NATURA Tip 19

Gypsum Karst Area near Osterode

Harz

GEOPARK
Harz . Braunschweiger Land . Ostfalen

Rural idyll along the Karst Trail: chapel in the village of Ührde

Formed by Water

You know the feeling: there are moments when you would like to vanish into thin air in order to avoid an embarrassing situation or the demands of daily life. Solving the problem would be the right strategy. Ignoring it, on the other hand, only creates new problems, up to an including serious ones of a material nature. These may then described with phrases like: "A great hole has opened up." The natural phenomena and experiences which are behind our oft-used sayings have frequently been forgotten. Dolines, sinkholes or swallets are often only a few metres deep, but they can reach depths of more than 300 m. These are three of the names given to karst phenomena. Karstification is the result of corrosion, the chemical decomposition of stone by various substances dissolved in water. In comparison to oxygen or nitrogen, carbon dioxide (CO_2) is relatively soluble in water.

Doline on Lichtenstein Hill

Gypsum karst near Ührde

All three gases are found in the air we breathe and, therefore, seem harmless. Nevertheless: in the current discussion regarding causes of global warming, CO_2 has fallen into disrepute as a "climate killer". On the other hand, its effervescent effect in sparkling wine or mineral water is highly valued. Depending on temperature and pressure, CO_2 can react with water to form carbonic acid. This has the capacity to dissolve stone containing high levels of calcium carbonate. As a result, in areas where dolomite is found, subterranean run-off of precipitation can occur. Gypsum is also water-soluble (up to 2 g/litre of water). Cavities form, which may collapse without warning. Entire houses have disappeared from the Earth's surface as a consequence. Karstic landscapes are, as a result, varied in form, like the one we find here on the southern edge of the Harz Mountains.

Early Inhabitants and Complexly Interconnected Habitats

In German the saying "to make gravel" means "to make money". It stems from the possibility of making money from extracting and selling raw materials. The way we live and work today would not be possible without advanced methods of raw material production. This insight alone, however, is not enough to ensure responsible use of valuable natural resources. We already know, from the period when the energy requirements of the mining industry in the Harz Mountains had to be met with wood and water power alone, how important it is to operate sustainably. Surface outcrops of gypsum are a very rare geological occurrence in central Europe. The largest contiguous gypsum karst area in Germany is located on the southern edge of the Harz and Kyffhäuser Mountains. Gypsum karst landscapes contain various habitats worthy of pan-European protection, including **"turloughs"**, **"(gypsum) caves not open to the public"**, and **"(semi-) natural rocky slopes with their specific vegetation"**. Here, on the southern edge of the Harz Mountains, they are found in the midst of the more regionally important habitats of forest and agricultural land. The latter has been created since humans settled the region. In 1980, Kathrin von Ehren, a biology student, made the first discovery of human bones in Lichtenstein Cave. Due to the chemical environment of the gypsum cave, the skeletal remains of almost 60 individuals spanning five generations had been so well preserved that DNA analysis of nearly all of them was possible. Palaeogenetic analysis was even able to demonstrate relationships to present-day residents of the Söse Valley. Sensationally, two highly probable descendants and 47 other probable descendants could be identified. Evidence of almost 3,000 years of settlement continuity!

The Area

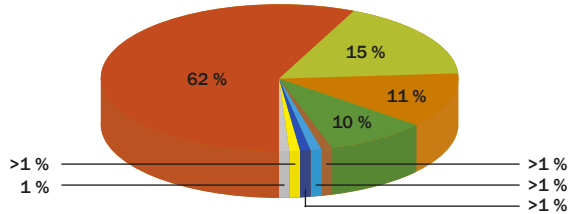
Designation	Gypsum Karst Area near Osterode
Code	FFH 133 Nds, DE 4226-301
Location	Karst Landscape near Osterode
Characteristics	Biotope complex on Zechstein and Bunter strata. Semi-natural core area with beech forests and variegated gypsum karst structures (caves, sinkholes etc.). Open landscape with grassland, semi-arid grassland on calcareous substrate, arable land.
Area	1.327,00 ha

Entry to Lichtenstein Cave

At home in the Söse Valley

Forest on Lichtenstein Hill ...

