NEED OF RESTORATION	ECOSYSTEM SERVICES (ES) IN THE FOCUS OF RESTORATION	POSSIBLE REFERENCE SYSTEMS FOR RESTORATION
Erosion-prone open landscape on the slopes to the north & south of the village Balderschawng	• <u>Regulating ES</u>: Protection from gravity-driven natural hazards such as avalanches and landslides • <u>Regulating ES</u>: carbon sequestration	• Protection forest/ forest shield • Near-natural mountain forest ecosystems with a biodiverse forest edge
River Bolgenach & its riparian zone	• <u>Provisioning ES</u>: fresh water cycle • <u>Regulating ES</u>: filtration of surface water + protection from flooding (function as a retention basin, e.g. for the water from melting snow/ice) • <u>Cultural ES</u> : outdoor recreation, access to the river shore --> increased wellbeing	• Healthy near-natural river & riparian zone ecosystems with fish passage opportunities
Fragmented & small-scale wetlands in Balderschawang's valley (e.g., fens & water head peatlands, wet meadows rich in sedges or rushes, marshes, etc.) (see figure 16)	• <u>Regulating ES</u>: carbon sequestration • <u>Regulating ES</u>: filtration of surface water + protection in case of flooding events • <u>Cultural ES</u> : environmental education (e.g. through nature education trails) + outdoor recreation	• Healthy near- natural semi-aquatic ecosystems (e.g. fens and water head peatlands already present in the area & marked as Alpine biotopes)
Degraded grasslands/ pastures/ open landscape in higher altitudes (i.e. around the mountain peaks to the north & south of the village)	• <u>Provisioning ES</u>: grassland biomass • <u>Cultural ES</u> : restoring the connection to the agricultural heritage (cultural landscapes + traditional lifestyle) • <u>Cultural ES</u> : increasing the aesthetical value through increased biodiversity *, health benefits**, possible tourism benefits (recreation, environmental education)	• Extensive species-rich Alpine pastures/ traditional grazing practice (fodder meadow & summer pastures) • Near-natural grasslands • Traditional agro-forestry practice (larch meadows)

NOTES:

* see e.g. Lindemann-Matthies et al. (2010); Schirpke et al. (2021)

** see Pichler et al. (2023)

5.5.2. Step 'A': Analysis of the ecosystems (project sites)

Building on the previous methodological steps, especially the spatial analysis presented in the chapter 5.4, in this step, two project sites (the first and the second one mentioned in the table 2) will be examined in more detail. According to Prof. Dr. Zerbe: *"The Alps are classified as the most vulnerable to erosion of all landscapes in Europe"* (Zerbe 2023e: 193). Thus, the choice is made to strongly focus the analysis of both project sites on the gravity-driven natural hazards.

Firstly, the focus of the analysis is on the slopes north of the road OA9. Figure 20 shows, e.g., warning zones for rockfall in dark blue, the areas prone to deep landslides in purple and areas monitored for avalanches outlined in red. This analysis of the project site contains (as well as the next figure 21) various translated technical terms (my own translation). If you would like to find out the exact meaning of the professional terminology (in German), you can scan the QR code on the figure (bottom right-hand corner) and access BayernAtlas portal, where you will find the information and data layers used in this analysis. Figure 20 suggests that the village Balderschwang, the farms and infrastructure are currently at risk due to the erosion-prone slopes 'above' the village. In particular, the slopes to the north-east of the village are highly vulnerable to deep landslides. This puts in risk several housing objects or farms, some of which are classified as architectural monuments (see figure 17). As far as avalanche protection is concerned, avalanche fences are located (only) in the area outlined in red and indicated by red dots. The risk of rockfall or other georisk objects north of the village is largely unaddressed. Remarkably, the risk of natural hazards to human health and wellbeing is especially obvious on the bare slopes without the forest vegetation.

ANALYSIS OF THE SITE : SLOPES NORTH OF THE VILLAGE

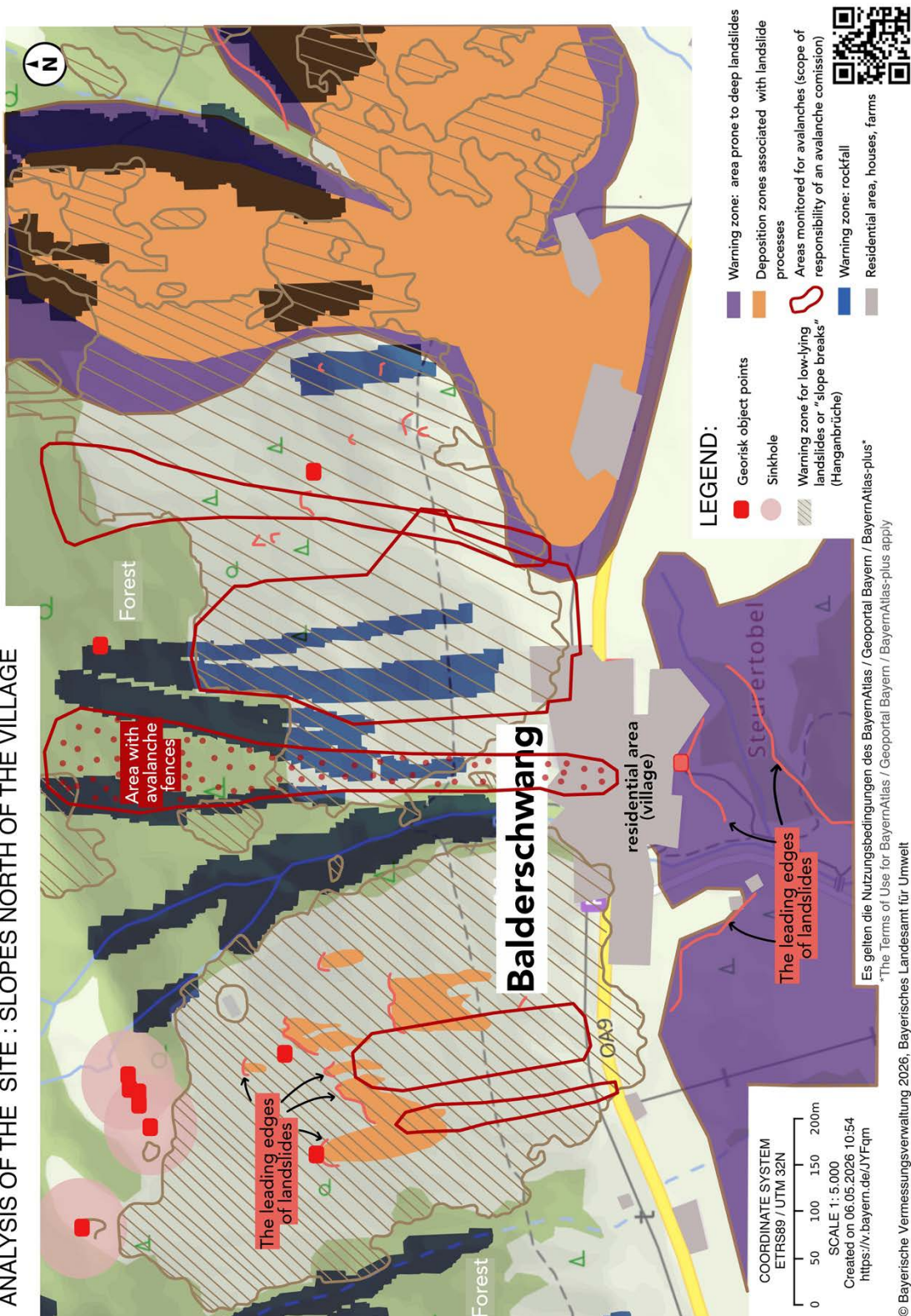


Figure 20: Treeless slopes north of the village are especially prone to gravity-driven natural hazards such as deep landslides. (Not to scale.)

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] + own synthesis of the data.

Secondly, the analysis in figure 21 (see the next page) shows the section of the river Bolgenach and its riparian zone closest to the residential area of Balderschwang. The warning zones for deep landslides marked in purple and the deposition zones associated with landslide processes are dominant in this figure. Prof. Dr. Zerbe explains the connection between the slow soil formation, the extreme climatic conditions and landslides in the Alps: *“Low soil temperatures significantly reduce the activity of microorganisms, so that the decomposition of dead organic matter and thus, the supply of mineral nutrients is inhibited. Soils are often shallow, especially on steeper slopes. On such slopes, regular landslides and solifluction can occur, also promoted by the pressure of the snow in winter”* (Zerbe 2023e: 189). In general, the effects of climate change, e.g., the extreme precipitation events in the Alps, are linked to an increased risk of natural hazards such as landslides and flooding (ibid.).

According to this analysis, should the landslides actually occur on the slopes to the south of the road OA9, the river Bolgenach and its riparian zone could be at least partly flooded. This could be even more noticeable during the spring snowmelt. You can see the water-sensitive areas (i.e. the areas that might get flooded) in the topography and water synthesis (figure 14). The abundance of different kinds of wetlands and other wet ecosystems near the river Bolgenach (see figure 16) demonstrates that the dynamic water occurrence in the project site resulted in rich biological diversity. This diversity is recognized through the Alpine biotope mapping. However, during my hikes along the riparian zone of Bolgenach, I did not notice any information signs about this ecological abundance present in the area. The signs mostly focused and clarified the cross-country ski trails which follow the river's current.

Let's focus on the section of the river located just south of the village centre, which has a completely altered riparian structure (see figure 21). In case of flooding, the large, asphalted parking area right next to the river could easily become flooded due to the impermeable ground cover (see figure 22). In that case, the access to the nearest ski lifts in winter (three T-bar lifts and one chairlift) would also be affected. In addition, the area where the water currently collects and locals have their meeting point called “die Kneippanlage” would also be inaccessible (see figure 21). The impermeable river ramp that prevents fish from migrating naturally is a further concern in this area. According to the data from BayernAtlas, in the area where the riparian zone is completely altered (red circle on the figure 21) the river Bolgenach is moderately altered and clearly altered in its structure. The riverbed structure on the same spot is ‘only’ slightly altered and moderately altered. However, it is necessary to look at the whole river catchment area and the wetland habitats surrounding Bolgenach, when one makes plans for the nature restoration of the river. Thus, an analysis of the whole catchment area can be considered as a need for further research. Importantly, both spatial analysis of the project sites (shown in figures 20 and 21) are showing selected aspects of the present state of these sites, not any recommendations for nature restoration. The latter are presented in the next subchapter.

