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Chapter 11
The diversity of ancient woodlands in Austria: Historical developments and contemporary social importance

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Abstract

Austrian landscapes range from plains at approximately 100 metres above sea-level to the Alps with peaks at almost 4,000 m. With a share of 47% the forest surface is an important element. One can assume that forests have been used intensively in the course of time and have been impacted by an increasing industry and population, but also by climate change. In some areas the utilization caused the modification of forest stands in particular with regard to the density, composition of tree species and age structure and reduced the extent of the forest area. However, despite these long-term interventions in the forest ecosystem the forests have never been cleared totally and about 30% of the territory remained wooded even in times of heavy exploitation. This is the reason why the share of natural forests is still relatively high. Today, some of these forests now form important assets of the Austrian network of protected forest areas. In this study I want to highlight the socioeconomic and ecological factors in the past which were responsible for this development. It will be illustrated by two case studies from different geographical regions. This examination can contribute to improving the knowledge base for decision making at the internodes of energy, biodiversity and forest policy as well as in forest resource management.

Introduction

A lot of European forests have been used as agricultural land in the past, but others, even if they are no virgin but managed forests, have not. Ancient forests are extremely valuable for the conservation of forest species and serve as reference for comparison with recent afforestations. They also form a valuable field laboratory for studying fundamental ecological processes. Often they form the last resort for the protection of archaeological and geomorphological heritage in a modern landscape. The importance for forest conservation has been accepted widely and particularly studied in Great Britain and Flanders, where the extent and distribution of the ancient forest resource is well known (Metaforum Leuven, 2011).

In the past twenty years there has been an increased interest in the management and fate of the remaining forest lands. However, there is a lack of understanding or agreement on what is meant by various terms that describe the condition of a forest. On occasion of the International Scientific Conference on The World's Natural Forests and Their Role in Global Processes Lund (2012) revised the definitions of old growth, pristine, climax, ancient forests, degradation, desertification, forest fragmentation, and similar terms. Having a common understanding of what constitutes a "forest" and its derivatives (such as old growth, pristine, native, secondary forest) is fundamental for a discussion of assessment methods, ecosystem status, and sustainability. However, there is considerable variation nationally and globally in the definition and use of these terms.

According to the Forestry Commission (Natural England, 2013) "Ancient wood (woodlands)" is a classification for woodland which has been in continuous existence from before AD 1600 in England, Wales and N. Ireland and from before AD 1750 in Scotland. It may be: Ancient Semi-natural woodland - Ancient woodland sites that have retained the native tree and shrub cover that has not been planted, although it may have been managed by coppicing or felling and allowed to regenerate naturally (Spencer and Kirby, 1992). Generally "Ancient Forests (Woodlands)" are defined as forests that have existed since at least a number of centuries, compared to recent forests which are much younger in origin. Most of them have been traditionally managed. Ancient forests do have a specific group of plant species only occurring in these forests (Metaforum Leuven, 2011).

Forests are the product of human intervention in natural processes and have always been dependent on the most relevant socio-economic evolution. There were two factors which influenced the natural composition of tree species: natural factors such as climate, topography,

geology, exposure, and anthropogenic factors such as landscape management, population growth, ownership structures and legal bindings. The management of forest landscapes is intensely dependent on the local demands of the rural population, political power structures and external demands such as mining and timber trade.

With a forest share of approximately 47% of its territory Austria is one of the most densely forested countries in Europe. Therefore forests rank among the most significant elements of Austria's cultivated landscapes. However, Austrian forests in their present form are the product of centuries of utilization, but also management. One can assume that forests have been used intensively in the course of time and have been impacted by an increasing industry and population, but also by climate change. In some areas the utilization caused the modification of forest stands in particular with regard to the density, composition of tree species and age structure. In some areas the impact affected the extent of the forest area and resulted in the diminution of the forest area by permanent or temporary clearings (Kral, 1988, 1991).

Despite these long-term interventions in the forest ecosystem the forests have never been cleared totally and about 30% of the territory remained wooded even in times of heavy exploitation in the first half of the 19th century. This is the reason why according to international conventions (FFH-guidelines of EU) the share of natural forests is still relatively high in Austria. More than two thirds of the forest surface contain elements of the natural vegetation (25% natural and semi natural forests). The existence of numerous habitats and species is directly linked to the sustainable management of forests, which has a long tradition in Austria. This is also illustrated by the fact that about 43% of the Natura 2000 areas reported by Austria are forest areas.

However, Austria's forests are not evenly distributed over the federal territory. A high percentage of forests are located on the steep slopes of the Alpine regions and the lower mountain ranges. Areas with low forest cover are situated in the summerwarm east (Bundesforschungs- und Ausbildungszentrum für Wald, Naturgefahren und Landschaft, 2010) (Figure 11.1).

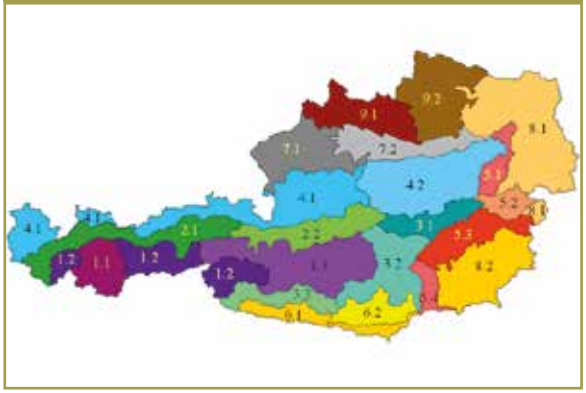
Today some of these forests now form important assets of the Austrian network of protected forest areas. What were the reasons why some forest areas were not overused and thus were able to maintain more or less undestroyed natural ecosystems, which are able to contribute remarkably to the present-day biodiversity? In this study I want to highlight the socioeconomic and ecological factors in the past which were responsible for this development. It will be illustrated by two case studies from different geographical regions. By analyzing the most important driving forces some conclusions can be drawn with regard to the solving of the societal discourse concerning the designation of forest protected areas and the responsibility and participation of the local population in this process at present.

Figure 11.1

Forest area of communities in Austria (%)
(Bundesforschungs- und Ausbildungszentrum für Wald, 2010)

Figure 11.2

Forest ecoregions in Austria
(Kilian et al., 1994)



Study area

In Austria 22 forest ecoregions have been distinguished, with special regard to the regional climate and to the woodland communities that prevail due to these climatic conditions and combined to form nine principal ecoregions (Figure 11.2).

Austria's forest cover but also its distribution pattern with regard to the range of naturalness of ecosystems is distributed quite diverse due to the topographical site, climate conditions, altitudinal zones, and natural woodland communities. Thus the percentage of forests is the highest in Styria and Carinthia (60%) in contrast to the lowland in the northeast of Austria (Lower Austria, Burgenland), where the forest area is very much fragmented and the percentage is below 40 and therefore also below the Austrian average of 47% (Bundesforschungs- und Ausbildungszentrum für Wald, Naturgefahren und Landschaft, 2002). Federal provinces with a high share of mountain forests and a high amount of traditionally shaped farm forests show the highest proportion of natural forest ecosystems (Vorarlberg, Tyrol, Salzburg, Carinthia) with a share of more than 40% of natural or semi-natural forests (Grabherr et al., 1998) (Figure 11.3).

Natural or seminatural forests are situated in the

Figure 11.3
Naturalness of the Austrian forest area

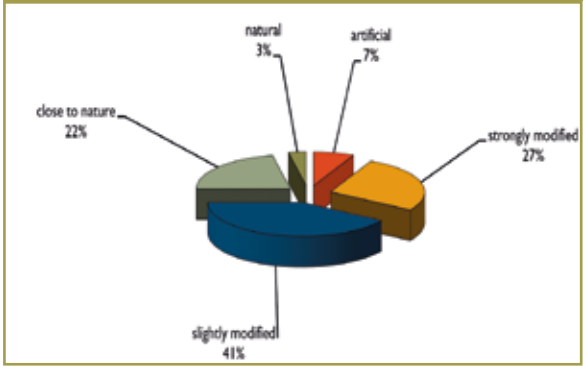
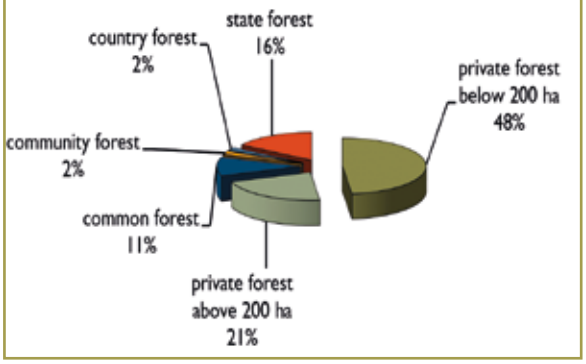


Figure 11.4
Distribution of forest ownership in Austria



montane and submontane altitudinal zones of the Alpine range particularly in the northern and southern limestone alps, while the submontane and foothill colline forests of the Alpine foothills and the planar zone in the summerwarm east have been moderately altered. They are forests which have been exploited but retained some residual elements of the potential natural vegetation. Some of them are also strongly altered forests (Frank, 2009).

Most of the forests are high forests. 85% are privately owned; about 70% are managed by small scale farming (Figure 11.4).

Material and Method

The study is based on unpublished archive material (primary sources) and spezialized literature. Primary sources related to forest ownerhip rights and management practises are stored in archives in Vienna (Hofkammerarchiv Wien), concerning coppice forests of the lowlands in St. Pölten (Niederösterreichisches Landesarchiv, Archiv der Niederösterreichischen Agrarbezirksbehörde), concerning high forests of the Alpine region in Klagenfurt (Kärntner Landesarchiv). Information about legal bindings concerning the management of commons, starting from the late Medieval period till the early modern period of modern history have been gathered by the publications of the Imperial academy of sciences having collected and published them in 1881 (Kaiserliche Akademie der Wissenschaften, 1881) and by Winter (1886, 1896, 1909, 1913). Forest laws concerning the 18th/19th century were published by Kropatschek (1789). The present status of the forests situated in the investigated region have been analyzed and published by several institutions particularly of the University of Applied Life Sciences (Hochbichler, 2008) and the Austrian research centre Mariabrunn in Vienna (Kilian et al., 1994) as well as Senitza (1996). The study also takes into account the outcome of previous research of the author (Johann, 1993, 2004).

Forest management in Europe and globally is currently experiencing a paradigm shift from sustainable timber production towards a multi-dimensional understanding of sustainable forest management (MCPFE 1993, 1998). However, the increasing demand for bio-based products and bioenergy will probably increase pressure on forest ecosystems, which are a key component in maintaining biodiversity. Global change, whether generated by climate change, land use change, social or economic pressures increases the need to understand socio-ecological processes in forest resource management (Hochbichler, 2008). It is worthwhile to analyze the historical development of forests having been exposed to the multiple uses in the past and why some former societies where able to balance the often converging interests in the different forest products and why some societies failed. This examination can contribute to improving the knowledge base for decision making at the internodes of energy, biodiversity and forest policy as well as in forest resource management.