... and open landscape



	FFH-LRT 9130	Asperulo-Fagetum beech forest
	FFH-LRT 6510	Lowland Hay Meadows
	FFH-LRT 9110	Luzulo-Fagetum beech forest
	FFH-LRT 8310	Caves Not Open to the Public (58 examples)
	FFH-LRT 6210	Semi-Natural Dry Grasslands on Calcareous Substrates
	FFH-LRT 9180	Forests of Slopes, Screes and Ravines
	FFH-LRT 91E0*	Alluvial Forests with Alnus glutinosa and Fraxinus excelsior
	Other habitat types	Medio-European limestone beech forest, hydrophilous tall herb communities, calcareous rocky slopes with chasmophytic vegetation, Galio-Carpinetum Oak-Hornbeam Forest, turloughs, Natural Eutrophic Lakes, rupicolous calcareous grasslands, species-rich Nardus grasslands
		Non-habitat types

Cave Experience Centre, Bad Grund
Iberg Dripstone Cave
www.hoehlen-erlebnis-zentrum.de

* Priority habitat type for protection

Asperulo-Fagetum beech forest

The European beech is the most competitive tree species in Central Europe. It dominates the semi-natural forests in the Geopark. What makes the European beech so successful? The shade cast by its dense canopy blocks direct sunlight from reaching its competitors. Even beech saplings only have a chance when thick forest is thinned out. This opportunity is today provided by commercial forestry practices, long before older trees die naturally. Among important habitat types there is a differentiation between Luzulo-Fagetum beech forest and Asperulo-Fagetum beech forest. The latter grows on base-rich, fresh brown soils with high water-retention properties. Such soils often form atop loess deposits from the end of last Ice Age, limestone or dolomite. Early in the year, before the canopy has closed over, a species-rich ground vegetation layer develops.

Lowland Hay Meadows

In its natural state the gypsum karst area near Osterode would be covered by forest. Only through human use were large, deforested areas created. These are principally used for agriculture, as cropland or grassland. The latter can be subdivided into hay meadows or pasture. Whether livestock, such as horses, cattle, sheep, or goats, graze on the grasses and other plants found in the pasture and leave their manure behind or, alternatively, the meadow plants are mowed in the space of a few hours, makes a huge difference! If such grassland is regularly (once or twice per year) mowed and consequently receives little fertiliser, then, in plains or low hill country, lowland hay meadows form. This type of meadow is particularly rich in a variety of species of flowering plants. Typically, the meadow is first mowed after the grasses main flowering period.

Asperulo-Fagetum beech forest

Luzulo-Fagetum beech forest

Hay Meadow

Dry Grasslands on Calcareous Substrate

Luzulo-Fagetum beech forest

In contrast to Asperulo-Fagetum beech forest, Luzulo-Fagetum beech forest is species-poor. This means that only a few plant species can be found in the generally sparse ground vegetation layer. The reason for this can be found in the soil and the geological substrata. If this consists of base-poor stone or acidic weathering stone, like bunter sandstone or greywacke, then brown soils with poor water retention properties are formed. Typical ground cover is a member of the rush family which lends its name to this forest community and habitat type: the white wood-rush (Luzula luzuloides). Also commonly found are wood sorrel, common oak fern and hair moss. If we take fungi and insects into account, then Luzulo-Fagetum beech forest is by no means species-poor. The current National Forest Inventory lists Luzulo-Fagetum beech forest, with 4.4 million ha, as the most common natural forest habitat in Germany.

Semi-Natural Dry Grasslands on Calcareous Substrates

Semi-arid grasslands are cultural biotopes. Their existence depends on regular use or maintenance, for example as pasture for sheep, being mowed once or twice per year, or being mowed once per year with subsequent grazing. When grazed, the selective choice of some plants and avoidance of others acts as the fundamental factor differentiating vegetation. Pubescent plants, above all, along with species containing essential oils, resins, tannins, or glycosides that make them either poisonous or unpalatable, are avoided by grazing animals and, therefore, promoted. Plant species that grow close to the ground cannot be easily grazed and prosper as a result. The bee orchid and the fragrant orchid, for example, grow on the nutrient-poor soil. If the land is no longer utilised, shrubs and bushes will rapidly spread.

For its project "NATURA 2000 in the Harz Nature Park", the Regionalverband Harz was recognised as a finalist in the 2018 Natura 2000 Awards given by the European Union.

Caves Not Open to the Public

In Lower Saxony caves – that is, underground cavities, possibly containing water, which are populated with specialised and/or endemic animal species – are, with very few exceptions, only found in limestone or gypsum. Through continuous leaching and sporadic rock-falls from cave roofs, ever-larger cavities can be formed. The position and number of surface openings create distinct differences in the ventilation of individual caves and cave systems and, by extension, differences in humidity and temperature. Plant growth (algae, moss) is only possible close to openings due to the resulting exposure to light. Cave entrances need to be secured in such a way that light can still enter and that air can circulate unhindered. Natural caves are natural biotopes which exist independent of human cultural influence.

GEOPARK
Harz . Braunschweiger Land . Ostfalen

The Natura 2000 Area is completely within the UNESCO Global Geopark Harz • Braunschweiger Land • Ostfalen. Here, we are in the area of Landmark 11 – Old Fortress, Osterode am Harz. The largest Geopark in Germany is characterised by its striking geological variety and rich mining history. Natural and man-made rock outcrops, cliffs and publicly accessible caves open windows into the history of the Earth. As a member of national and international networks, the organisation responsible for a Geopark is required to ensure the protection of geological heritage and support for regional development. Raw material extraction, within the framework of the applicable laws, is allowed within the territory of UNESCO-Geoparks. A further challenge that agencies responsible for Geoparks around the world have to meet is provision of education and training in the field of sustainable development.