ANALYSIS OF THE SITE : RIVER BOLGENACH & RIPARIAN ZONE

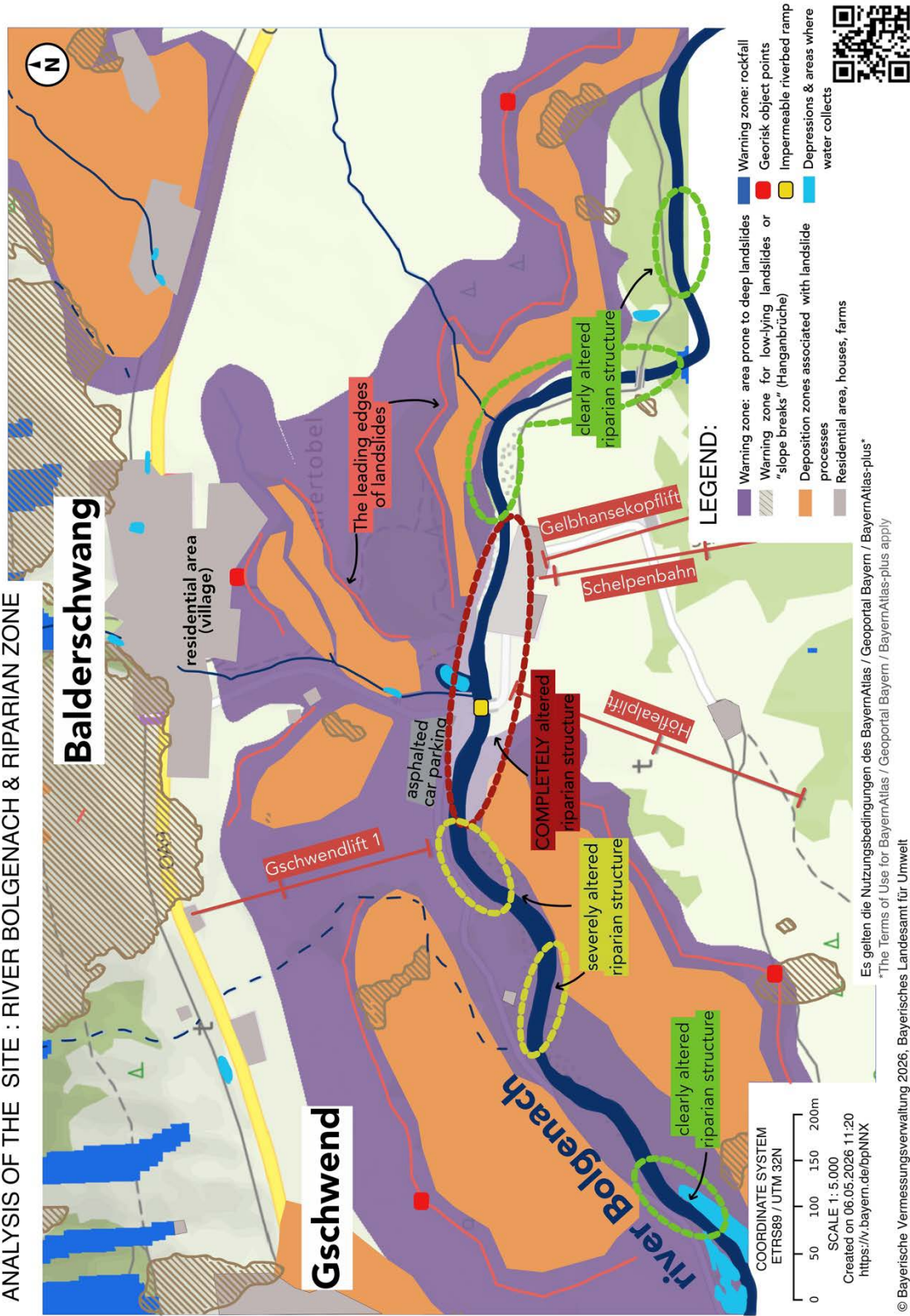


Figure 21: The riparian structure around the river Bolgenach has been completely altered (see the red circle). The fish migration in the area around the 'central' car park is obstructed. (Not to scale.)

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] + own synthesis of the data.



Figure 22: Completely altered riparian zone of the river Bolgenach. Cross-country ski trail to the left. To the right: a large car park and a T-bar lift (Geschwend 1) on a landslide-prone slope below the road OA9 (Own photography.)

5.5.3. Step 'C': Choice of guiding principles & measures for nature restoration

In this step of the development of a hypothetical nature restoration proposal in Balderschwang, the guiding principles for the nature restoration of the project area are formulated. In addition, two separate nature restoration proposals for project sites, which were analysed in the previous subchapter, are presented. An individual list of the chosen guiding principles, potential measures for ecosystem restoration and a visual representation of the core ideas is allocated to each project site – firstly, to the slopes north of the village and secondly, to the river Bolgenach with its riparian zone. The general question that arises at this point is: what is the overall nature restoration mission for the whole project area?

In the future, the village and the current ski resort Balderschwang will no longer be marketed and perceived solely as a winter (ski) destination. This would also not be sustainable in the long run due to climatic and demographic changes (see subchapter 5.4.3.). Instead, the restoration mission for the project area, envisions **Balderschwang as a peaceful, tranquil, all year-round destination where visitors can (re-)connect with thriving nature or "more-than-human world" and get to know the local culture and "living traditions"**. Through this nature restoration mission, the results of the "Balderschwang 2040" booklet developed with the local people as a part of the BeyondSnow are respected (see Kienle & Gemeinderat Balderschwang 2025). In addition, the guiding principles for the whole project area encompass a **high quality of life for locals**, as well as a respect for and appreciation of the **dynamic traditional ways of living in harmony with nature**. Thus, the nature restoration mission respects the mayor's voice that represents the local people (see subchapter 5.3.2). It also respects the local flora and fauna that has adapted to the extreme climatic conditions and the anthropogenic stewardship of the mosaic of habitats developed in the Alps over the last centuries (Zerbe 2023e). Moreover, this mission **prioritizes** the urgent need of our time to further develop the cultural landscapes into **"functional cultural**

landscapes” as Prof. Dr. Kollmann suggested (see subchapter 5.3.5.). The vision for the development of the functional cultural landscapes is primarily centred around using natural structures to prevent or at least to mitigate the gravity-driven natural hazards that endanger people’s lives, wellbeing and material valuables.

Table 3: Choice of the guiding principles (restoration mission) & measures for nature restoration of two project sites in Balderschwang. (Own work.)

PROJECT SITES/ ECOSYSTEMS IN A NEED OF RESTORATION	ECOSYSTEM SERVICES (ES) IN THE FOCUS OF RESTORATION	POSSIBLE REFERENCE SYSTEMS FOR RESTORATION	GUIDING PRINCIPLES/ THE MISSION IS ...	POSSIBLE MEASURES FOR RESTORATION
Erosion-prone, bare slopes to the north of the village Balderschwang	• <u>Regulating ES</u>: Protection from gravity-driven natural hazards such as avalanches and landslides • <u>Regulating ES</u>: carbon sequestration	• Protection forest/ forest shield • Near-natural mountain forest ecosystems with a biodiverse forest edge	... to protect human life & wellbeing by safeguarding against potential gravity-driven natural hazards through natural structures (forest shield). ... to enhance environmental wellbeing by promoting the local biodiversity & improving the aesthetical quality of the slopes (forest edge)	• tree planting (protection forest) to stabilize the soil & damp/prevent the possible hazards such as rockfall or landslides • planting a species-rich forest edge with blooming bushes (e.g. Prunus spinosa, Viburnum lantana, etc.) • developing a management plan with local people to upkeep the new landscape structures
River Bolgenach & its riparian zone	• <u>Provisioning ES</u>: fresh water cycle • <u>Regulating ES</u>: filtration of surface water + protection from flooding (function as a retention basin, e.g. for the water from melting snow/ice) • <u>Cultural ES</u> : outdoor recreation, access to the river shore --> increased wellbeing	• Healthy near-natural river & riparian zone ecosystems with fish passage opportunities	... to develop a concept that includes: • the idea of environmental wellbeing (through restoration of the completely degraded riparian zone) • local cultural landscape elements • attracts tourists all year around	• unsealing the large parking area & building a parking house (with the same m2 available for parking close by) • dismantling of the T-bar lift Geschwend 1 (and other T-bar lifts with time; the chairlift could be open all year around) • opening up the access to the river shore • building a fisch ladder (e.g. rock-ramp fischway) • agroforestry grazing system with larch (aesthetical benefits: autumn colours + animals grazing) • current ski facilities/ buildings in the valley repurposed for the the open-air museum center (main attraction: local culture, cuisine & alpine biotopes such as different wetland types) - Ecotourism

To sum up, the nature restoration mission for Balderschwang prioritizes further developing cultural landscapes to promote the protection from natural hazards. Moreover, this mission is inspired by the cultural land use practices that positively influence the biodiversity and the environmental wellbeing. The latter includes the human wellbeing, as well as the healthy functioning ecosystems. The two project sites visualised on the following pages are just two examples of how this nature restoration mission can be localised in the project area through different measures for restoration (see Table 3).

Building on the table 2, an overview of the guiding principles for nature restoration and measures that could hypothetically be implemented on mentioned project sites is presented in table 3. Importantly, Prof. Dr. Zerbe points out that nature restoration can help with preventing landslides (Zerbe 2023e). These are particularly concerning on the slopes to the north of the road OA9 (see figure 20). In this project site, planting a **protection forest** is proposed as the main nature restoration measure (see figures 23 and 24). Protection forests or forest shields are advised to be (re-)planted in the mountains: *“to protect soil, safeguard water flows and guard against natural disasters, such as avalanches, landslides and floods”* (United Nations 2021:17). In this context, it is helpful to draw on the experience gained from a nature restoration project on another mountain in the Oberallgäu region called Geschwender Horn (Corradini et al. 2024). In particular, to answer the question which tree species could be planted in Balderschwang, one can look at what was planted as a part of reforestation measures at Geschwender Horn: *“Up to an altitude of 1,200 metres above sea level, the objective is to establish a site-appropriate mixed mountain forest comprising approximately 45% spruce (Picea abies), 10% silver fir (Abies alba), 30% beech (Fagus sylvatica), 10% sycamore maple (Acer pseudoplatanus) and 5% mountain elm (Ulmus montana). (...) Above 1,200 m above sea level – in the subalpine spruce forest zone – spruce is planted as the dominant tree species (60% share) (own translation)”*²³ (Dietmann et al. 1995 :102). On moist micro-sites of the slopes, *grey alder (Alnus incana)* and the *common ash (Fraxinus excelsior)* were planted (*ibid.*). In the first project site (see figure 23), these two tree species, together with willow species (*Salix spp.*), could be planted around the natural and near-natural watercourses (see figure 25). To prevent wild animals from browsing on the newly planted trees, it was decided to use larger plants as a part of the restoration project at Geschwender Horn (Kinshofer 2000). This could also be considered in Balderschwang. Fencing the area with young trees would be another possible alternative. Remarkably, the reforestation efforts at Geschwender Horn were successful (Dietmann et al. 2004), which makes the measures proposed for this nature restoration project in Balderschwang also promising.