In this study I focus on forests with a long tradition in forest management. They have been and still are owned by commons or farmers. Despite the long tradition of forest utilization the investigated forest sites have one thing in common: that they are ancient forests because they have never been cleared and turned into fields or pastures. Therefore the natural composition of species is still present to a considerable high extent. This is the reason why some of these forests have become part of Austria's nature protection network. To Figure out the most important driving forces for the development two regions were selected, which show great differences with regard to the geographical situation, topography and vegetation. They are located in the summerwarm east (Weinviertel, Lower Austria) and in the mountain region of the Central Alps (Hohe Tauern, Carinthia). Thus a colline landscape with a low share of forests and fertile fields has been compared with a montane/subalpine zone with a high share of forests and a low percentage of arable land. Both ecoregions have experienced different historical developments but are presently characterized by rural structures.

The historical development, ownership structures and forest management have been analyzed. Also the present importance with regard to its ecological value has been

studied. In comparing the results I wanted to point out some of the driving forces which were relevant in the course of time to maintain the high naturalness of the forest stands apart the high demands for utilization.

Results

Austria is situated in the temperate climatic zone and a great share of its land consists of mountains. Austrian landscapes range from plains at approximately 100 m above sea-level to the Alps with peaks at almost 4,000 m. The influence of the mountainous topography produces a diversity of climatic conditions and different forms of land use. The vegetation is determined by latitude (the southern part is warm, north is cold), altitude (higher is colder), distance to the Atlantic Ocean (west is oceanic, east is continental), and the alpine elevation which influences precipitation patterns (central Alps and summerwarm east – arid, peripheral – humid). Another factor determining natural vegetation and possible forms of land use is the geological ground: A mixture of various crystalline and sedimentary rocks provides different possibilities for cultivation. In general, there are well-developed soils which are resistant to erosion, but there are also sites which are prone to erosive processes (steep slopes at high altitudes, lime stone sites – karst, loess – wind erosion).

During the glacial period (ice-age) with its last peak about 18,000 years ago, the Alpine region was completely covered with glaciers of up to 1,700 m strength. Forests started to grow again about 13,000 years ago from retreat areas in south-east Europe. In the stone-age the area was almost completely covered with forests. Only the high peaks of the Alps and bogs were spared. From the stone-age on (Neolithic: 4,000 years B.C.) settlers started to clear woodlands for agricultural use. Arable land was cleared while the forest remained untouched on steep and stony sites (Pregernig and Weiss, 1998). However, the impact on the woodland was not remarkable because the settlers moved to another place from time to time and therefore trees overgrew the open spaces. Even the clearings which came into being during the period of the Roman Empire where rejuvenated with trees in the time of the Big Migration of Nations. It was not before the Middle-Ages when settlements started again. The growing population cleared forests for farming and for pastures, thus lowering the timberline in the Alps and reducing the forest area in regions well suited for agricultural activities. At present, about 47 % of Austria's territory is covered with forests. Most of the forests are located in mountainous regions. In the planar zones forests often cover less than 20% of the land.

Case study 1

Coppice forests in the lowlands (northeast of Lower Austria)

In Austria the share of floodplain and coppice forests is very small and comprises only 2.4% of the whole territory. 73% of these forests are managed as coppice forests; nearly half of them (43 %) have small scale structures. They are managed as coppice forests or coppice with standards with a varying number of standards in the overstory. Coppice forests have presently the highest extension in the Federal province Burgenland and Lower Austria. In these regions coppicing in the mixed oak stands of the colline and submontane sites of the pannonian east has a long tradition and is still an important asset to the cultural landscape (Hochbichler, 2008).

Landscape

With a share of 13% to 15% forests the region addressed in this case study belongs to the most deforested areas in Austria. It comprises mainly Tertiary downs and gravel terraces. Both elements of the landscape are partly covered with Loess and limestone-free Flyings. The climate is pannonian-subcontinental, arid-warm with moderate cold winters with little snowcover. Summery dry periods are frequent. The annual precipitation does not exceed 450 mm to 700 mm and is the lowest in Austria; the maximum appears during the summer season (Harlfinger and Knees, 1999).

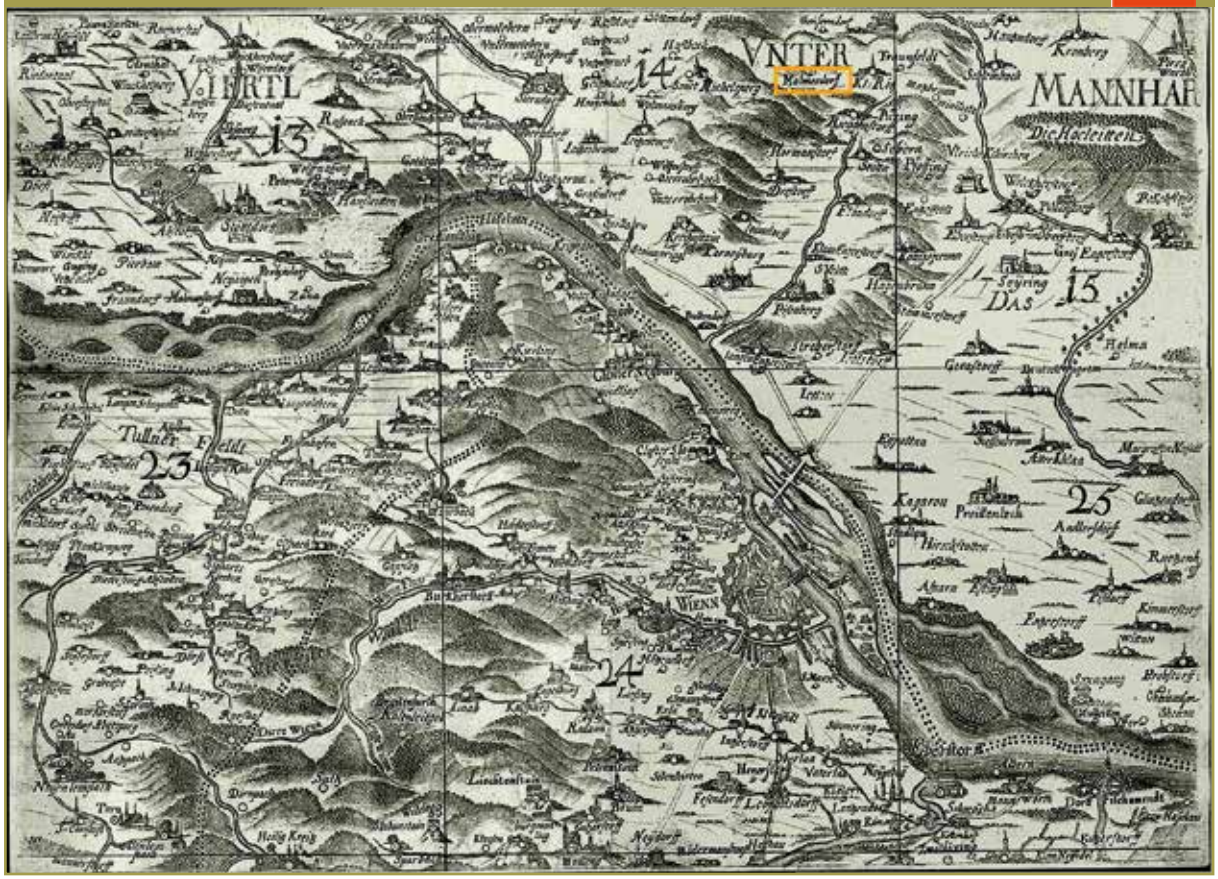
The region is situated in the ecoregion summerwarm east in the woodland community of the „Pannonian lowland and hilly region" (Kilian et al., 1994). At the colline altitudinal zone *Quercus robur* (pendulate oak) and *Carpinus betulus* (common hornbeam) forests are growing, at lower altitudinal zones mixed forests of *Quercus cerris* (Turkey oak) and *Quercus petraea* (European oak) are dominating On sunny and arid sites as well as limestone-rich sites *Quercus pubescens* (Pubescent Oak) is present. Coppice forests are dominating. Assessing the potential natural vegetation some problems occur due to the impact of former utilization practices such as coppicing, pasturing and litter harvesting on the composition of species (Starlinger, 1997).

The ecoregion (ecoregion 8.1 see Figure 11.2) is very well suited for growing crops and therefore agricultural activities are dominating. Something special are the productive floodplain forest and woodlands along the rivers Danube, March and Thaya. These floodplain forests are not in the focus of this study. Some of the cleared land with marginal yield such as moving sand dunes (Marchfeld), but well suited to grow forests have been afforested to a considerable extent with *Pinus nigra* (black pine) and *Robinia pseudoacacia* (common acacia) more than hundred years ago (Kilian et al.,1994).

In this study I am investigating the coppice forests (with and without standards) growing in the hilly region of the „Weinviertel" situated in the northeast of Lower Austria (altitude 150 m - 350 m) und the gravel terraces

Common Molmannsdorf (Mollmersdorf) 1697 (Vischer, 1697)

Figure 11.5



of the Marchfeld (altitude 140 m - 150 m). They have been and still are in the ownership of commons and jointly managed in the traditional way for centuries. Two of the largest commons Mollmannsdorf (community of Harmannsdorf) with a forest area of 120.25 ha and Niedersulz (135.78 ha) will be taken as examples for the development in view of the fact that their history and management is documented since the 15th century (Figure 11.5).

Historical development: Settlement – ownership structures

The still existing commons in Lower Austria have historically two different starting points. One is connected with the first settlements and has a more than 5400 year old history. The second is the result of a fight concerning the participation in utilization rights which could be solved in the middle of the 19th century.

Already before Slavic tribes settled in the woodland-free areas extended villages existed in the region between Danube and Moravia (Marchtal, Mistelbach, Leiser Berge) in the 5th and 6th century. The management of the surrounding agricultural land was planned and organized jointly.

Under the leadership of Charlemagne or Charles the Great the cultivation of the conquered land in the eastern part of his Empire started in the 9th century. In its first beginning the unplugged land of the conquered territories belonged to the king or duke but could be utilized simultaneously by the settlers. The king donated extended uncultivated land to noblemen, monasteries and commons. Because of the rather late colonization land also was given to free settlers. The woodland and forests surrounding the villages were jointly used and called "Gmain" (common land). Simultaneously the cultivated land was in the restricted ownership of distinct farmers. The sum of parcels often scattered in the landscape together with the right of utilization of the common wood land and joint pasture was called bovate. A bovate also included the participation in the management of the community because the laws and orders given by the administration referred to the utilization of the common land, the common pastures and of running waters (Schiff, 1899).

In the region of the "Weinviertel" large commons developed during the Medieval period. They often comprised more than 60 to 70 farmsteads (Photograph 1). A considerable number of documents have been maintained verifying the kind of management and claimed duties. The amount of duties which had to be paid for the utilization of the land depended on the frequency of utilization, the size of the common land and also the size of the existing available woodland.

Photograph 1: Zwerchhof Niedersulz. This type of farmstead was very common in the south and southeast of Austria (P. Lauppert).

Photograph 2: Coppice forest in the northeast of Lower Austria (J. Kiessling).

Multiple uses of forests and management

Till the 19th century the existence of forests was essential for the rural population of Lower Austria. However, the size of these forests was only partly extended. Additionally important were the small and scattered farm forests, the floodplain forests and the jointly used coppice forests with and without standards. Nevertheless, for many farmers in this region wood was not the main use. More important were other forest uses such as pasture, slash and burn activities, litter harvesting, and tar and resin. Often the success of agriculture and livestock breeding was dependent on these kinds of uses.

From the very first beginning forest utilization and management of the coppice forests owned by the commons was regulated by common laws which based on the agreement of the members of the commons. These orders ("Weistümer") were developed by an open dialogue between the farmers entitled to forest rights. It was a law orally transferred from generation to generation. From the late medieval and early modern period onwards till the end of the 18th century this law was written down for several reasons. One of the most important motives to lay it down in writing was the fear to loose these rights to the surrounding manors wanting to patronize the commons. Another motive was to maintain the recourses of the commons in a sustainable way by preventing the forest utilization and pasturing against the demand of new settlers having moved into the village (Photograph 2).

The sustainable management of the commonly owned coppice forests was secured by the following measures: (1) distribution of the entire forest area in annual utilizable blocks. The size of these blocks depended on the given forest area and the number of members entitled to utilization rights, (2) restriction of the allowable amount of harvested wood according to the demand of the specific farmstead, (3) ban of young stands and cleared areas, (4) limitation of the time of harvesting and timber transport, (5) sparse use of wood, (6) constraint of the sale of wood within and prohibition of the sale of wood outside the boundaries of the village (Winter, 1909). Also pasturing was regulated by common laws. Thus forest grazing which had been allowed in former times was restricted to areas without young stands. Also the number of cattle which were allowed to stay in the forest was limited (Johann, 1979).

Thus the former unlimited utilization of common forests became reduced by and by. These restrictions included the amount of wood and the quality which was allowed to harvest. Also the former right to use the forest free of charge was abolished locally. While in many common forests fuelwood could be harvested without limitations the use of construction timber was often controlled by a forester or another person engaged by the members of the common. However, from the 16th century at the latest also the annual amount of fuel wood each farmstead was entitled to became as well reduced. Extended forest uses were not allowed any more by the old settlers to avoid the devastation of the forest land (Winter, 1886, 1896, 1909, 1913).

Conflicts – external interests

Although commonly practiced utilization and the sustainable management were supervised by foresters and judges who were recruited from the villagers, the State and the manors increased the control concerning the commonly owned forests exercised during the 16th century. The argument used as a pretext to justify this control was the necessity of forest protection against the devastation practiced by the farmers. In fact, the multiple use of forests by farmers with regard to pasture, litter and fodder, tar and limestone burning and the harvesting of fuel wood contradicted to the interest of the State, the manors and the increasing industry considering the production of valuable timer to be of highest priority. The forest law from 1766 and the order from 1768 valid for the entire Crownland Lower Austria considered the following management practices to act against these laws and to be responsible for the destruction of the forests: forest grazing of goats, forest grazing of cattle in clearcuts and young stands, forest grazing of sheep and pigs, the

construction of fences, uncontrolled gathering of resin (Kropatschek, 1789).

In many cases farmers were forced to overutilize the forest land and to inhibit the reforestation of cleared land. This was due to the fact that according to the Forest Law from 1766 clearcuts which became naturally forested should be treated like forest land and were no more available for pasturing. However, despite these restrictions forest management for the provision of the multiple uses of the farmsteads was preserved during centuries. The maintenance of self determination of a common or the partly or total loss of this self determination to the surrounding manors or the State was depending on the functioning of the society within the village, the degree of competence of the involved mayor and the representatives of the village, but also on the availability of old documents proving the traditional village rights. If the self governance was weakened by disagreements within the community, the common frequently lost its rights or had to accept their reduction. In some cases the manor gained the full ownership over the former common woodland. These social factors were the reason why the development differed from common to common.

One example proving that the fight of a common against the manor could be successful is the common Mollmannsdorf (Figure 11.5). After a heavy dispute with the neighbouring manor in the 16th century this community was able to keep the ownership of their forest till the present day. This forest with a size of 120.25 hectares can be regarded to be one of the most compact and not scattered forest areas in this region (Niederösterreichische Agrarbezirksbehörde unpubl. data 1581) (Photograph 3, 4, 5, 6 and Figure 11.6).

The multiple use of farmsteads favoured mixed forests with a high percentage of understory. In commonly managed farm forests radical impacts were rather rare, the transition of forest land due to changing demands happened relatively slowly.

The typical forms of forest management systems (coppice forests with and without standards, floodplain woodland) were relatively stable and secured the maintenance of the quality of soil. Even forest grazing could contribute to the quality of the soil in case it was regulated in an adequate way.

Till the 19th century the so-called "by products" or "minor utilization" were the most important uses in common woodlands. However since the beginning of the modern period they were increasingly condemned by modern forestry. Caused by global changes with regard to industry and technical development (construction of railroads, replacement of charcoal by mineral fuels) the market for wood and timber changed dramatically in the 19th century. The demand for timber of high value increased and the demand for fuel wood decreased.

Photograph 4: Old boundary stone (monastery Klosterneuburg) in Rohrwald, district Korneuburg, Lower Austria (S. Laefner).

Photograph 5: Mollmannsdorf: late-Gothic shrine in the community of Harmannsdorf (Naoag)

Photograph 3: Meadow in the coppice forest Rohrwald (Naoag).

Photograph 6: View to the church and the coppice forest (Rückersdorf-Harmannsdorf) (S. Laefner).

Besides, reforms in the field of agriculture also influenced forest management such as forest pasturing which lost its importance in the 18th/19th century. The maintenance of the forest land was also secured by the Imperial Forest Law from 1852 which for the first time was valid in the entire Austro-Hungarian Monarchy. According to this law it was not allowed any more to turn forest land into something else. "Forest land has to be maintained as forest land". Clearcuts had to be reforested within five years (Fischer et al., 1917).

The protection of woodland – balance of utilization interests

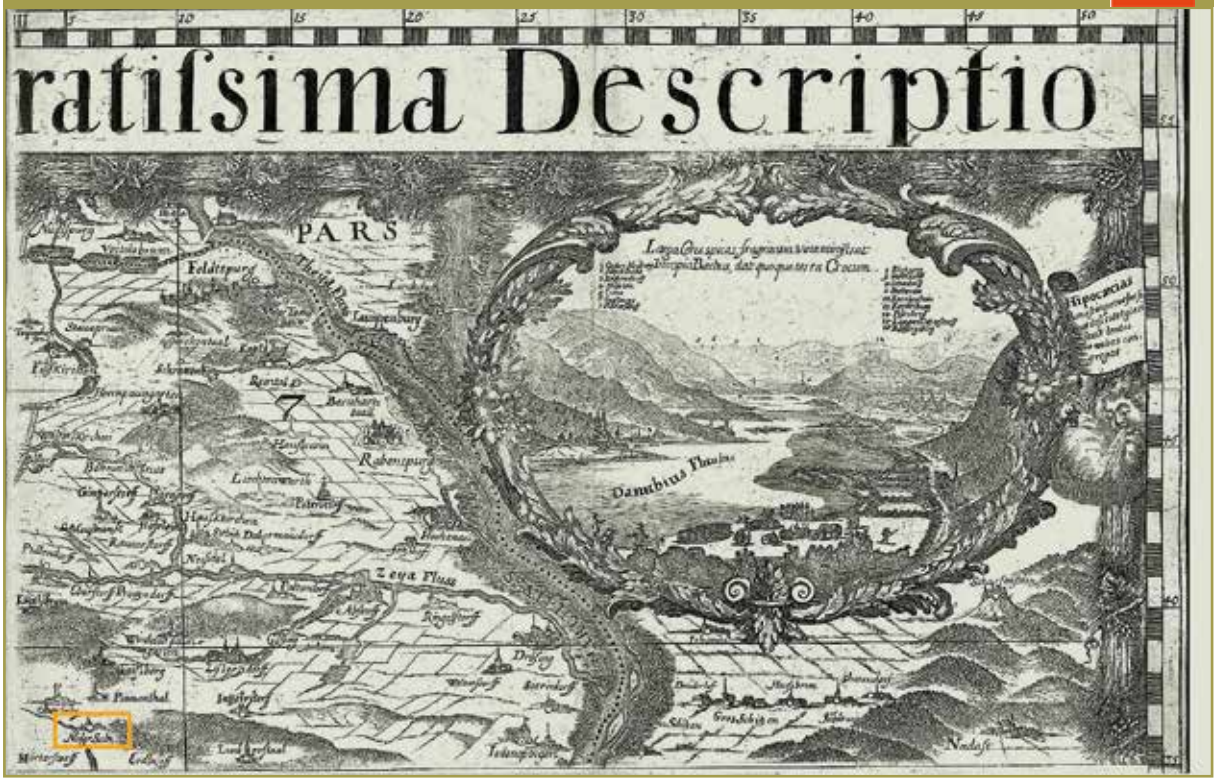
Referring to the time of the end of the 19th century no detailed information are available concerning the economical situation of common forests. The Austrian Forest Congress 1882 as well as several contemporary witnesses from this time complained the bad condition of these "unregulated and wild common forests" overused by farmers. The neglecting of the existing statutes and the often not defined amount of wood the farmstead was entitled to receive as well as controversial ownership rights were considered to be the main reason for the bad condition of the forest stands. However, several laws published in the 1880s (Teilungs- und Regulierungsgesetz July 7th 1883 and June 3rd 1886) provided the basis to regulate the utilization rights and thus improve the yield and the culture of the commonly owned and utilized forests (Schiff, 1899).

Forest culture should be implemented by specialized consulting. Thus also the condition of the forest should be improved. However, till the end of the 20th century the production of timber of high value was in the focus of interest of the forest authority involved in this activities and the so-called by-products were set aside. This focus has changed since the demand for biomass increased again.

To illustrate the development I choose the common woodland of Niedersulz as an example (Niederösterreichische Agrarbezirksbehörde unpubl. data 1751-1908).

Figure 11.6

Map of part of Lower Austria including the common Niedersulz (Vischer, 1697)



Example: ancient forest Niedersulz

Its development can be regarded as representative for a considerable number of commons in the northeast of Lower Austria. This common was able to preserve and maintain its forest area of more than 130 hectares till present day (Figure 11.6).

The concerned forest was mentioned first in a groundbook of the monastery Heiligenkreuz in 1435. It was described as a forest situated across the river Danube where the members of the common had utilization rights for which they had to pay taxes. 1638 and 1675 the management of the woodland and pastures was written down. The maintenance of this woodland is proved by several documents (certificates) describing ownership rights and wood harvesting in detail. Each full sized farmstead was allowed to utilize four coupes (Lose) of the forest, each half sized farmstead two coupes. The amount of taxes the farmers had to pay to the manor Niederleis on Saint Martin's day corresponded to the size of the farmstead. The common considered this forest to be its ownership and managed and used the forest in the traditional way at all times. Thus conflicts arouse between the monastery Heiligenkreuz as the manor and the common which were solved by a compromise in 1797. This agreement preserved the utilization rights of the common but forced them to pay for these rights. Besides, the common was obliged to deliver the wood harvested on 12 coupes to the parsonage. This agreement had to be renewed every ten years (Photograph 7).

The villagers had to cultivate the forest area according to the existing forest laws and to maintain its good growth. The administration of the manor claimed the right to control the management of the common land by foresters. However, it was still the exclusive responsibility of the common to figure out and mark the suitable places for the annual clear cut. Not all villagers could participate in the utilization. The right was attached to 63 farmsteads whereas there were already 81 houses in this village at this time.