²³ Original quote in German by Dietmann et. al.: *“Bis zu einer Höhe von 1200 m NN ist Zielvorgabe die Erziehung eines standortgerechten Bergmischwaldes aus ca. 45% Fichte (Picea abies), 10% Weißtanne (Abies alba), 30 % Buche (Fagus sylvatica), 10% Bergahorn (Acer pseudoplatanus) und 5 % Ulme (Ulmus montana). (...) Über 1200 m NN - im Bereich des subalpinen Fichtenwaldes - wird die Fichte als führende Baumart (60%-Anteil) gepflanzt”* (1995:102).

In addition, a **species-rich forest edge** with an organic shape is suggested as an ecotone between the protection forest and the open grasslands. An ecotone can be explained as a transitional area or an *in-between zone* that connects different ecosystems (Lasky 2022). This restoration measure is suggested to support the environmental wellbeing of the site by further stabilizing the soil, promoting local flora and fauna species diversity and making the hiking experience on the already existing path more enjoyable. The species that could be planted there are the native bushes such as *Clematis alpina*, *Prunus padus*, *Prunus spinosa*, *Euonymus europaeus*, *Berberis vulgaris*, *Sambucus racemosa*, etc. (Igelspacher 2026). This nature restoration proposal for the first site and the next one presented on the following pages are both envisioned to be implemented until the year 2050.



Figure 23: The view of Balderschwang village centre & the project site no. 1. Observe the signs of erosion processes on the slope to the north-west of the village. (multimaps360.de : 2026).

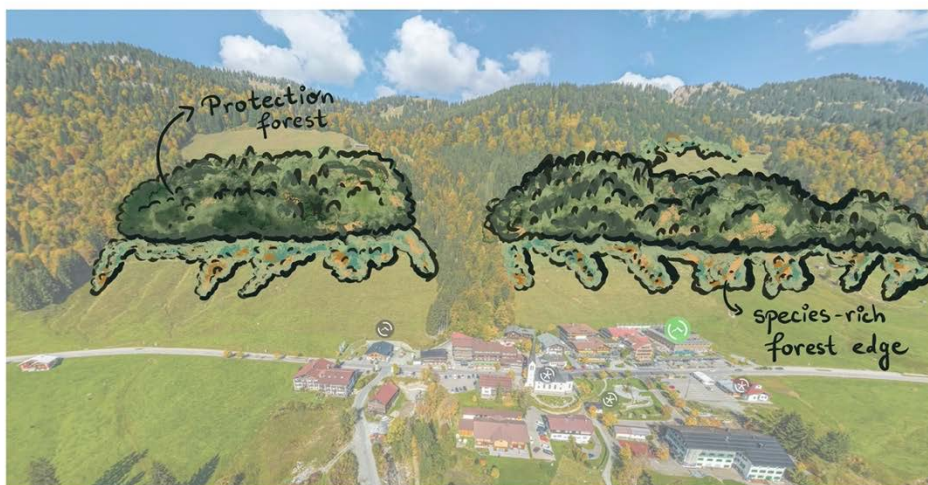


Figure 24: Year 2050: a belt of near-natural forest ecosystem on the slopes above the residential area. In the higher altitudes above the forest shield, open spaces are used as extensive grasslands and alpine pastures. (Illustration not to scale).

NATURE RESTORATION PROPOSAL : SLOPES NORTH OF THE VILLAGE

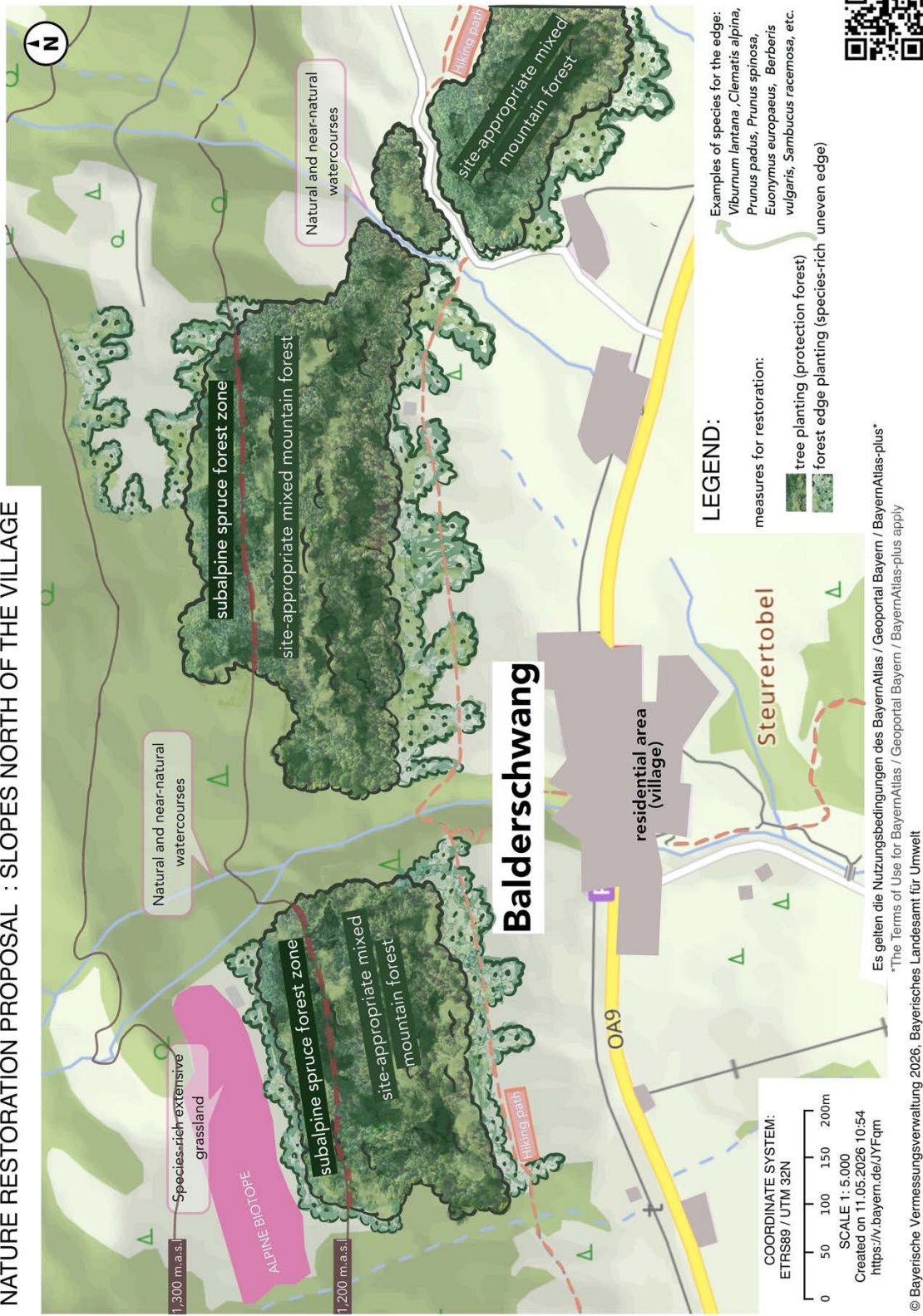


Figure 25: Nature restoration proposal for 2050 (site 1). Restoration of a mixed mountain forest and subalpine *Picea abies* forest, the primary function of which is to provide protection against natural hazards on the landslide-prone, treeless slopes above the village. (Not to scale.)

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] + own layers on top of the base map.

Let's focus on the second site – the river Bolgenach and its riparian zone (see figure 26). Importantly, this nature restoration proposal concerns mainly the part of the riparian zone of Bolgenach, that is currently completely altered from its natural state (see figure 21). Ideally, one would aim to consider the river as a whole and its entire water catchment area when planning for nature restoration (Zerbe 2023k). In this thesis, the scope of the project is considered. This means, e.g., that a potential **fish passage** is still suggested as a measure for nature restoration, even though the fish's ability to move throughout the whole river should have been taken into account. The focus on the environmental wellbeing and the cultural land-use practices led to the idea of an **outdoor museum** of natural and near-natural wetland habitats such as fens, swamp forests, etc. (see figure 27). This open-air museum could also include the local architectural, culinary and land-use heritage. In this way, the nature restoration project could not only help fish to successfully pass through the area but also attract more tourists by increasing awareness of the natural richness that is already there to be explored in the area. Another suggested measure is to slowly replace the ski lifts, apart from the chairlift (that could be open all year round), and use the existing buildings in the valley as a museum centre. The eco-tourism approach would benefit the area that urgently needs to figure out concepts how to be independent from the snow- conditions and winter sports activities. Moreover, it is suggested to establish a **larch meadow (agroforestry system)** on the slopes that are currently at risk of landslides (figure 21) and are still used for skiing in winter. Ski slopes at lower altitudes are not only irrelevant for the future under a 2°C warming scenario (Bayer et al. 2025), but also linked to an increased erosion (Zerbe 2023e). In addition to the soil stabilisation through planting trees in rows along the altitude lines (figure 27), the aesthetic quality (e.g. autumn colours of *Larix*), the benefits for biodiversity and the preservation of the cultural heritage of land-use are further advantages of this nature restoration measure. This is true since the agroforestry system (marked in orange on the figure 28), together with the forests, wetlands, alpine pastures and other ecosystems, forms a mosaic of habitats (ibid.) which strengthens the environmental wellbeing of the project site. This proposal for nature restoration suggests that people could enjoy spending their time on the river shore beach close to the water, which could have restorative effects and benefits for both the mind and body (Rathmann 2021). The expansion of the river is proposed based on the river's floodplain indicated on the historic map (see figure 10). This measure aims to create a near-natural habitat that could serve as a **retention basin for stormwater or flooding**, if necessary. To achieve this, the large parking area needs to be demolished, and the topography of the site changed, as there is currently no access to the river shore. The suggestion is to build a multi-story car park with the same number of parking spaces nearby. Moreover, a new road and a cycle path would be redirected to provide the **access to the riverbank**. Further work with this proposal should involve exactly defining the proposed measures on the spatial level, e.g., defining the technical details about planning the access to the shore, modelling the terrain, designing the open-air museum (especially focusing on the visitor guidance), constructing a fish pass, etc.