According to the Imperial Law from July 1st 1813 the forest area was mapped, the growing stock and calculated yield estimated and allotted to annual felling areas. The forest survey of the "common oak forest Niedersulz" included the report of the geographical location and boundaries of the property, the growing stock and the direction of the planned conduct of felling. The forest stand contained oak trees mixed with some rather well growing pine (Pinus sylvestris) and European Aspen (*Populus tremula*). The calculated rotation period amounted to 18 years. Within this period the dimension of the harvested fuelwood was expected to have grown to a diameter of a man's arm, and because of the fertile soil would have reached the age of cutting. The final age of the overstory and standards was determined with 80 years (Niederösterreichische Agrarbezirksbehörde unpublished data 1751-1908).

In course of time the common administration bought some neighbouring forests. This purchase was financed

Photograph 7: Parsonage of Niedersulz (late 18th century) (P. Lauppert).

by its own resources. The common also paid further expenses such as taxes, the employment of a forest warden and reforestation activities. 63 farmers were allowed to participate in the utilization of the forest of about 100 ha. The annual logging unit was divided into sections. Each farmstead entitled to utilization rights was allowed to harvest two sections per year. This kind of management neglecting the demands of the remaining members of the village excluded from the utilization caused permanent disagreements within the community. The excluded members protested and made complaints several times (1834, 1644, 1847, 1862, and 1868) and at last made an application for the regulation and separation of the commonly owned forest area according to the law from July 3rd 1886 valid for the entire Crownland Lower Austria (Schiff, 1899). It took a long time to work out an agreement acceptable for all participants. 1903 at last the ownership of the forest was dedicated to the forest-cooperative Niedersulz (Waldgenossenschaft Niedersulz), the parish and 62 peasant families. Despite the long lasting disagreements the common Niedersulz was able to maintain the forest area in its extension and also to go on with the management as a coppice forest with standards.

The prolongation of the composite forest system resulted in the structure of the oak coppice forests with standards characteristic for the summerwarm east (Weinviertel). Proved by field research Frank (1937) confirmed that this kind of regulated forest management system has been practiced since more than 400 years. In addition, Kral (1985) proved a remarkable increase of the portion of oak during this period due to human intervention by pollen analysis.

Present structures – the cultural landscape as a witness of former forest uses

The long lasting utilization of forests and woodland and the experience gathered from this traditional forest management can be described as composite forest system. This system has a wide variation depending on

site conditions. Coppice forests with a low number of standards were growing on sites where the quality class was low. Sites of medium or high quality class were stocked with coppice forests with a rich overstory and a high number of standards. Coppice forests without standards were restricted to unfavourable and unfertile sites (Eckhart, 1975).

The planned management of coppice forests with standards can be considered as one of the first examples of sustainable forest management (Schütz, 2001). The principle relies on the sustainable distribution of age classes (diameter classes) in the overstory containing a sufficient number of staddles in the understory. The number of staddles available for the rejuvenation of the overstory is important for the sustainable safeguarding of the regrowth for the overstory (Hochbichler, 2008). Due to this kind of management a suffiecient supply with timber and fuelwood for the own demand of the members of commons could be secured. In a similar way also forests owned by bigger enterprises were managed for centuries apart from the rotation period of the fuel wood which – compared to the peasant's forests - was extended to 25 to 30 years (Hagen 2005). Thus the sustainable utilization of valuable timer and the supply with fuel wood of the sourrounding peasants and communities was secured. In Lower Austria according to the forest survey from 1961/70 the share of coppice forests amounted 20%, coppice forests with standards 30% and coppice with some hold-over trees 50% (Eckhart, 1975).

Changing goals in the management of composite forest systems with standards have created varying types of forests in course of time. Historically coppice forests were mainly managed in order to cover the local demand of the communities for energy, i.e. fuel wood. They can be regarded as the forerunners of today's short rotation energy plantations. Caused by market changes and the decline of the importance of fuel wood (coal and oil became available for energy use) also the value of coppice forests with and without standards decreased. Large parts of former coppice forests were substituted by afforestation with other tree species, or converted to high forests by postponing their harvest, and managing them in longer rotations. Anyway, this reduced the area of coppice forests considerably. Within the past decades discussions concerning the best composition of the overstory and improvements of the performance of the site by conversion or transition of composite forest systems into high broadleaved and coniferous forests were put at the forefront (Krissl and Müller, 1989). Traditional silvicultural planning processes concerning oak-dominated standard coppices are also questioned because of the increasing loss of vitality of oaks since the 1960s (Tiefenbacher, 1996).

However, since the end of the 20th century the interest in composite forest systems received a renewal caused by a high demand for valuable broadleaved timber and biomass. Since renewable resources are advocated and even financially supported, because of their almost neutral CO_2 balance, managing coppice forests could

Photograph 8: Coppice forest Niederweiden (Lower Austria) (J. Kiessling).

experience a revival. At least this development could encourage forest owners to take up again managing their coppice forests. This could be an important contribution to rural development, because the management and sustainable use of coppice forests could forestall the drainage of added value from the respective region, and could revive typical economic communities, like the commons ("Agrargemeinschaften").

Nature protection aspects value for today's society

Only recently these traditional management systems have become once again important in the frame of nature protection and landscape conservation (Freist and Klüssendorf, 1991; Buckley, 1992) by sustaining a type of cultural landscape of special species diversity (Institut für Waldwachstum und Zentrum für Umwelt und Naturschutz, 2008). It can also promote the further development of broadleaved-management systems (Schütz and Rotach, 1993) (Photograph 8).

Today in this region a broad spectrum of tree species is characteristic for coppice forests with standards and composite forests. Pendulate oak (*Quercus robur*) and European oak (*Quercus petrea*) are dominating with a share of 60% in the overstory. The oak species are mixed with common ash (*Fraxinus excelsior*), common maple (*Acer pseudoplatanus*), Norway maple (*Acer platanoides*), wild service tree (*Sorbus torminalis*), service tree (*Sorbus domestica*), wild cherry (*Prunus avium*) and European wild pear (*Pyrus communis* subsp. *pyraster*) (Schöfberger, 1990). These existing broadleaved species in the overstory are considered as valuable hardwood mixture for the future and receive particular tending operations (silvicultural measures). In the understory hornbeam (*Carpinus betulus*), field maple (*Acer campestre*), field elm (*Ulmus minor*), small-leaved lime (*Tilia cordata*) and several other tree species as well as common hazel (*Corylus avellana*) are growing. Most frequent are cornelian cherry (*Cornus mas*), common privet (*Ligustrum vulgare*), spindle tree (*Euonymus*

europaeus), black elder (*Sambucus nigra*) and other shrubs (Hagen, 2005).

The management of coppice forests with standards has a high importance for xerotherm (light and warm temperature loving) organism. A high biodiversity on small spaces occurs due to the temporal follow-up of structural varying kinds of vegetation within a short temporal period and also by the bordering of clear cut areas and young stands of differing ages.

Caused by the traditional management systems practiced for hundred of years a specific biocoenosis could develop adapted to the rhythm of regular disturbance due to utilization and following period of regeneration. This dynamic provides the living space for a high number of plant and animal species and safeguards them because the traditional management of coppice forests offers different phases of development (open spaces, shrubb-phase, phase of closed canopy) side by side (Treiber, 2002). In fact coppice forests and composite forests belong to forest ecosystems with the highest number of species in Europe (Ellenberg, 1996). Their importance for the safeguarding of endangered species, in particular for thermophile insects and birds is proved in many cases (Buckley, 1992; Rossmann, 1996, Treiber, 2002). Nowadays the pannonian oak and hornbeam forests managed as coppice forests belong to the habitat type (91G0) (Pannonian subcontinental oak-hornbeam forests) of the European wide network Nature 2000 which is considered to be endangered (Petersen et al., 1998). Its favorable shape can only be safeguarded by adequate utilization and adapted management systems (Ellmauer, 2005). Thus wood harvesting and the protection of species and the biotope can be combined (Institut für Waldwachstum und Zentrum für Umwelt und Naturschutz, 2008). Further measurements can promote the safeguarding of important and valuable structures of these forests such as the increase of the amount of dead wood and the support of regeneration to ensure the aimed composition of species in protected habitat types.

Case study 2

Farm Forests in the mountain region (Central Eastern Alps - today's National Park Hohe Tauern, Carinthia)

In Austria two third of the territory belongs to mountainous regions which is characterized by particular features such as small structures and vulnerability.

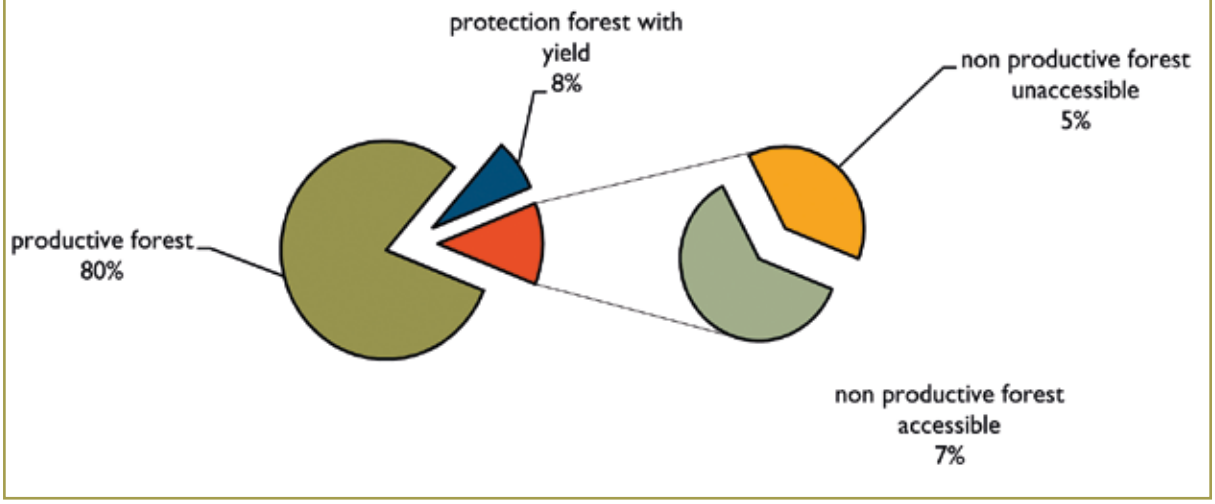
19.5% of the total Austrian forest area is classified as protection forest. Among this category 7.6% are protection forests with yield, 11.9% non-productive protection forests. 7.3% of the non-productive protection forests are accessible and 4.6 % are inaccessible (Figure 11.7). According to the results of the Austrian Forest Inventory (Bundesforschungs- und Ausbildungszentrum für Wald, Naturgefahren und Landschaft, 2002) there is a need for regeneration (two third of the area in the productive and one quarter in the non-productive protection forest). The inhibiting factors that obstruct an adequate regeneration are i.e. too dense ground vegetation, erosion, and forest pasturing.

The "Hohe Tauern" or High Tauern which are addressed in this case study are a mountain range of the main chain of the Central Eastern Alps. The range includes Austria's highest peak, the Grossglockner. It is situated between the Federal provinces of Salzburg, Carinthia and East Tyrol (Photograph 9).

Today along 100 kilometres of the main chain stretches the High Tauern National Park (Nationalpark Hohe Tauern), to which a private owner and three Federal Provinces (Carinthia, Salzburg and Tyrol) have contributed territory (Figure 11.8 and Figure 11.9). With an area of about 1,834 square kilometres (708 sq mi), it is by far the largest of Austria's six national parks as well as the largest nature reserve in the Alps. The protected area of today includes glaciers, rocks, alpine pasture and forests.

A peculiarity of the national park "Hohe Tauern" is

Share of productive and non-productive forests in Austria — **Figure 11.7**



Photograph 9: Hohe Tauern with the highest peak Großglockner (E. Johann).

the fact that the protected area does not only include undisturbed natural sites but also cultural landscapes shaped by the management of farmers for centuries. The high diversity with regard to animals and plants, but also a high abundance of the cultural heritage (farmsteads, churches, castles, ruins) are the result of a long-lasting symbiosis between wild nature and cultural landscape. The first people arrived already 5000 years ago. The motivation to settle in this harsh and challenging region was the search for gold, but also the strategic position of the place along the traffic connection between the Mediterranean region and Central Europe.

Landscape

The forests of the present national park in its entirety represented a modest colonized living space for centuries. However, an increasing population caused the decrease of the forest area by clearings and utilization also on steep slopes, particularly on the sunny side of the valley, already at the end of the Middle Ages (Figure 11.10).

Today the unfragmented forest belt merely starts just above the highest farmsteads (Photograph 10). Its extent and density depends on its exposure and therefore also on the natural upper border for settlements. Often the cultivated area on sunny slopes is separated from the lower alpine pastures just by a small and understocked strip of forest land.

The shady slopes exposed to the north are not suited for settlements. Therefore they never have been cleared and the forests are not scattered, but fully stocked, reaching from the bottom of the valley up to the timber line at an altitude of about 2000 m. Thus the percentage of forest land of the specific communities differs remarkably and is mainly determined by its topographical location. It varies between 30% to 50% of the productive, and between 15% to 40% of the entire area of a definite community (Johann, 2004) (Figure 11.11).

In general the upper timber line expands to an altitude of about 2000 m to 2200 m, the upper timber line of the forest with yield to 1700 m to 1800 m. The possibility of growing barley and rye is limited to 1700 m, for corn to 1200 m above sea level. The upper boundary for alpine

Figure 11.8

Map of Carinthia 1730-1740
(Homann, 1730-1740)
((http://www.altelandkarten.de/images/19594-01.jpg)

Figure 11.9

Map of the Hohe Tauern Nationalpark in Austria 1992
(drawn by Anita Graser 2008) (https://commons.wikimedia.org/wiki/File:Nationalpark_hohe_tauern.png)

Figure 11.10

Settlements Grosskirchhaim and Sagritz and protection forest 1688
(Valvasor, 1688; reprint 1882)

Photograph 10: The Möltal – valley near Winklern (E. Johann).

Photograph 11: Mallnitz-valley - Cleared slopes on the sunny side of the valley, the shady side is forested around 1910 (Österr. Nationalbilbiothek Wien: Bildarchiv, Nr. 131.449).

pasturing can be considered at an altitude of 2600 m (Photograph 11).

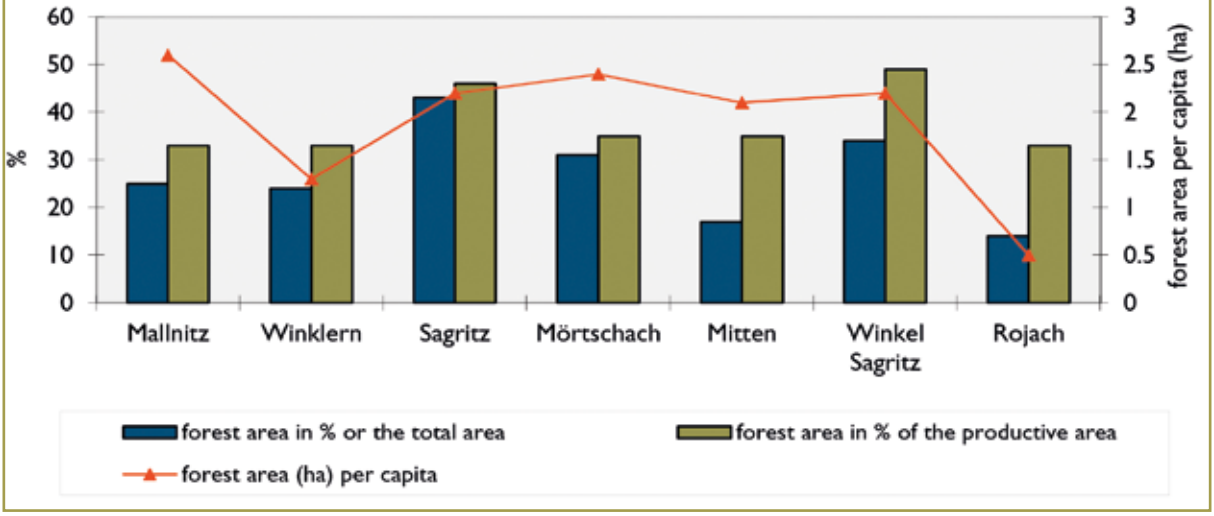
The main natural forest communities comprise spruce-fir forests (*Picea abies – Abies alba*) and spruce forests (see Figure 2 forest habitat 1.3). They occur at an altitude between 750 m to 1650 m. Caused by locally influenced climatic conditions such as frost or specific stands (i.e. moisture) also montane spruce forests without the occurrence of fir are natural. Locally beech (*Fagus silvatica*) can be part of the natural vegetation, pine (*Pinus sylvestris*) occurs only on sunny poor sites on a small scale. Grey alder (*Alnetum incanae*) is growing in riparian forests and on wet slopes (i.e. originating from avalanches and soil erosion). On fresh-wet slopes locally also mixed forests of sycamore maple (*Acer pseudoplatanus*), Scots elm (*Ulmus glabra*), and common ash (*Fraxinus excelsior*) are growing. Montane spruce forests (particularly Larici-piceetum) (1650 m – 1900 m) and subalpine larch (*Larix*) - arolla pine forests (Larici-pinetum cembrae) are well developed at an altitude of 1900 m to 2100 m. Sub-alpine shrubbs of green alder (*Alnetum viridis*) are growing on wet stands with a rich snow-cover. At the subalpine altitude (1400 m – 2100 m) shrubbs of mountain pine with rusty-leaved alpenrose (Rhododendro ferruginei-pinetum prostratae) are well developed (Winter et al., 2005).

At the bottom of the valleys a continental inner-alpine climate is dominating, characterized by very warm summers and cold winters with relatively low precipitation. The precipitation permanently increases correspondingly with the altitude up to the mountain range. At high altitudes a frosty climate with Atlantic influence is dominating. The annual sum of precipitation amounts between 800 mm and 900 mm in the valley and between 900 mm to 1250 mm in the montane and subalpine region. The precipitation reaches its maximum in summer time (Winter et al., 2005).

Silicate rocks with components of rocks poor of base (gneiss, granite, slate, quartzphyllit) and rich of base (limestone-schists, volcanics) are dominating.

Distribution of the forest area in the Mölltal-valley around 1830

Figure 11.11



Photograph 12: Upper Mölltal-valley farm house around 1920 (Österr. Nationalbilbiothek Wien: Heiligenblut, Kärnten: Aufnahme 1922 XII 28, Nr. 128.508).

Photograph 13: Forests with protective functions in the Upper Mölltal (1998) (Photo: E. Johann).

Locally also marble and limestone are present. The most frequent type of soil is semipodsol (more than 50%). Caused by climatic influence also podsol and ranker are broadly spread. Base-rich cambisol (brunic arenosols) and cambisols on limestone are relatively wide spread at higher altitudes (more than 20%). Less important are cambisols on moraine and gravel, gleysols and bogs.

Generally the living conditions in this high mountain region are extreme (Photograph 12). The living space is permanently threatened by natural impacts such as flooding, avalanches and soil erosion. In the course of time, natural (avalanches erosion) as well as human interventions have remarkably contributed to the evolution of the cultural landscape. Apart from anthropogenic influences changes in the natural conditions (climate, vegetation) have plaid an important role. Thus climate change in the course of history had an impact on the social environment of the rural population. The time of the first settlements corresponds with the period of the medieval climatic optimum lasting from the 8th to the 15th century. The climatic conditions of this time were convenient for the expansion of settlements but also for mining activities at high altitudes (up to 2000 m above sea level). The following little ice age had a dramatic effect on the entire cultural landscape.

My study focuses on the farm forests of the mountain region Hohe Tauern situated in the Federal province Carinthia, in particular on the protection forests of the Mölltal-valley. These protection forests have always been managed as high forests and have been valued by the local population because of their protective functions with regard to the safeguarding of the living space since the medieval period. This was the reason why they have never been cleared totally. Thus they can be described as ancient forests, even in some cases they can be regarded as pioneer forests due to natural dynamics such as erosion and avalanches (Photograph 13).

The share of protection forests in the individual communities was high, making up half of the forest area in most cases (Figure 11.12). Proved also by the results of pollen analysis the dominating tree species of the forests with yield was Norway spruce, either alone or associated with larch. Its portion varied from a small percent in some communities (Mallnitz, Lassach, Winklern, Winkelsagritz, Lainach, Gössnitz, Tresdorf, Stall) up to 30% (Sagritz, Rojach,), sometimes exceeding 50% (Stranach), particularly on steep slopes. The area of protection forest was already mapped in the cadastre (Franziszeischer Kataster) in the first decades of the 19th century (1820-1827). In the protocols attached to the cadastre also the occurrence of fir mixed with some larch is noticed. Broadleaved trees were not recorded in the high forests (Figure 11.12) (Kärntner Landesarchiv unpubl. data 1820-1827).

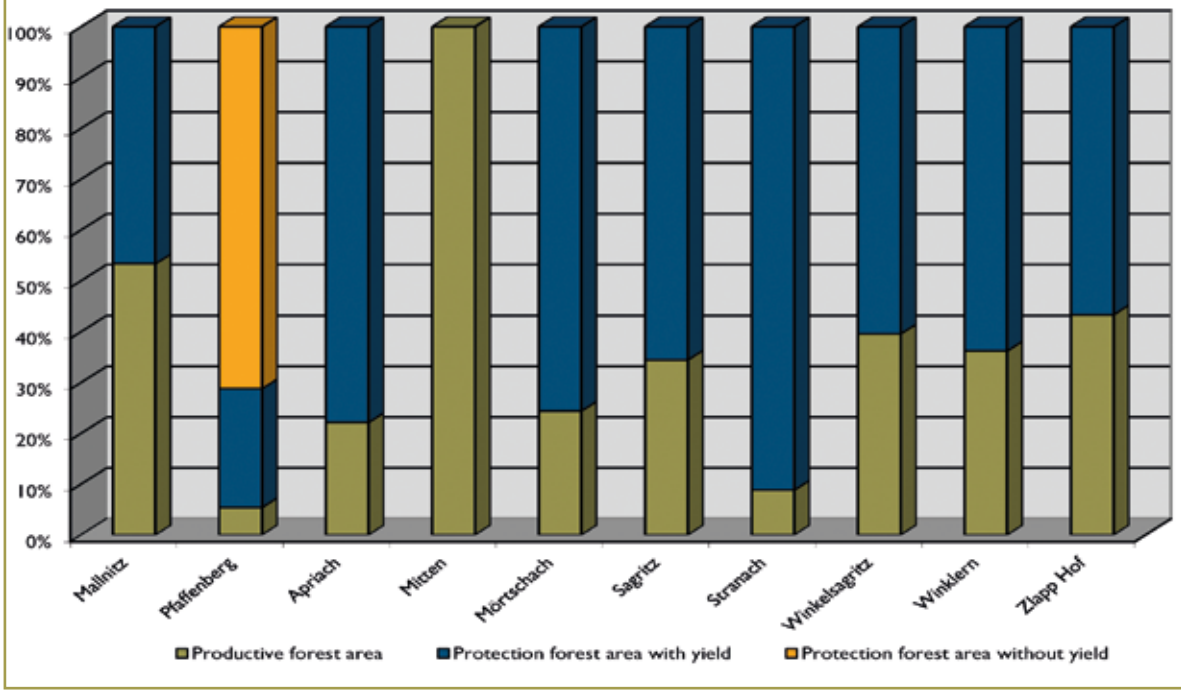
Historical development

The already mentioned traffic route across the mountain range which was constructed during the Roman Empire in the 1st century BC and joined two economic important regions – the Mediterranean in the south and Central Europe in the north, was one of the most important factors for people to settle in this area. Another factor was a considerable abundance of gold. Gold mining activities had been carried out already by Celtic tribes and were continued without interruption till the beginning of Modern times (Moosleitner, 1976).