Figure 26: The view of the project site no. 2. The building with the red roof is a restaurant, the one with the blue roof is a place where you can rent skis in winter. Observe the large car park next to the inaccessible riverbank.
(multimaps360.de : 2026).

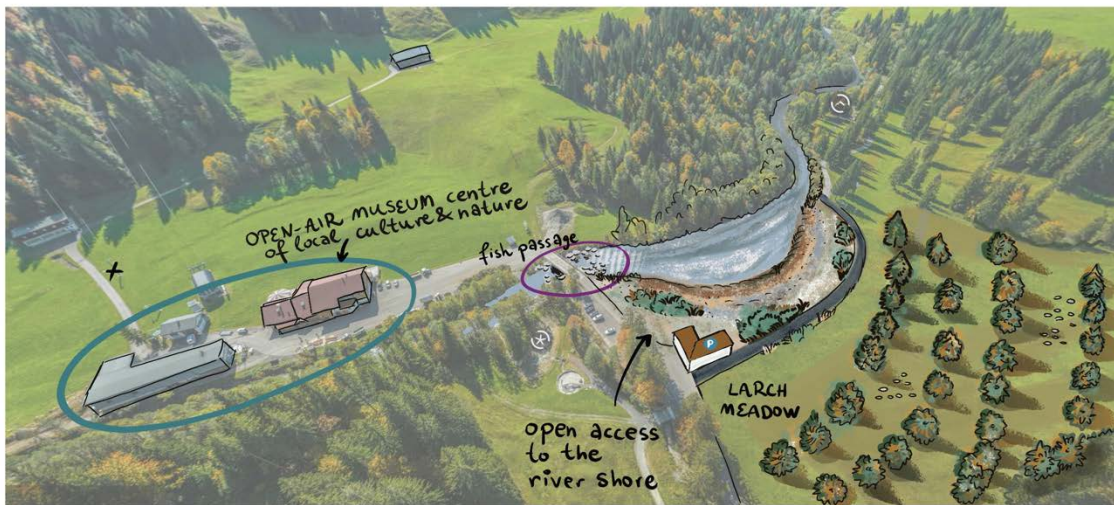


Figure 27: Year 2050: In Balderschwang, you can experience and discover the Alpine nature & local culture at first hand. The **nature restoration proposal** includes measures inspired by the environmental wellbeing, the cultural-land use practices and the erosion protection. (Illustration not in scale).
(Based on the figure 26 and own work.)

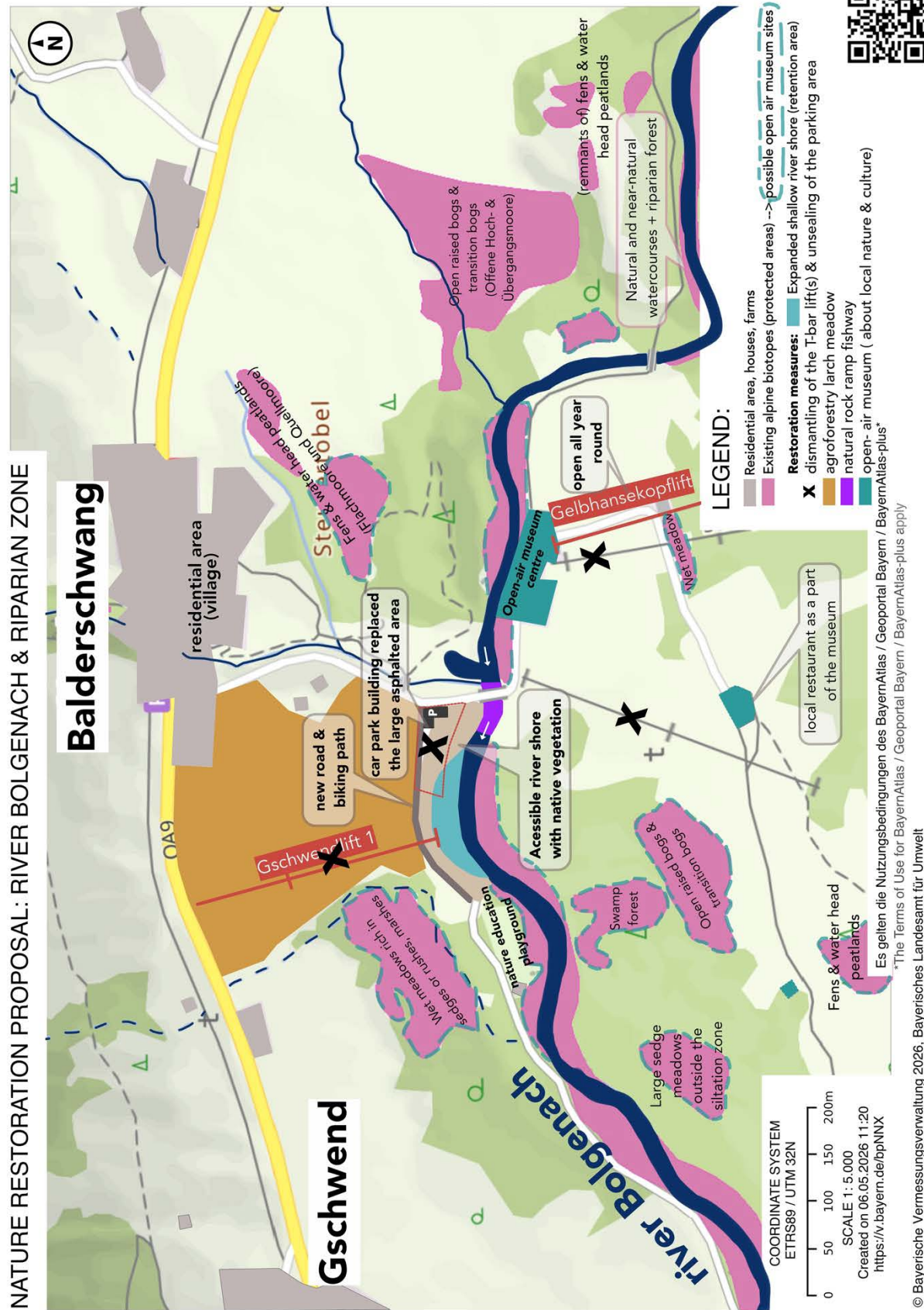


Figure 28: Nature restoration proposal for 2050 (site 2). The proposal rethinks the area developed around winter sports. Instead of further investments in the ski industry, an alternative could be developing an open-air museum about the wetlands and local agricultural heritage and creating access to the river shore. (Not to scale).

Source: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [©Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] + own layers on top of the base map.

5.5.4. Step 'K': Keeping track of the potential implementation & monitoring of the project

As a next methodological step in this hypothetical project, it is suggested to implement the measures for nature restoration until the year 2050 and to monitor their development on two chosen sites in Balderschwang. Theoretically, this step K is arguably the most important one as it bridges the gap between the academia and practice of ecological restoration. It *brings the nature BACK*. Practically, to transition from a thesis paper to 'planting trees on the ground', is a very complex (but not an impossible) task. Of course, the scope of this thesis does not allow for the realisation of this project and its two nature restoration proposals for two project sites. If the suggested restoration measures were to be implemented in Balderschwang, one would need to consider many more aspects besides those shown in Table 2 and Table 3 and visualised in the previous chapters. In general, which measures for nature restoration can be implemented on site depends on different circumstances, which are not only determined by the ecology of the site, but also, e.g., the finances, landownership issues, acceptance of the local people, permits, etc.

The aim of this hypothetical project was not to provide clear instructions for the implementation phase of the selected measures, nor was it to monitor their development on site, as the scope of the work does not allow for it. The purpose of this work is rather to communicate about the value and necessity of nature restoration projects. Remarkably, some of the success factors for implementing the EU Nature Restoration Regulation (NRR) in the Member States are: " (...) *increased acceptance of nature restoration and landscape change, (...) and increased attractiveness of nature restoration to land users and land owners*" (Marquard et al. 2025: 1). These were the main reasons to focus on the communication and to see the implementation as a future research (and practice) need.

At this point, I want to emphasize that there is still a great deal of work to be done before one can think of actually implementing the proposal on the site(s), which will be further explored in the discussion about the future research needs (subchapter 6.3.). This thesis is just the beginning of a potential nature restoration journey for this Alpine village and perhaps for other villages facing similar difficulties.

6. ENDING WITH REFLECTIONS & DISCUSSION

In this chapter, the final methodological step E completes the acronym NATURE BACK. This step includes a reflection about the methods used in this case study (subchapter 6.1.), the reflections about the study findings (subchapter 6.2.) and the recommendations for further research (subchapter 6.3.). Finally, the project finishes with a concluding summary and the main message (subchapter 6.4.).

6.1. Discussion of the methodological steps

Prof. Dr. Zerbe writes about the importance of communicating nature restoration projects: *"One of the fundamental prerequisites for the broad acceptance of a restoration project by stakeholders and the population is comprehensive **information** and **transparency** of decision-making processes and activities related to ecosystem restoration [boldface by author]"* (Zerbe 2023g: 482). The synthesis of the methodological steps abbreviated with the acronym **NATURE BACK** was useful primarily as a **communication tool** to describe steps taken along the journey to develop nature restoration proposals in this thesis work. In fact, the decision was taken to develop two proposals on a conceptual level, instead of developing one comprehensive masterplan for the whole project area. In general, the methodological steps were useful to state a core intention of the project, namely: to restore nature or simply, *to bring it back*. The NATURE BACK idea was also useful in providing structure to the writing process. In practice, however, the steps did not always build on one another chronologically, as the process of developing a spatial proposal was more iterative than linear. For example, the step N (*Note down the impressions from the project area visit*) was taken after I acquired some basic knowledge about the project area and the project BeyondSnow, which would ideally be included in the step A, i.e. *Acquire knowledge from the relevant literature and other sources (...)*. Strictly speaking, the order of the letters in this example might have had to be different. I decided to keep the acronym, as I found it useful to communicate the narrative and the intention of this case study project. The choice of a case study format was also useful as: *"Case studies can often answer big questions at the intersection of policy and design. They are useful (...) for culturally sensitive design, and for studies trying to refine or test emerging concepts and ideas"* (Francis 2001:17). The case study in Balderschwang was an attempt to test how to bridge the gap between the policy (the EU Nature Restoration Regulation (NRR)) and the design of the nature restoration proposals. This seems particularly important in 2026, as the EU Member States need to elaborate and submit their own national restoration plans in September 2026 (European Commission 2026).