In the 14th and 15th centuries the mountains Hohen Tauern comprised the biggest gold mine in Europe whith 10% of the global gold production. These mining activities were characterized by extreme climatic and

Figure 11.12

Proportion of the productive forest area, protection forest area with yield and protection forest area without yield in selected communities of the upper Mölltal-valley arround 1830 (Johann 2004)



environmental conditions, because the gold deposits were situated at an altitude up to 2700 m above sea level. Thus the location of the mines belonged to the highest in Europe. As they were in operation during the whole year mining was a high challenge for the miners considering that even approaching the most yieldable mine named "Goldzeche" required nine hours of walking (Figure 11.13). The path was in places exposed to extreme climate and dangerous terrain such as avalanche gears. During the high time of gold mining activities the consumption of wood and charcoal for the smelting process was high and caused the cutting of the mountain forests also at high altitudes (Johann, 2004).

Figure 11.13

„Goldzeche" gold mining activities above the timber line
(Landesmuseum für Kärnten, Klagenfurt)

Even if gold mining activities had started earlier the evolution of forests was influenced primarily by climatic factors till about 800 AD. Only locally anthropogenic impacts were noticeable before the 11th century, when the number of settlements increased. Clearings were not longer restricted to the edges of the forest but broke through the forest belt. However, they remained within the forest area and did not reach the upper tree line. During the 12th and 13th century extended clearing activities due to new settlements established for the production of cheese locally impacted this upper tree line (Meirer, 1973). In the 15th/16th century the flowering time of gold mining caused once more the decrease of the forest area which was locally continued till the 17th/18th century. This decrease also rooted in the changing climatic conditions due to the influence of the little ice age on agricultural activities (cold summers, early snowfall, and long lasting winters). At this time large clear cut areas for the supply of the mines (gold, copper, and iron) extended from the bottom of the valley till the upper tree line. They were legally permitted by the so-called "Montanforestreservat" giving the sovereign the right to prioritize mining activities and unlimited timber harvesting for the supply of the mines and attached smelting processes also in forests not owned by the sovereign (Johann, 1994).

Ownership structures

From the very beginning each farmstead was equipped with its own forest land in the vicinity of the house. The use of this forest was at the free disposal of the farmer.

Photograph 14: Mixed farm forests (spruce, larch) on steep slopes (E. Johann).

Photograph 15: Wooded landscapes in the Mölltal valley (E. Johann).

Besides, forest land, grassland and alpine pastures were often attached to the entire village and thus formed the common land with joint utilization structures. Moreover extended utilization rights in the neighbouring manorial or State-owned forests were attached to the respective farmstead (Photograph 14).

These rights covered the demand of the farmstead with regard to fuel wood, construction timber, wood for fences, water pipes and other agricultural uses, but also included the right for litter harvesting (soil and branch litter), forest grazing and alpine pasturing. Often also miners and peasants owning only a small piece of land were equipped with parts of such forest utilization rights for the purpose "to keep the peace in the village". Therefore forest land could be in the ownership of free or subservant farmers, of commons (called "Gemain"), of manors or the State. Utilization rights existed in state-owned, manorial and commonly owned forests. A particular feature of this region is the high amount of free farmers dating back to the time of first settlements. Their property was written down in the so-called "Landtafel" thus securing them certain undisputed rights (Johann, 2004).

When mining activities started, forests gained higher importance in the view of the sovereign as well as the mining industry. The high demand for firewood, poles and charcoal forced the sovereign on the one hand to claim the right of forest utilization ("Montanforstreservat"), on the other hand to influence the kind of farm forest management prioritizing wood harvesting and restricting traditional farm forest uses.

Forest management

The forest was mainly managed as high forest, one part as selection forest with a calculated rotation period of 120 years, one part as compartment system (Photograph 15). Only a very small part was managed as coppice with a short rotation period of 10 to 20 years.

The aspiration to protect the forest stands against overutilization and to safeguard the sustainability of the forest yield date back to the 16th/17th century. The first step was to describe the forest stands in detail, to estimate the yield as well as to make plans for harvesting and rejuvenation. The second step was to write down the measures which were considered suitable to fulfill the plans best. The third step was to publish the main important issues in form of so-called "Waldordnungen" (forest orders). Some of these descriptions are still stored in the Kärntner Landesarchiv Klagenfurt and prove the efforts of former generations to maintain the given resources for the following generations (Johann, 2004). To illustrate these actions I give some examples: Several descriptions of some forest stands in the Mölltal valley 1522, 1543, 1556, and of the entire valley 1650, forest descriptions of the manors Sommeregg 1651 and Gmünd 1652 and 1700 including a forest order from 1640. A general order published by Emperor Ferdinand in 1632 gave order to visit and assess all forests reserved for the supply of the mines to maintain the good quality of the stands and to avoid misuse (Kärntner Landesarchiv unpubl. data).

The first step toward a sustainable planning was the division of forest stands into annual coupes. This was particularly necessary when they were dedicated to the supply of the mining industry. Due to this planning the continual and permanent supply as well as the safeguarding of the forest stands could be preserved. The planning period often stretched out for a hundred years.

The maintenance of the forest cover had high priority in regions which were important for the energy-supply of the mining industry. This was the reason why temporal or permanent clearings carried out by farmers were restricted or forbidden. The amount of wood which was allowed to be cut should be adapted to the expected yield (increment). Frequent visitations and assessment were considered to be the best basis for an adaptive forest management. Therefore they were increasingly carried out and arranged by public and private foresters since the 18th century (i.e. 1766, 1785) (Kropatschek, 1785). The frequency of assessments increased in the first half of the 19th century (Guttenberg, 1898). Because these assessments and inventories focused on each stand exist

they witness the occurrence of these forests for centuries. The assessments provided the basic elements for forest harvesting and have a long tradition also in the Mölltal-valley. These reports inform in detail about the condition of the respective forest stand and the planned and carried out utilization. Thus an assessment from 1837 gives notice about the extent of each forest stand, the composition of tree species and the expected yield. The existence of clearcuts caused by the harvesting of the mining industry for the production of charcoal are recorded as well. Until the second half of the 19th century the rejuvenation of these clearcuts was mainly left to nature (leaving of seed trees, ban of forest grazing). This assessment gives also record about the understocking of many forest stands situated on the sunny slopes. However, informs also about the overstocking of forest stands growing on sites hardly accessible. They showed a high amount of dead wood and had a high age. They had not been used for a long time or had never been used at all (Johann, 2004).

Information about the existing forest areas, the tree species and the growing stock as well as the expected yield, the distribution of fields, pastures, gardens and woodland in the landscape as well as ownership structures can be gathered also by the protocols and detailed maps of the cadastre (Kärntner Landesarchiv 1820-1827) from the 1820s (Figure 11.14).

Controversially to the management for the supply of the mining industry farmers practiced selective cutting to cover the various demands of the farmstead. For the production of construction timber, boards, fences, fuel wood, water pipes and other products needed for the running of the farm different diameters were necessary. Depending on site conditions farmers calculated the final age of trees between 90 to 150 years. The rejuvenation in the forest stand was left to nature. Everywhere forest grazing was quite common from springtime till late autumn. In summertime the livestock stayed at the alpine pastures except the cattle which was needed for the daily supply. This cattle grazed in the surrounding forests the whole day also in summertime. In the entire Mölltal valley because of the lack of broadleaved trees branch litter from spruce provided the necessary manure for the fields. Also this right to litter was legally secured

Photograph 16: Branch litter harvesting for the supply of the farmstead (19th century) (Rosegger et al., around 1900).

(Photograph 16).

Farm forest management was for a long time carried out to cover the own demand of the farmstead only. However, caused by the increase of the urban population, the development of industry and traffic but also tourism a remarkable increase of the demand for utilizable timber came into being in the second half of the 19th century. Therefore timber prices increased which had been very low before. Thus the aimed goal also of farm forest management activities basically changed from fuelwood and charcoal production to the production of the most valuable timber.

Within the last hundred years the importance of the various forest uses (agriculture – timber production) have undergone dramatic changes particularly at high altitudes. Within the last decade the forest area increased due to the abandonment of unfertile agrarian sites in context of the extensification of agriculture. Today the maintaining of the social and protective functions is one of the most important tasks the forests have to fulfill in the Tauern-region.

Figure 11.14

Map of the region Mallnitz (Mölltal valley) (Kärntner Landesarchiv unpul. data 1820-1827)

Protection forests against avalanches

Until the second half of the 19th century the rural population had only very few possibilities to protect themselves against the threatening by natural hazards such as avalanches. On the one hand it was the choice of the place of settlement conducted by traditional

Photograph 17a: Forest with protective functions (upper Mölltal valley) 1929 (Johann, 2004) (Österr. Natonalbibliothek Wien: Bildarchiv, Nr. 232.324).

Photograph 17b: Forest with protective functions (upper Mölltal valley) 1999 (E. Johann).

knowledge concerning nature and the environment. On the other hand it was the maintaining of the forest area situated above the farmsteads and along the traffic routes in a sufficient extent and good stand quality (Photograph 17a and 17b). However, the traditional knowledge particularly with regard to avalanches and flooding only developed slowly from generation to generation and had to be reassessed several times (Bundesministerium für Land- und Forstwirtschaft, 1989).

Since the early modern period several activities carried out by the commons as well as the manors aimed at the protection of settlements as well as traffic routes. The most important measure was the ban of the forest area which was considered to fulfill protective functions. In some regions the maintenance of the protective function was more important than wood production and was a strong impulse to achieve sustainable forest management in its entirety.

Farmers had always been aware of the necessity of safeguarding protective forests. This was the reason why the forest stand situated above the respective farmstead usually was allocated to it in order to fulfill protective functions. The only person who was allowed to use this area was the farmer himself. Wood harvesting in form of clearcuts for the supply of the mining industry was not allowed. Thus people and their exposed assets seemed protected in a sufficient way. In the Mölltal-valley there are several examples proving the ban of forests and exclusion from wood harvesting apart from the owner of this piece of land. One of the very old documents proving the protection of a forest stand in favor of some villages dates back to 1518 (protection of a forest called "Rannachwald" situated in the community "Winklsagritz" in favor of the inhabitants of the villages "Krass", "Griess" and "Ranach") (Johann 598-612) (Figure 11.15).

The concerned forest was managed as storeyed high forest surrounded by meadows, pastures, and forests. After a court-session and a following inspection of the site the district court made the judgment that the affected forest stand should be sheltered as protection forest because of the imminent danger of avalanches. Thus litter harvesting with threatening rakes was forbidden as well as temporal clearings. The arguments for this decision pointed out the fact that avalanches had destroyed people and their assets in the surrounding villages not only the current year but also in the past. The local farmers having gone to court referred on the old law ("Landrecht"). It regulated the management of forests with protective functions and prohibited the cutting of wood in areas endangered by avalanches and above roads as well as clearings. These protection forests should be free of use.

In addition to this the council decided the ban of further forest stands with regard to the protection against soil and stone erosion. Apart from the farmer who had historical rights of forest grazing and harvesting a certain

Figure 11.15
Protection forest Rannach situated in the community Winklsgritz. Map from 1828
(Kärntner Landesarchiv unpuibl. data 1820-1827)

Figure 11.16
Common forest Stappitz map from 1828
(Kärntner Landesarchiv unpubl. data 1820-1827)

amount of construction timer and timber for fences nobody was allowed to cut wood or to make clearings. The judgment came into being after a complaint of the members of the common. In 1688 the forest stand was put under protection once more because of the impact of an avalanche which had once more damaged the livestock and people and their assets tremendously.

The so-called "Waldverteilungsvergleich" (agreement for the distribution of forests), completed in 1620 in the manor "Oberfalkenstein", may serve as another example for taking into account the protective functions of forest stands (Figure 11.16). The concerned forest area was located in the Mallnitz-valley and was in the ownership of a common called "Stappitz", comprising 33 farmsteads. When the originally common forest became divided into parcels among the villagers, 40% of them were equipped with a protection forest. This forest area was in any case situated just above the respective farmstead. Due to this kind of division the farmer and his assets were considered to be protected against avalanches. The borders of the plots were marked to avoid conflicts. The avalanche gear as well as the plot of land used for the transport of timber and branch litter remained common land. It is remarkable, that on the occasion of this division not only farmers but also peasants and miners owning only a small piece of land or even no land at all were provided with a proportion of forest.

Decades later the view of the forest authority changed and the protection of the farmstead was considered to be secured best by the responsibility of the entire society. In the context of the division of the common forests of "Mallnitz", a common located just below the mountain range, it was pointed out by the district court that the distribution of protective forests was strictly forbidden. Protection forest should be left free to safeguard houses, fields and farmers and their assets. In protection forests nobody should be allowed to cut wood or branch litter any more.

Protection forests were also addressed by forest assessment protocols initiated and carried out by the government in 1766. (Johann, 1968) These detailed records ("Waldbereitungsprotokolle") also comprised the description of the entire protection forests of this region and described the individual stands. There was a high abundance of those protection forests being either in the ownership of commons or of individual farmsteads. In some commons even each farmstead had its own protection forest. Because of the danger of flooding, soil erosion and avalanches wood harvesting was strictly forbidden apart the extraction of dead wood. Farmers having old utilization rights were allowed to exercise their rights, but also in this case these rights were restricted. Among these protection forests also the common Stappitz cited above was mentioned with four forest stands within its common boundary (Hofkammerarchiv Wien, 1751-1770).

In case of emergency, when avalanches threatened the main traffic route across the mountain range and thus endangered the life of travelers and miners, farmers had to give up their traditional right of forest use (ius lignandi) although they had possessed this right for a very long time. Only the permission to collect dead wood remained. There was only one farmer in the surrounding area who was allowed to continue with wood cutting, however only at places where the stand structure was very dense. He derived this right from an explicit decree given to him by the Governor of Carinthia in 1694.

Conflicts – external interests

Summarizing the development one can conclude that despite the strict rules and orders concerning the management of protection forests, these forests were repeatedly damaged, thus affecting their protective function. In case public goods such as roads or the safety of travelers were endangered, the authorities prohibited the utilization of the forest stands entirely or allowed only single tree systems of management.

In case private good was threatened the authorities estimated the expected danger of avalanches less seriously. The forest authority itself gave permission for utilization or also marked trees for felling even when farmers protested against wood cutting in their protection forests. However, because of the sometimes long lasting period between the occurrences of the individual avalanches it was sometimes difficult for the actors to estimate the risk in each concrete case. Particularly from the beginning of the 19th century onwards the dispute concerning the protection forest and its management was obviously also driven by the motive to claim ownership rights both by the farmers and the mining authority. Predominantly

Figure 11.17

Overutilized forest stands Döllach caused by conflicting demands (mining industry – common) (Wagner, around 1850)

those forest stands were concerned which could be harvested easily and whose timber could be transported to the consumer without great efforts (Figure 11.17). Thus a multitude of conflicts originated between the mining authority and the farmers from the beginning of the 19th century onwards. Repeatedly the farmers pointed out the expected threats caused by avalanches, particularly when clear cutting systems were carried out, while the mining authority appeased the danger.

The protection of woodland – balance of utilization interests

Legal prescriptions to safeguard the protection forest were already part of the forest laws of the 16th century (i.e. forest law of the manor Gmünd 1640). The restriction of utilization was one of the tools to reach this goal (Johann, 1994).

From 1808 onwards the forest authority was demanded by experts such as Freiherr v. Aretin to enact legal binding regulations concerning the utilization of forest and fields on sites endangered by erosion. He disregarded the arising opinion to cover the expenses for the removal of damages by tax revenue. Instead he proposed the idea to ask the person/common/industry being responsible for the damage for financial compensation (Aretin, 1808). In fact such restrictions came into being not before the Austrian Imperial Forest Law was brought into force on December 3rd 1852. It provided the possibility to distinguish between productive forests and protection forests (Schreckenthal, 1949). Thus forests situated on steep slopes or wind exposed sites or places near the timber line, where soil erosion and flooding could be expected, were approved as protection forests which had to receive a particular forest management. Forests which were necessary to prevent the impact of natural hazards such as avalanches, rock fall, erosion, landslide, debris flow or flooding on persons and their asset could also be banned. In these cases the demanded forest treatment was prescribed by the forest authority (Schindler, 1866).

Present structures – the cultural landscape a witness of former forest uses

In the 1990s the mountain forests situated in the national park region Mallnitz/Hohen Tauern have been investigated and assessed by Senitza (1996). He examined in situ the anthropogenic factors having influenced the development of the forests in the course of centuries. The results of his study match largely with the results gained by the analysis of the historical archive material. The remnants of former forest use such as root stocks and grassland species are still clearly visible in the present-day cultural landscape (Photograph 18 and 19).

The investigations carried out in nature prove that parts of the mountain forests of this region have been shaped and changed remarkably by intensive forest use, regionally lasting till the 1950s. In the present day national

Photograph 18: Pollarding at present day (E. Johann).

Photograph 19: Seebach-valley remnants of former grazing and moving activities (E. Johann).

park-region Mallnitz the anthropogenic impact included selective cutting of larch for construction timber and of spruce to gain fuel wood as well as the mowing of grass on temporal cleared extreme steep slopes. These plots can be recognized in nature by the present succession comprising green alder and birch, respective mountain pine. Particularly alpine pasturing at high altitude, which was carried out much more intensively compared to present day, has left visible tracks in the landscape.

The heavy impact of clearcuts carried out by the high industrial demand for charcoal of the forges and furnaces (copper, iron) are still visible in some forest stands, such as forests situated in the Mallnitz valley. However, clearcuts carried out for the supply of the gold mining industry during the 16th to the 18th century can not be noticed any more. Here the vegetation can for the most part be considered not affected by human intervention. These natural forests comprise more than half of the forest area.

The investigations also confirm that farm forest

Photograph 20: Old growth protection forest (1998) (E. Johann).

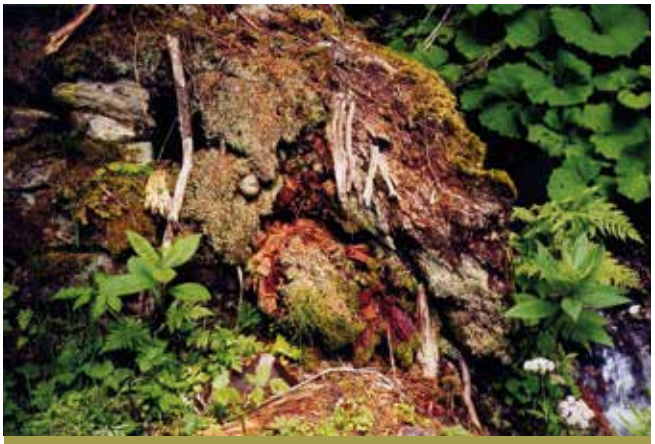
management preferred selection logging and the irregular cutting of single trees, adapted to the respective demand. It could be proved on 20% of the forest area. However, the degree of the decomposition of the rhizomes also confirms that the time of utilization dates back to the 1960s. The harvesting took place mainly at the final stage of tree growth. Strip selection cutting took place rather seldom. Clearcuts were carried out only on 6% of the area and rejuvenated till present day.. Traces of extensive pasturing in the past can be observed on about 12% of the forest area. Some forests in the valley are still grazed (grey alder forests and understocked larch forests with an open canopy) (Senitza, 1996). Forests growing at the bottom of the valley usually show a higher degree of human impact (Egger, 1994).

The traces of the frequent natural hazards having impacted the region in course of time and which were repeatedly mentioned in historic documents are still visible in today's landscape. They form the important element of the forest vegetation in this extreme high mountain landscape. Areas occasionally or periodically shaped by avalanches are covered with grey alder or mountain pine shrub forests or high perennials or grassland (54% in the Mallnitz valley). In areas were avalanches appear only episodically relative short succession cycles develop.

Nature protection aspects value for today's society

Today the forest growing in the investigated region comprises on the one hand side vegetation which is close to nature, on the other side vegetation which has been influenced by anthropogenic impact and therefore differs from the natural vegetation with regard to ecology, species composition and shape (Photograph 20).

However, the protection forests with their rather small anthropogenic impact can be considered as forests whose vegetation is close to nature also today (Photograph 21). The main part of the forest area belongs to the high mountain climax tree species, where natural subalpine Norway spruce forest communities are dominating



Photograph 21: Protection forests habitat (deadwood) (E. Johann).

Photograph 22: Old spruce tree around 1920 (National Park) (Österreichische Nationalbibliothek Wien, Bildarchiv. BS 282: Partie bei Mallnitz)

Photograph 23: Biodiversity of mountain forests due to frequent natural disturbances by avalanches (E. Johann).

(Photograph 22). Extended areas comprise continuous forest communities whereas the development of vegetation is inhibited by soil erosion or natural impacts, thus remaining more or less in an early stage. External disturbances such as frequent avalanches also contribute periodically in the short term to a regress to this early phase (Photograph 23). These communities of species show no anthropogenic influence and are therefore largely natural. This holds also true for the stands of green alder in gorges and mountain pine forest stands on steep slopes exposed to periodic avalanches (Senitza, 1996) (Photograph 23).