In this case study, the choice was made to work in Balderschwang, a community that already took part in the project BeyondSnow. The interview with the mayor Kienle also confirmed that there is (in this Alpine community) an awareness of the changing climate and other crises of our time. The chosen approach in this study was to plan *with* the local people by considering them as experts during the semi-structured interviews. In addition, the thesis includes insights gained through the interviews with the researchers from the fields of spatial planning and restoration ecology. However, one could criticize or question why all the interviewees were white men. On the contrary, perspectives from different European countries were taken into account, which can be seen as a strength of the project. All interviews contributed greatly to the development of the nature restoration proposals for the project sites. The latter were not specified at the start of the project, and they were discussed together with the experts during the interviews. This approach - to select the exact sites after the project area visit, the spatial analysis and after the interviews- was chosen to enable a more informed decision when selecting the exact locations in a need of ecosystem restoration. In practice, my assumption is that this step of finding a project site is often given at the start of a nature restoration project and linked to the funding of it. This was different in this thesis, as the aim was to answer the RQ and to develop a case study to create a nature restoration proposal which includes the concept of environmental wellbeing and the cultural land use practices. In other words, the aim was *to find out how to develop a nature restoration project and to (actually) develop a nature restoration proposal* for the case study area in Balderschwang. This explains why the project's timeframe only allowed for the development of the nature restoration proposal at a conceptual level.

The decision not to use AI (as far as possible) as a part of my thesis, was taken because of many different unclear aspects of AI and my personal concerns, including the environmental and ethical debates around the use of data and visual material generated by AI. Besides this, the critical reflection about the choice of the literature and sources is one of the central aspects of academic writing and should be carried out regardless of whether we use AI or not (Cerratto Pargman et al. 2024). Personally, there was a wish to create an authentic project (even if it's not 'perfect'), a project rooted in my own human experience. This was particularly important when reflecting about the project area visit or the interviews. For instance, the ink sketches (made by hand) of the special features in the project area (shown in figure 8) inspired me later in the process to recognize the already existing richness of the Alpine natural and cultural heritage of the place and to propose opening an outdoor museum as a restoration measure. Arguably this is not a common nature restoration measure, but rather an example of the benefits of not leaving up the work to AI – it opens up the possibility for creative ideas 'out of the box'. Admittedly, AI could have potentially replaced the tedious work of summarizing the interviews manually, but for me it was a way of deepening my knowledge about the content.

Finally, I visited the project area during the winter months, which limited my range of movement as a non-skier. A visit during the summer months would have been more advantageous for observation and analysis of the local conditions and would have enabled me, e.g., to carry out a vegetation mapping.

6.2. Reflections about the case study findings

The RQ is: *How can a proposal for a nature restoration project in the Bavarian Alps - in this case study in the village of Balderschwang and its surroundings - be developed in a culturally sensitive way that includes the uniqueness of the local cultural landscapes and the concept of the environmental wellbeing?*

The answer to this is complex. Through the methodological steps summarized under the acronym NATURE BACK, two spatial proposals for nature restoration were developed for project sites (that consist of several connected ecosystems) in Balderschwang. In doing so, the focus was on including the uniqueness of the cultural land-use practices and the environmental wellbeing through the choice of the reference systems or measures for nature restoration. This was done, for example, by choosing cultural landscapes as reference systems for restoration as explained by Zerbe (Zerbe 2023b). The concept of environmental wellbeing helped greatly in communicating the core idea of the project: **to restore the wellbeing of the alpine ecosystems and to simultaneously contribute to the human wellbeing**. Interestingly, the focus on these two core topics - the cultural heritage and the environmental wellbeing- led to another, (unexpected) essential topic in this nature restoration project: the protection from natural hazards driven by gravity, such as landslides, avalanches and rockfall. Another, perhaps more obvious topic of significance to the Alpine region is tourism. Both gravity-driven natural hazards and the importance of tourism had a profound influence on the nature restoration proposals created for Balderschwang. This is reflected, e.g., in the focus of the analysis of the chosen sites (see subchapter 5.5.2) and in the choice of measures for nature restoration (subchapter 5.5.3.).

Besides the main topics, the interviews had a great influence on the development of the nature restoration proposals. Through these five conversations it became clear that, the communication about the project is crucial, because different people most likely have a very different understanding of what ecological restoration actually means and what it should achieve. Some actors might equal *nature restoration* with *rewilding efforts* or with the abandonment of the open landscapes and the agricultural heritage which was developed over centuries – perhaps even by their own ancestors. Thus, they could perceive any suggested changes in their ‘home landscape’ with a sense of loss and resentment. Perhaps nature restoration does not need to be polarized into two scenarios: first that stands for wilderness, loss of jobs, loss of open landscapes – and the second that stands for tourism, skiing, winter sports, wealth and high-yield agriculture. What would be possible if the traditional cultural landscapes in the Alps, that many people consider their home, were recognized as a part of a dynamic, man-made natural heritage with a high ecological value?²⁴ Could the dynamic way of living *with nature* in the Alps even be called *ecosystem restoration* in areas where other activities and land uses have currently replaced the traditional agricultural practices?

²⁴ Perhaps, someone would open a museum about it ☺.

By learning from the traditional land-use practices, such as the alpine farming, we can adapt this knowledge to our current efforts to restore the ecosystems in the Alpine region in a sustainable manner. However, if we focus exclusively on the cultural landscapes of the Alpine region, some might advocate for mentioning the winter sport landscapes, such as the downhill ski slopes as an integral part of the local culture. Their preservation (under the motto ‘as long as possible’) can be justified from an anthropogenic point of view or by emphasising the economic and social factors. However, if we consider the concept of the *environmental wellbeing* as described by Dobson and Redman (2025) and include the “more-than-human world” (Whatmore 2006) into our considerations about the development of landscapes, it becomes clear that, the upkeep of the ski slopes is often a catastrophe from an ecological standpoint *and* for humans if we think about the long-term effects of our actions. The focus of the spatial proposals in the Alps should therefore be on the values that consider the well-being of both humans and non-human living beings – which can be practically achieved through actions aimed at nature restoration. For Prof. Dr. Zerbe it is clear that: *“The vegetation on intensively used and eroded ski slopes (...) must be restored, or the loss of biodiversity in valley areas used for settlement, transport, industry, and agriculture must be compensated for by the restoration of near-natural ecosystems or the restoration of traditional land-use types”* (Zerbe 2023e:192). A culturally- sensitive restoration of the Alpine rural area in this case is therefore not about optimising and preserving the use of the ski slopes and trails at all costs. Instead, it is about the need “...to preserve and promote the anthropo-zoogenic habitat and landscape diversity that has developed over the centuries” (ibid.: 193). The existence of the “anthropo-zoogenic habitat and landscape diversity” (ibid.) can also be described as a mosaic of the Alpine habitats. This mosaic in the landscape shows that *agricultural heritage* has been passed down through the generations.

Nowadays, are the low-altitude ski resorts and the related infrastructure (or perhaps the soon-to be remnants of the ski industry) the *heritage* we are leaving for next generations who might not have the chance to experience snow or winter sports in the same way? Moreover, what will we pass on to next generations, if we don’t find the reasons and resources to restore degraded ecosystems we are obliged to restore by law? The question arises as whether the landowners and cable-car operators in Balderschwang (and beyond) see the end to their investment into the ski industry, and how courageous they are to look for other sources of income.

6.3. Reflections about the future research needs

This thesis work deals with nature restoration combined with natural hazard protection in the Alpine setting. It recognizes that there is a need in the future to dismantle some ski infrastructure and to invest more attention into hiking, nature education and eco-tourism that promotes the local “*living traditions*” and environmental wellbeing. It also emphasizes

the importance of communication and the terms we use as researchers or academics to describe what we want to achieve through nature restoration projects. Could the difficulties arise because various stakeholders want the same things, but use different words to describe it? Future research will need to do more than address the question of different views on ecosystem restoration and its semantics.

Importantly, this case study and the nature restoration proposals that were developed offer merely a starting point for future restoration endeavours in Balderschwang. They offer concepts and ideas that might be useful for further research, planning of nature restoration measures and their implementation. For example, to realise spatial changes to the course of the river Bolgenach, one would need to examine the whole river and its water catchment area in order to model how such change might affect the entire system. In general, one should also be in the project area during the vegetation period to analyse the microclimate, the ecosystems and their state of degradation from the first hand.

Let's think of the first project site – the slopes to the north of the village. Besides planting bushes and trees on this project site, there are further relevant measures that could potentially be considered. For instance, Prof. Dr. Zerbe writes: *“Eroded slopes can be fixed with geotextiles, grassland sods, rolled turf (...). Transplantation of vegetation together with the topsoil (sod transplantation) from a donor site can also accelerate the development of vegetation cover”* (Zerbe 2023c: 53). The proposal for the first site in Balderschwang included ‘only’ developing a protection forest and a forest edge. However, if one were to actually implement the suggested protection forest, there are many, many details yet to be defined. These include, e.g., the choice of a tree nursery and of the tree sizes, costs, transportation, planting patterns, visitor guidance, management of the forest, distribution of responsibilities, just to name a few aspects. At the second site (river Bolgenach and its riparian zone), the consideration of future research should be given to specific tasks or special ecosystems. Besides the river and its catchment area, one should investigate how to describe detailed measures to dismantle the local T-bar lifts, how to design the open-air museum, how to construct and build a suitable fish ladder, how to plant and manage the larch meadow (an agroforestry system) and so on.

In case that some of the proposed measures from one or both nature restoration proposals are going to be further developed and implemented as envisioned until the year 2050 (to adhere to the EU Nature Restoration Regulation), there is a research need to investigate how well do the suggested nature restoration measures (such as the protection forest and the larch trees planted in rows) contribute to the protection from the gravity-driven natural hazards. In short, there are not only many reasons for further research, there are, as the EURAC researcher Omizzolo highlighted, also many reasons for action.

6.4. Concluding summary

Landscape architects, as mediators for interdisciplinary work, can combine their own skills with those of the local people and experts from different fields to shape and transform the rural landscapes on different scales in a regenerative manner. One possibility to do this is through nature restoration. This thesis builds on the outcomes of the research project *BeyondSnow* and chooses one of its pilot project sites - *the mountain village Balderschwang in the Bavarian Alps, Germany*- as a case study area. The study demonstrates that spatial proposals for nature restoration can be developed under the influence and inspiration from the local land-use practices and the concept of the environmental wellbeing as described by Dobson and Redman (2025). This work presents possible future spatial visions for a village community in Balderschwang, that is not alone in their need to invent new approaches to deal with future challenges brought by climate change and ecosystem degradation in the Alpine rural landscapes. The communication about the ideas related to the ecosystem restoration, the continuation of the cultural land-use practices and the environmental wellbeing is emphasized with the help of the acronym NATURE BACK. This acronym also summarizes the methodological steps taken to develop the case study.

Furthermore, the protection from the gravity-driven natural hazards and the importance of tourism revealed to be highly important topics in the local context. They were considered through the choice of the guiding principles for the development of the *“functional cultural landscapes”* surrounding a small alpine village which, in recent decades, has focused heavily on winter sports. Balderschwang as a ski resort currently has 41 km of groomed slopes, 13 cable cars (10 T-bar lifts and 3 chairlifts) and 80% artificial snow on the slopes (Bayer et al. 2025). How will this mountain community define itself in a future where the snow occurrence and winter tourist flows cannot be guaranteed any longer? Perhaps the ‘Bavarian Siberia’ could be described in the future as the ‘*Alpine nature-culture village*’ where people come to visit the open-air museum or to appreciate the ‘peace and quiet’, the nature education and the health benefits of spending time in the mountains regardless of the season.

7. ACKNOWLEDGEMENTS

I want to thank my supervisors at SLU Anna Peterson and Caroline Hägerhäll for all the support, especially for our long talks about the progress of my thesis.

I want to also express my thanks to all the interviewees - Andrea Omizzolo, Konrad Kienle, Rolf Eberhardt, Fabian Hartmann and Prof. Dr. Johannes Kollmann - who took the time to share their knowledge with me. Thank you so much for all the expertise and insights you shared.

Special thanks to my former lecturer in nature restoration Prof. Dr. Johannes Kollmann. Your work has inspired this thesis greatly.

Last but not least, warm thanks to my family and all their unconditional love and support. I could not accomplish any of this without you.

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Figure 17: *The cultural structure synthesis (...).* © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [© Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] (2026). Balderschwang. [Map]. Layers and the base map are available at:

[https://atlas.bayern.de/?c=583532,5257229&z=14&r=0&l=vt_luftbild,43687c62-79d6-42ba-a1fb-0786474103e9,11aebff0-aa38-4806-ab0f-803c3bee7d37,e528a2a8-44e7-46e9-9069-1a8295b113b5,6e2f5825-4a89-4942-a464-c88ec41bb734,949e8659-9fff-4743-b92a-07c75a74731c,992b37a9-3530-43a1-9ef5-cb5d06c623ea,b6b71115-eeb0-45ac-a820-d6b28b37b8f2,86e82390-1739-4d21-bf78-e8b189c1a35d,bcce5127-a233-4bea-ad08-c0e4c376bccf,f85b55f2-bf67-4f19-a162-75e11303b81e,6f5a389c-4ef3-4b5a-9916-475fd5c5962b,d0e7d4ea-62d8-46a0-a54a-](https://atlas.bayern.de/?c=583532,5257229&z=14&r=0&l=vt_luftbild,43687c62-79d6-42ba-a1fb-0786474103e9,11aebff0-aa38-4806-ab0f-803c3bee7d37,e528a2a8-44e7-46e9-9069-1a8295b113b5,6e2f5825-4a89-4942-a464-c88ec41bb734,949e8659-9fff-4743-b92a-07c75a74731c,992b37a9-3530-43a1-9ef5-cb5d06c623ea,b6b71115-eeb0-45ac-a820-d6b28b37b8f2,86e82390-1739-4d21-bf78-e8b189c1a35d,bcce5127-a233-4bea-ad08-c0e4c376bccf,f85b55f2-bf67-4f19-a162-75e11303b81e,6f5a389c-4ef3-4b5a-9916-475fd5c5962b,d0e7d4ea-62d8-46a0-a54a-09654530beed&l_o=1,1,1,1,1,1,1,1,1,1,0.36,1,1&cnids=541322277,-1231529227,1977331535,354609803,-1470751308,-232643403,-193105281,-1716871604,1338285655,613299387,1777370386,-930891915,1830604336,257052753,-1286479885,-859746923,230652168,-324930446,462070190,957694082,1244314845,-371191447,72351432,-1666618033,-1582459512,-217235624,1025817025,-699755783,1381251043,1838292486,-1112904634,1465283901,1484339189,30068061,114046747&mid=1)

[09654530beed&l_o=1,1,1,1,1,1,1,1,1,1,0.36,1,1&cnids=541322277,-1231529227,1977331535,354609803,-1470751308,-232643403,-193105281,-1716871604,1338285655,613299387,1777370386,-930891915,1830604336,257052753,-1286479885,-859746923,230652168,-324930446,462070190,957694082,1244314845,-371191447,72351432,-1666618033,-1582459512,-217235624,1025817025,-699755783,1381251043,1838292486,-1112904634,1465283901,1484339189,30068061,114046747&mid=1](https://atlas.bayern.de/?c=583532,5257229&z=14&r=0&l=vt_luftbild,43687c62-79d6-42ba-a1fb-0786474103e9,11aebff0-aa38-4806-ab0f-803c3bee7d37,e528a2a8-44e7-46e9-9069-1a8295b113b5,6e2f5825-4a89-4942-a464-c88ec41bb734,949e8659-9fff-4743-b92a-07c75a74731c,992b37a9-3530-43a1-9ef5-cb5d06c623ea,b6b71115-eeb0-45ac-a820-d6b28b37b8f2,86e82390-1739-4d21-bf78-e8b189c1a35d,bcce5127-a233-4bea-ad08-c0e4c376bccf,f85b55f2-bf67-4f19-a162-75e11303b81e,6f5a389c-4ef3-4b5a-9916-475fd5c5962b,d0e7d4ea-62d8-46a0-a54a-09654530beed&l_o=1,1,1,1,1,1,1,1,1,1,0.36,1,1&cnids=541322277,-1231529227,1977331535,354609803,-1470751308,-232643403,-193105281,-1716871604,1338285655,613299387,1777370386,-930891915,1830604336,257052753,-1286479885,-859746923,230652168,-324930446,462070190,957694082,1244314845,-371191447,72351432,-1666618033,-1582459512,-217235624,1025817025,-699755783,1381251043,1838292486,-1112904634,1465283901,1484339189,30068061,114046747&mid=1)

Note: the figure is a synthesis of the data made by Tea Kriz-Posavec.

Figure 18: *The screenshot shows the orange-coloured surface as an area below the zero-degree line (...).*

Bayer, C., Bayerl, S. & Wörz, S. (2025). *Schnee war gestern – Klimawandel in den Alpen* ['Snow was yesterday'/ Snow: a topic from the past – climate change in the Alps (own translation)]. BR 24. [Illustration that shows up when you search for "Balderschwang" and "Globale Erderwärmung um 2°C"]. <https://schnee-war-gestern.interaktiv.br.de/#ski-explore-slide> [2026-05-4].

Figure 19: *The illustration shows four potential sites for nature restoration (...).* Own illustration by Tea Kriz-Posavec. (2026).

Figure 20: *Treeless slopes north of the village (...).* © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [© Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] (2026). Balderschwang. [Map]. Layers and the base map are available at:

https://atlas.bayern.de/?c=582986,5257690&z=16&r=0&l=vt_standard,c84b12d9-24db-4632-a4c2-cb8019daca5d,6fe35439-236f-49fa-9e4a-e27115651b05,41a7493c-dd03-456e-94e5-b60de14b49c1,110dda56-75e5-41eb-9d2e-475773dc990e,84d2ea76-e12d-4a5a-95d7-7174bdf94391,2ee12402-7569-4382-be8e-e7c912fa6afb,a9e01517-d879-4844-b22a-add2c9b2d9f5,fc4809dd-1aa3-4d66-a52a-0fc3c61cb8f9,5b054010-c21b-4298-9e52-f56c89c2513f,85fc5218-30fb-472d-bfdc-e2c29717fafa&t=umw_ntg&cnids=-1841708010,1620966672&tid=export&mid=0

Note: the figure is a synthesis of the data made by Tea Kriz-Posavec.

Figure 21: *The riparian structure around the river Bolgenach (...).* © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [© Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] (2026). Balderschwang. [Map]. Layers and the base map are available at:

https://atlas.bayern.de/?c=582788,5257215&z=16&r=0&l=vt_standard,6fe35439-236f-49fa-9e4a-e27115651b05,41a7493c-dd03-456e-94e5-b60de14b49c1,110dda56-75e5-41eb-9d2e-475773dc990e,a9e01517-d879-4844-b22a-add2c9b2d9f5,fc4809dd-1aa3-4d66-a52a-0fc3c61cb8f9,5b054010-c21b-4298-9e52-f56c89c2513f,85fc5218-30fb-472d-bfdc-e2c29717fafa,4089c1ee-c6a4-40fd-8302-692d81207d9b,5ba08bdb-bc79-430e-8b96-af946431d32f,5134655b-1a3e-4c5b-99b9-95c3b80cc71b,71bdd85d-729f-4193-880c-0800d6009b87,ac2df7c9-345b-4a27-923b-6ef90aa62516,3e00d448-0866-48a6-927c-39e69b5af134&t=umw_ntg&cnids=-1841708010,1620966672,2022570915&tid=export&mid=1

Note: the figure is a synthesis of the data (from BayernAtlas) made by Tea Kriz-Posavec.

Figure 22: Completely altered riparian zone (...). Own photography by Tea Kriz-Posavec. (2026).

Figure 23: multimaps360.de (2026). *The view of Balderschwang village centre (...)*. [photograph]. [2026-04-27]. Used with the copyright holder's permission (managing director Gerhard Ruff was contacted).

<https://multimaps360.de/vr360/allgaeu/oberallgaeu-sommer/index.html#fischen>

Figure 24: Year 2050: a belt of near-natural forest ecosystem (...). The figure is based on the **figure 23** (source: multimaps360.de) and an illustration made by Tea Kriz-Posavec. (2026).

Figure 25: *Nature restoration proposal for 2050 (site 1) (...)*. Base map: © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [© Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] (2026). Balderschwang. [Map]. The base map is available at:

https://atlas.bayern.de/?c=583351,5257499&z=15.73&r=0&l=vt_standard,vt_baeume,vt_gelaende&cnids=-1841708010,662872140,541322277,347861463492&mid=0&gl=true

Note: the figure is based on the map and information from BayernAtlas with the addition of illustrative layers made by Tea Kriz-Posavec. (2026).