When the Großglockner, with a height of 3,798 metres above the Adriatic, the highest peak of Austria and the highest mountain of the Eastern Alps, was ascended for the first time by the archbishop of Gurk Franz Xaver von Salm Reifferscheid, who was accompanied by a huge group of interested scientists, the Tauernregion became internationally well known as a place for tourism but also as an scientifically interesting region from 1800 onwards (Jabornegg, 1875). Thus the specific and peculiar fauna and flora were already well known when Austria generally started its efforts to protect natural landscapes, in order to maintain their originality as well as endangered species in the second part of the 19th century. In nature reserves no human beings should be in the foreground of interest, but the nature respective the landscape in its naturalness and originality,having been relatively little changed by human intervention. The basis for the foundation of the present national park Hohe Tauern was laid by the donation of 4100 hectares to the German-Austrian-Alpine society by a private forest owner and businessman in 1918. He joined the donation with the explicit dedication that this mountain area should be preserved as a nature protection park for ever.

Situated on the border between Carinthia, Salzburg and Tyrol the Hohe Tauern National Park as a whole comprises an area of 183.600 hectares today. The first beginning was 1981. It is home to 10.000 animal and 1.800 plant species. The reserve spreads over wide alpine landscapes such as glaciers, cliffs, lawn and mountain farming culture and alpine landscapes. In addition to its function as a recreational area for man and nature the national park Hohe Tauern is still very important for scientific research, particularly in the context of climate change.

Parts of the cultural landscape, now situated in the national park, were used for many centuries. Despite this long human intervention unique and often very species-rich habitats were able to evolve. However, as the IUCN interference-free nature reserve zone has not to be below 75% negotiations between all stakeholders (Federal countries, landowners, communities, beneficiaries) and long-lasting public discussions were necessary. Thus the

establishment of the national park required several years but is well accepted by the local population at present day.

Discussion – what do these two case studies have in common?

In the course of time farm forest management caused the development of a variety of forest types depending on the geographical site and the shape of landscape. In Austria they comprise coppice forests with and without standards in the summerwarm east as well as selection forests in the high alpine region, mixed broadleaved forests or dense monocultures of Norway spruce in the Alpine foothills, even age or multiple storied stands. They developed due to the multiple products these forests offered to the rural population such as wood, pasture, alpine pasture, litter harvesting, and the production of manure by soil or branch litter harvesting. All these different kinds of management occurred either as ecologically well balanced arrangement or as a product of unplanned and often extensive utilization. The multiple reasons for overutilization have often the same roots. At the first beginning of settlement each farmstead was equipped with the same amount of forest resources (own forest land, utilization rights). Caused by population growth, inheritance, selling and buying this fairness got lost from the 14th century onwards. In addition new settlers immigrated into the village such as miners and craftsmen who demanded to participate in the utilization of the common land even they did not own a farmstead with entitled utilization rights.

Since the 13th century the members of the commons took over responsibility for the shaping of the living space and the safeguarding of the given resources by participation in the administration as well as the management of the common woodland. The self-governance practiced at the beginning by the commons concerned the forest management as well as the regulation of pasturing and litter harvesting, but also the maintaining of wells, roads, fences, and bridges. In case commons (major, village-representatives) made efforts to give the land-less population a part or full access to the multiple forest products, balanced structures within the community were maintained. This modus operandi was often articulated by the wording "we give them access for the sake of piece". As a result the common was able to preserve the self governance against the interest and pressure from outside, such as from the manor or the State. In case of serious disagreements within the community of villagers the commons often lost their former rights partly or even totally.

In the course of time the increasing interest of the sovereign in the forest resources as well as societal suspensions with regard to forest uses within the community caused tremendous conflicts. Not later than in early Modern times the power of forest authority developed also in those forests not being in the ownership of manors or the State. Common forests became banned by the sovereign to serve as a hunting place or for the sake of the supply of the mining industry. Thus the forest area became the object of claims for power, the sovereignty of commons was restricted, and the free ownership of farmers jeopardized. The basic elements the forest authorities relied on were (1) the right of noblemen to protect their property, (2) the right and duty of the manor to control the economic handling of the subservants, (3) the right of the authority to control the common property and (4) the right to control the forests which were reserved for the supply of the mines (Johann, 1983, 112).

The dominance was remarkable and comprised prescriptions concerning the rotation period as well as the extent of utilization and the location of harvesting (Johann, 1993, 213-223). The authority justified the supervision with the claim to protect the forest and to avoid forest destruction carried out by farmers. Seen with the eyes of the forest authority the multiple uses of forests such as forest grazing, litter harvesting and tar and limestone burning were generally overutilization and misuse. These uses were considered to be minor utilizations and received increasingly pressure by legal restrictions. However, certain consent among the farmers being entitled to these rights was able to avoid the extended uses and was the precondition for a sustainable forest management. Without this consent the ecological balance of the respective forest stand was endangered.

On the social level the arrangement between forestry and rural interests in any case were important factors. When ownership and utilization rights were secured on a long-term basis, the interest of the rural population in the sustainable management as well as the protection of forests was strong. The elements of rural economy (self supply, multiple forest use, selection forest management, coppicing) resulted in the maintenance of some kind of ecological balance in the forest. Far-reaching utilization in common forests as well as in farm forests was rather unusual. Also the transition or transformation of the forest stands caused by changing demands and new management methods as well as global market conditions came into being rather slowly.

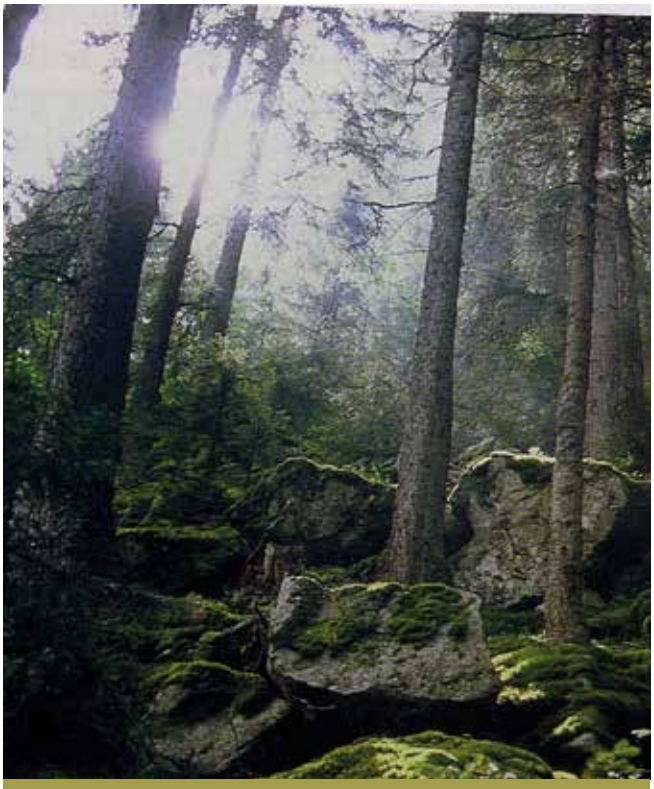
Effects of management and forest use

Today wood and forest economy are the most important economic branches in Austria and regularly generate a high trade surplus. The intensity of forest management in Austria has been and still is very much shaped by the conditions of the site such as the inclination of the slopes and the seclusion. The construction of forest roads and the increasing technical progress also with regard to wood harvesting and transport offer new possibilities for wood harvesting, thus having a direct impact on the ecological structure of forest stands and their affinity to nature. In addition, global developments such as population and economic growth, trade liberalization and new markets have a remarkable influence.

Despite of the intensive management lasting for centuries the Austrian forests still represent rather

predominately natural ecosystems compared to the strongly anthropogenic shaped European cultural landscape. The present high biodiversity is based among other factors on the ecological frame conditions such as climate, pattern of the natural landscape, geology as well as forest communities which also are the outcome of these natural site factors. According to the demand of society it has to be in the focus of forest management to maintain the site adapted to a relatively high biodiversity, still existing in a considerable part of the Austrian forests, particularly in the context of the global retreat of natural forests (Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, 2004).

Beside the sustainable production of wood the society looks forward to a variety of other benefits the forest should make available all the time, such as the protection against natural hazards (avalanches, mudflow and rockfall), the regulation of waterbalance and climate, the deployment of water resources and recreation areas as well as the compensation of environmental impacts. In a typically alpine country like Austria ensuring and enhancing the protective effect is particularly important. Thus the social and environmental functions of the forests are crucial for the quality of life of the entire population. However, the performance of the forest ecosystem depends on ecological stability. A site-adapted biodiversity is considered to provide the basic precondition. It contributes in a substantial way to the optimization of the overall benefits of the forest land.



Photograph 24: Close to nature forest stand in the Mallnitz-valley. Since the 17th century it protected the people and their asset against avalanches. Wood cutting was not allowed. Therefore the natural composition of tree species maintained till present day (NPV Kärnten).

Benefit for today's society

In Austria biodiversity has mostly increased in the course of cultural history due to extensive management. However, starting from the time of industrialization and intensified during the recent fifty years a dramatic loss of this diversity came about also in Austrian. Here biodiversity is endangered by the fragmentation of the landscape and habitats caused by the construction of roads and new buildings, the abandonment of traditional land use systems, the impact of pollution and additional nutrients, and climate change (Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, 2009).

Maintaining this diversity represents a special responsibility. Since 1994 Austria has been one of the states being contracting parties to the Convention on Biological Diversity (CBD). Six National Parks with a total of 235.000 hectares, several Nature parks and Nature protected areas often embedded in lovely landscapes, one Biosphere reserve located partly in and around the city of Vienna and a considerable number of protected areas due to the Austrian Natural Forest Reserve Programme constitute last areas of retreat for animal and plant communities which, without appropriate protection measures, would be threatened by extinction. In addition 14.7% of Austria's territory is nominated as Natura 2000 - the pan-European ecological network of special areas of conservation for the protection of rare habitats and species. Lower Austria is on the second range with 23% (Umweltbundesamt, 2013).

Parts of the forest area addressed in the two case studies were included in one of these protected areas within the last twenty years, such as parts of the coppice forests in the Lowlands, which are now integrated in the pan-European network Natura 2000. Particular management plans have been worked out to maintain the present status. In the high mountains protection forests maintained by farm forest management for centuries were put out of production and became part of the first Austrian national park (Photograph 24). It is the merit of our ancestors that the use and management of these cultural landscapes, particularly the forests, was able to preserve the biodiversity of plants and animals our society in longing for in present times.

Conclusion

Because the local people heavily depended on the natural given resources they were forced to develop sustainable management systems to secure the living space. As long as the communities had the sovereignty with regard to the shaping of the cultural landscape and were self responsible for the sharing out of the various forest products among the villagers, the traditional forest

management was able to reach this goal. The cooperative coppice forest management carried out in Lower Austria centuries ago and still continuing in present days, or the joint responsibility of commons of the mountain regions with regard to the maintaining of the protection forests may serve as good examples of the functioning of the mutual traditional practice.

Today, caused by supra-regional and global concerns relating to the destruction of nature and its biodiversity protected areas are proclaimed, often banned, and in case of need also management plans are developed and implemented. However, what we can learn from history is the fact that the implementation of these plans will only be successful in the future if it takes into account the local demands, and if utilization conflicts can be solved reasonably. Thus the acceptance and participation of the local population in the shaping of the cultural and natural landscape are important tools which should not be neglected.

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