Figure 26:: multimaps360.de (2026). *The view of the project site no. 2. (...)*. [photograph]. [2026-04-27]. Used with the copyright holder's permission (managing director Gerhard Ruff was contacted). <https://multimaps360.de/vr360/allgaeu/oberallgaeu-sommer/index.html#fischen>

Figure 27: Year 2050: In Balderschwang (...). The figure is based on the **figure 26** (source: multimaps360.de) and an illustration made by Tea Kriz-Posavec. (2026).

Figure 28: *Nature restoration proposal for 2050 (site 2) (...)*. © Bayerische Vermessungsverwaltung 2026, Bundesamt für Kartographie und Geodäsie [© Bavarian Surveying Authority 2026, Federal Agency for Cartography and Geodesy] (2026). Balderschwang. [Map]. The base map is available at:

https://atlas.bayern.de/?c=582818,5257154&z=16&r=0&l=vt_standard,vt_baeume,vt_gelaende,40986241-934a-46e8-a24a-2c0383c5963e&t=umw_ntg&cnids=-1841708010,662872140,541322277,347861463492,75039582&tid=export&mid=0&gl=true

1841708010,662872140,541322277,347861463492,75039582&tid=export&mid=0&gl=true

Note: the figure is based on the map and information from BayernAtlas with the addition of illustrative layers made by Tea Kriz-Posavec. (2026).

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Participation in an independent project at SLU – consent and information about the processing of personal data

When you consent to take part in the independent project *Nature Restoration project inspired by cultural land use practices and environmental wellbeing in the Alps. A case study from Balderschwang, Germany* you consent to the Swedish University of Agricultural Sciences (SLU) processing your personal data.

Consenting to this is optional. However, if you do not consent, you cannot take part in the project. This form aims to give you all the information you need to decide whether you consent to participating in the project and to SLU processing your personal data.

Consent is the legal basis for processing your personal data. You can withdraw your consent at any time, and you do not have to justify this. However, withdrawing your consent will not affect the processing that has already taken place. SLU is responsible for processing your personal data. SLU's data protection officer can be contacted at dataskydd@slu.se. Your contact person for the project is the student Tea Kriz-Posavec (email: teec0001@stud.slu.se). You can also contact the supervisor Anna Peterson (email: anna.peterson@slu.se).

We will collect the following personal data:

- 1) **Your full name will be collected and mentioned in the thesis paper, as well as your current workplace and/or position within the institution where you work.**
- 2) **The information you are stating during the interview will be recorded, analysed and presented in the final Master thesis paper.**
A tape recording of the online interview will be recorded and deleted after being transcribed "by hand" without the use of AI and within two weeks after the interview was conducted. After the transcription, the interviews will be presented in the full length in the Appendix of the mentioned Master thesis. The main points relevant for the Master project and stated by the interviewee will be presented in the main part of the thesis paper. These points will be selected based on the information from the audio recordings and supplemented with the notes which will be made during the interview. The student can send back the written notes taken

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10. APPENDIX

10.1. Interview consent form (English & German version)

Participation in an independent project at SLU – consent and information about the processing of personal data

during the interview for the interviewee to confirm them, if there is a request by the interviewee to do so.

The purpose of processing your personal data is to allow the SLU student to carry out their independent project *Nature Restoration project inspired by cultural land use practices and environmental wellbeing in the Alps. A case study from Balderschwang, Germany* with good scientific quality. Your personal data will not be transferred to other organisations or companies. The data will be handled in a way that prevents unauthorised access.

More information on how SLU processes personal data, and about your rights, is available at www.slu.se/personal-data. You have the right, under certain circumstances, to have your personal data erased, corrected or limited. You also have the right to access the personal data being processed, and you have the right to object to the processing of your data.

If you have any comments, contact the data protection officer at dataskydd@slu.se. If you want to make a complaint, contact the Swedish Authority for Privacy Protection at imy@imy.se. Read more about the Swedish Authority for Privacy Protection at <http://www.imy.se>.

☐ I hereby consent to take part in this independent project and to SLU processing my personal data in the manner explained in this text, including any sensitive data I may submit.

Signature

Date

Name in block letters

Teilnahme an einem unabhängigen Projekt an der SLU – Einwilligung und Informationen zur Verarbeitung personenbezogener Daten

Wenn Sie der Teilnahme an dem unabhängigen Projekt „Renaturierungsprojekt inspiriert durch die kulturelle Landnutzungspraktiken und ökologisches Wohlbefinden in den Alpen. Eine Fallstudie aus Balderschwang, Deutschland“ zustimmen, stimmen Sie der Verarbeitung Ihrer personenbezogenen Daten durch **Die Schwedische Universität für Agrarwissenschaften (SLU)** zu. Die Zustimmung dazu ist freiwillig. Wenn Sie jedoch nicht zustimmen, können Sie nicht an dem Projekt teilnehmen. Dieses Formular soll Ihnen alle Informationen liefern, die Sie benötigen, um zu entscheiden, ob Sie der Teilnahme an dem Projekt und der Verarbeitung Ihrer personenbezogenen Daten durch die SLU zustimmen.

Die Einwilligung ist die Rechtsgrundlage für die Verarbeitung Ihrer personenbezogenen Daten. Sie können Ihre Einwilligung jederzeit widerrufen, ohne dafür Gründe angeben zu müssen. Der Widerruf Ihrer Einwilligung hat jedoch keine Auswirkungen auf die bereits erfolgte Verarbeitung. SLU ist für die Verarbeitung Ihrer personenbezogenen Daten verantwortlich. Der Datenschutzbeauftragte von SLU ist unter dataskydd@slu.se erreichbar. Ihre Ansprechpartnerin für das Projekt ist die Studentin Tea Kriz-Posavec (Email: teec0001@stud.slu.se). Sie können auch die Betreuerin Anna Peterson (email: anna.peterson@slu.se) kontaktieren, falls Sie Fragen haben.

Wir erheben folgende personenbezogene Daten:

- 1) Ihr vollständiger Name wird erhoben und in der Abschlussarbeit genannt, ebenso wie Ihr derzeitiger Arbeitsplatz und/oder Ihre Position innerhalb der Einrichtung, in der Sie tätig sind.
- 2) Die Informationen, die Sie während des Interviews angeben, werden aufgezeichnet, analysiert und in der endgültigen Masterarbeit präsentiert. Eine Tonbandaufzeichnung des persönlichen Interviews wird aufgenommen und nach der „manuellen“ Transkription ohne Einsatz von KI innerhalb von zwei Wochen nach Durchführung des Interviews gelöscht. Nach der Transkription werden

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Teilnahme an einem unabhängigen Projekt an der SLU – Einwilligung und Informationen zur Verarbeitung personenbezogener Daten

die Interviews aus dem Deutschen ins Englische übersetzt und in voller Länge im Anhang der genannten Masterarbeit präsentiert. Die für das Masterprojekt relevanten und vom Befragten genannten Hauptpunkte werden im Hauptteil der Abschlussarbeit dargestellt. Diese Punkte werden auf der Grundlage der Informationen aus den Audioaufzeichnungen ausgewählt und durch eigene Notizen, die während des Interviews gemacht wurden, ergänzt. Die Studentin kann die während des Interviews gemachten schriftlichen Notizen an den Befragten zur Bestätigung zurücksenden, wenn dieser dies ausdrücklich wünscht.

Der Zweck der Verarbeitung Ihrer personenbezogenen Daten besteht darin, den Studierenden der SLU die Durchführung ihres unabhängigen Projekts „Renaturierungsprojekt inspiriert durch die kulturelle Landnutzungspraktiken und ökologisches Wohlbefinden in den Alpen. Eine Fallstudie aus Balderschwang, Deutschland“ mit guter wissenschaftlicher Qualität zu ermöglichen. Ihre personenbezogenen Daten werden nicht an andere Organisationen oder Unternehmen weitergegeben. Die Daten werden so behandelt, dass ein unbefugter Zugriff verhindert wird.

Weitere Informationen darüber, wie die SLU personenbezogene Daten verarbeitet, und über Ihre Rechte finden Sie unter www.slu.se/personal-data. Unter bestimmten Umständen haben Sie das Recht, Ihre personenbezogenen Daten löschen, berichtigen oder einschränken zu lassen. Sie haben außerdem das Recht, auf die verarbeiteten personenbezogenen Daten zuzugreifen, und Sie haben das Recht, der Verarbeitung Ihrer Daten zu widersprechen. Wenn Sie Anmerkungen haben, wenden Sie sich bitte an den Datenschutzbeauftragten unter dataskydd@slu.se. Wenn Sie eine Beschwerde einreichen möchten, wenden Sie sich bitte an die schwedische Datenschutzbehörde unter imy@imy.se. Weitere Informationen über die schwedische Datenschutzbehörde finden Sie unter <http://www.imy.se>.

☐ Hiermit erkläre ich mich damit einverstanden, an diesem unabhängigen Projekt teilzunehmen und dass die SLU meine personenbezogenen Daten in der in diesem Text beschriebenen Weise verarbeitet, einschließlich aller sensiblen Daten, die ich möglicherweise übermittle.

Unterschrift

Datum

Name in Druckbuchstaben

10.2. List of questions for the semi-structured interviews (English & German versions)

NOTE: NR is the abbreviation for Nature Restoration

INTERVIEW 1: Andrea Omizzolo - Spatial Planner and Senior researcher at EURAC (researcher)

Intro question:

- 1) As a Senior researcher at EDURAC, what are some of the current issues you are dealing with in relation to the Alpine areas at lower altitudes (up to 1,500 metres above sea level)?

General questions about NR:

- 2) Do you have any experience with NR projects?
- 3) What do you personally think about nature restoration (NR) in the Alpine region?
- 4) On a scale of 1 to 10 (where 1 is the lowest score and 10 is the highest score for the most likely scenario): How likely is it that NR can take place in Balderschwang?
- 5) Imagining a scenario where the village of Balderschwang has the financial means allocated for NR, for example through EU founding, where would the project site be located? You can explain your choice on the map.

Specific questions:

- 6) Why was the village of Balderschwang chosen as one of the focus areas of the Beyond Snow project?
- 7) In your opinion, what is the future of alpine ski areas at lower altitudes such as Balderschwang in terms of landscape development?
- 8) How do you see the emotional consequences of the change in land use for the local inhabitants?

Additional questions/ Wrapping up:

- 9) *Question(s) to gain clarity about what they said * if necessary
- 10) Would you like to add something?

INTERVIEW 2 & 3:

Konrad Kienle - Mayor of Balderschwang, tourism stakeholder (local expert)

+ same questions for the Interview 3:

Rolf Eberhardt – geoscientist & Managing director of the Nagelfluhkette Nature Park (local expert)

Intro question:

- 1) In your role as mayor of Balderschwang/ Local expert in Nature Conservation, are there any responsibilities that directly affect the landscape planning of your village?

General questions about NR:

- 2) Do you have any experience with NR projects?
- 3) What do you personally think about nature restoration (NR) in the Alpine region?
- 4) On a scale of 1 to 10 (where 1 is the lowest score and 10 is the highest score for the most likely scenario): How likely is it that NR can take place in Balderschwang?
- 5) Imagining a scenario where your village has the financial means allocated for NR, for example through EU founding, where would the project site be located? You can explain your choice on the map.

Specific questions regarding his expertise:

- 6) What are the local's opinions regarding the future development of winters with less snow due to climate change effects?

- 7) Do you know of any typical or traditional land use practices in Balderschwang or the surrounding area?
- 8) How do you think the landowner(s) would react if a skiing slope was to be out of function due to less snow in winter and instead dedicated for NR?

Additional questions/ Wrapping up:

- 9) *Question(s) to gain clarity about what they said * if necessary
- 10) Would you like to add something?

NOTE: the interviews 2 and 3 were held in German. Here are the questions I asked in German:

Einleitende Frage:

- 1) Gibt es in Ihrer Tätigkeit als Bürgermeister von Balderschwang/ als Experte für den Naturschutz Aufgaben, die sich direkt auf die Landschaftsplanung Ihres Dorfes auswirken?

Allgemeine Fragen zur Renaturierung:

- 2) Haben Sie bereits Erfahrung mit Renaturierungsprojekten gesammelt?
- 3) Was halten Sie persönlich von der Renaturierung im Alpenraum?
- 4) Auf einer Skala von 1 bis 10 (wobei 1 die niedrigste und 10 die höchste Punktzahl für das wahrscheinlichste Szenario ist): Wie wahrscheinlich ist es, dass Renaturierung in Balderschwang stattfinden kann?
- 5) Stellen Sie sich ein Szenario vor, in dem Ihrem Dorf finanzielle Mittel für die Renaturierung zur Verfügung stehen, beispielsweise durch EU-Fördermittel. Wo würde sich das Projektgebiet befinden? Sie können Ihre Wahl auf der Karte erläutern.

Spezifische Fragen zu seinem Expertenwissen:

- 6) Was ist die Meinung der lokalen Bevölkerung hinsichtlich der zukünftigen Entwicklung von Wintern mit weniger Schnee aufgrund der Auswirkungen des Klimawandels?
- 7) Kennen Sie typische oder traditionelle Formen der Landnutzung in Balderschwang oder der Umgebung?
- 8) Wie würden Ihrer Meinung nach die LandbesitzerInnen reagieren, wenn eine Skipiste aufgrund von weniger Schnee im Winter nicht mehr genutzt werden könnte und stattdessen für die Renaturierung vorgesehen würde?

Zusätzliche Fragen/ Zusammenfassung:

- 9) *Fragen zur Klärung der Aussagen * falls erforderlich
- 10) Möchten Sie noch etwas hinzufügen?

INTERVIEW 4: Fabian Hartmann - local hotel director, tourism stakeholder (local expert)

Intro question:

- 1) As an tourism stakeholder in the region, can you give us some examples of where do you see the links between human wellbeing and Alpine landscapes?

General questions about NR: (same as in the previous template/ interview 2 & 3)

Specific questions:

- 2) Are there any cultural land use practices typical for your village or the Allgäu region?
- 3) Nature restoration is a great idea, but please not in my backyard. Do you agree with this statement?
- 4) What is your opinion on the future development of the outdoor recreational tourism in the region?

Additional questions/ Wrapping up: (same as in the previous template/ interview 2 & 3)

NOTE: the interviews 4 was held in German. Here are the questions I asked in German:

Einleitende Frage:

- 1) Als ein Tourismus Akteur in der Region, können Sie uns einige Beispiele nennen, wo Sie Verbindungen zwischen menschlichem Wohlbefinden und den alpinen Landschaften sehen?

Allgemeine Fragen zur Renaturierung: (wie in der vorherigen Vorlage/ Interview 2& 3)

Spezifische Fragen:

- 2) Gibt es irgendwelche kulturelle Formen der Landnutzung, die für Ihr Dorf oder die Region Allgäu typisch sind?
- 3) Naturrenaturierung ist eine großartige Idee, aber bitte nicht in meinem Hinterhof (engl. „not in my backyard“). Stimmen Sie dieser Aussage zu?
- 4) Wie sehen Sie die zukünftige Entwicklung des Outdoor-Freizeittourismus in der Region?

Zusätzliche Fragen/ Zusammenfassung: (wie in der vorherigen Vorlage/ Interview 2 & 3)

INTERVIEW 5: Prof. Dr. Johannes Kollmann – Professor at the Technical University of Munich, Head of the Chair for Restoration Ecology (research expert)

Intro question:

- 1) Which topics are central in your daily work as a researcher in the field of Restoration Ecology?

General questions about NR: (same as in the interview 2 & 3)

Specific questions regarding his expertise:

- 2) Which ecosystems in the Alps on rather lower altitudes (from 1000- 1500 m/ asl) should be restored first?
- 3) What is the biggest challenge for NR in these ecosystems?
- 4) Can you give an example of how NR can be combined with the traditional land use practices in the Alps to achieve its vision?

Additional questions/ Wrapping up: (same as in the interview 2 & 3)

NOTE: the interviews 5 was held in German. Here are the questions I asked in German:

Einleitende Frage:

- 1) Welche Themen stehen im Mittelpunkt Ihrer täglichen Arbeit als Forschungsexperte auf dem Gebiet der Renaturierungsökologie?

Allgemeine Fragen zur Renaturierung: (gleich wie im Interview 2& 3)

Spezifische Fragen zu seinem Expertenwissen:

- 2) Welche Ökosysteme in den Alpen in eher niedrigeren Höhenlagen (von 1000 bis 1500 m ü. M.) sollten zuerst renaturiert werden?
- 3) Was ist die größte Herausforderung für die Renaturierung in diesen Ökosystemen?
- 4) Können Sie ein Beispiel dafür nennen, wie die Renaturierung mit den traditionellen Landnutzungspraktiken in den Alpen kombiniert werden kann, um ihre Vision zu verwirklichen?

Zusätzliche Fragen/ Zusammenfassung: (gleich wie im Interview 2& 3)

10.3. Full Legend of the synthesis of the ecological structures: Soil

Soil type numbers on the map	Color & definition from the original soil overview map (in German)*	Summary of the soil type (in English)**
9k	 9k: Fast ausschließlich (Haft-)Pseudogley und Gley aus grusführendem Lehm bis Ton (Schwemmfächersediment)	Almost exclusively (adhering) pseudogley and gley soils formed from gravelly loam to clay (alluvial fan sediments)
30f	 30f: Vorherrschend Braunerde (pseudoverglet), gering verbreitet Gley aus (grusführendem) Lehm bis Ton (Jungmoräne, carbonatisch, lokal geprägt)	Predominantly brown earth with small areas of gley formed from (gravel-bearing) loam to clay
40	 40: Fast ausschließlich Syrosem und Felshumusboden aus Konglomerat, carbonatisch (Molasse)	Almost exclusively syrosem and rocky humus soil composed of conglomerate, carbonate
40c	 40c: Bodenkomplex: Vorherrschend Braunerden und Pseudogley und gering verbreitet Gleye aus Substraten der (Kalk-)Konglomerat-, (Kalk-)Sandstein- und Mergelverwitterung (Molasse) mit weitem Bodenartenspektrum	Soil complex: predominantly brown soils and pseudogley soils , with gley soils occurring to a lesser extent
44a	 44a: Fast ausschließlich Braunerde-Pseudogley und Pseudogley, selten (Hang-)Gley aus Lehm sand bis Lehm (Deckschicht oder Mergelstein) über Schluff bis Ton (Mergelstein der Molasse)	Almost exclusively brown earth pseudogley and pseudogley , rarely (sloping) gley ranging from sandy loam to loam over silt to clay
56h	 56h: Bodenkomplex: Feib, O/C-Böden, Syrosem, Lockersyrosem, (Para-) Rendzina (humusreich) an Talhängen von Eng- und Kerbtälern sowie Rambla und Kalkpaternia in Bereichen mit Talsohle	Soil complex: rock, O/C soils, syrosem, loose syrosem, (para-)rendzina (rich in humus) on the slopes; rambla and calcareous paternia in areas of the valley floor
60	 60: Bodenkomplex: Hanggleye und Quellengleye aus Substraten unterschiedlicher Herkunft mit weitem Bodenartenspektrum	Soil complex: slope gley and spring gley formed from substrates of varying origin
78	 78: Vorherrschend Niedermoor und Erdniedermoor, gering verbreitet Übergangsmoor aus Torf über Substraten unterschiedlicher Herkunft mit weitem Bodenartenspektrum	Predominantly fens and lowland moors , with a limited occurrence of transitional moors formed from peat over substrates of various origins
84d	 84d: Fast ausschließlich Kalkpaternia aus Carbonatfeinsand bis -schluff über Carbonatsand bis -kies (Auensediment)	Almost exclusively calcareous floodplain pararendzina soil , ranging from fine carbonate sand to silt, through carbonate sand to gravel (floodplaine sediment)
838	 838: Vorherrschend Braunerde (pseudoverglet), gering verbreitet Braunerde-Pararendzina aus (grusführendem) Tonschluff bis Schluffton über Ton- oder Mergelstein(-schutt)	Predominantly brown earth ; brown earth-pararendzina is found in limited areas
840b	 840b: Vorherrschend Braunerde und (Haft-)Pseudogley, gering verbreitet Gley aus grusführendem Lehm sand bis Lehm über Flyschgestein(-sschutt)	Predominantly brown earth and (adhering) pseudogley ; limited occurrence of gley soils
842	 842: Fast ausschließlich (Haft-)Pseudogley und Gley aus (grusführendem) Lehm bis Ton (Flyschgestein), gering verbreitet aus (grusführendem) Schluff (Deckschicht)	Almost exclusively (adhering) pseudogley and gley soils formed from (gravelly) loam to clay (flysch rock)

NOTES:

*The original map is called: Die Übersichtsbodenkarte 1:25.000 (ÜBK25)

** bold words = indication of the soil types on the map