Winter in Jetten Cave

Eutrophic lake

Gypsum quarry

Geopark stele

Other habitat types

The gypsum karst area near Osterode is markedly diverse. Beside the Natura 2000 habitat types described here, the following can also be found: **Tilio-Acerion forest of slopes, screes and ravines, alluvial forest with Alnus glutinosa and Fraxinus excelsior, Medio-European limestone beech forest, hydrophilous tall herb communities, calcareous rocky slopes with chasmophytic vegetation, Galio-Carpinetum oak-hornbeam forest, turloughs, natural eutrophic lakes, rupiculous calcareous grassland and species-rich Nardus grassland**. The names of the habitat types are self-explanatory. But what are turloughs? In Irish the word "turlach" refers to a winter lake – a karst lake only periodically filled with water. Such temporary karst lakes are exceedingly rare in Germany. They occur in depressions on the southern edge of the Harz as a result of extreme precipitation events. The white substance found when a turlough dries up is called "algal paper".

Born of the Sea

The extraction and processing of gypsum in the southern Harz region has a history stretching back more than 1,000 years. Today, however, this industry is more controversial than ever. The landscape of the southern Harz foreland between Förste in Lower Saxony and Pölsfeld in Saxony-Anhalt is chiefly characterised by carbonate and gypsum strata dating to the Zechstein period. Ca. 255 MYA (Upper Permian) this area formed part of a shallow basin in the Zechstein Sea. The climate was arid. High rates of evaporation resulted in increasing salt concentrations. The basin dried up time and time again. The material held in solution in the water was deposited in a repeating sequence of carbonate, sulphate (white gypsum) and chloride. The process of evaporation, deposition and new influx of water due to rising sea levels was repeated about four times.

Entry to the caves is forbidden!

Karst Trail

Those who would like to discover the EU Site of Community Importance (SCI) should begin with the Karst Trail. The concept of the Karst Trail is older than EU Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (a.k.a. Habitats Directive) enacted in June, 1992. The establishment of the Karst Trail began east of the Inner German border in 1982, in what was then the District of Sangerhausen in the present-day federal state of Saxony-Anhalt. With the later involvement of the District of Nordhausen (Thuringia) and the former District of Osterode am Harz (Lower Saxony) the trail has connected three federal states since 1996. Between Bad Grund in the District of Göttingen and Pölsfeld in the District of Mansfeld-Südharz the trail measures 239 km and allows hikers to experience the karst landscape which stretches ca. 100 km as the crow flies on the southern edge of the Harz Mountains.

Learning to Read the Landscape

Our first port of call is the entrance to Lichtenstein Cave. Its immense importance for research into the history of settlement in the Söse Valley, stretching back to the Bronze Age, has already been mentioned. Maidenhair spleenwort grows here. A black woodpecker – the king of the beech forest – calls in the distance. High above sit the ruins of Lichtenstein Castle. It was first documented in 1404. Wild garlic has taken over the motte and moat. A little later, a sign on the Karst Trail draws attention to erstwhile ridge and furrow fields. The form, course and spacing of this medieval cultivation system are still clearly recognisable. After Lichtenstein Castle was abandoned in the second half of the 16th century, the forest began to take over once more. Nearby we find sinkholes on Bauernberg Hill.

Looking back toward Förste

Trail sign on Lichtenstein Hill

Ruins of Lichtenstein Castle

At our goal in Hörden

One SCI after the other can be found along the Karst Trail. Effectively protecting these areas is a challenge of international importance. In the village of Förste, administratively part of Osterode am Harz, the Karst Trail branches into a northern and a southern route. Beginning from the Sültebreite bus stop, with connections to and from Badenhausen, Katlenburg and Osterode, we take the southern route. We pass by the Salza springs on our way to Lichtenstein Hill. We then follow the clearly signposted Karst Trail in the direction of Ührde and, just on 2 km later, reach the Gypsum Karst near Ührde Nature Reserve, which is part of the Natura 2000 area. From here on we are required by law to stay on the marked paths. These are easily accessible at all times of year. Don't forget: in karst landscapes water principally runs off underground. The long-term consequences of this, in the form of swallets and dolines, are everywhere. Hart's-tongue fern can be found here.

An information board explains the difference in how sinkholes and solution dolines are formed. From here our gaze falls upon a nearby active gypsum quarry. The Mammutstein ("mammoth stone") helps us to read and understand the landscape. Shortly after this we cross the B 241. Seven chambers: water found an underground path along a geological fault. A cave system was created which collapsed over time forming this line of sinkholes. We soon reach Ührde, a picturesque village offering the chance to take refreshments. The Karst Trail then continues on to Feldherren Hill. A **S3** trail marker piques our interest. In order to satisfy our curiosity we leave the Karst Trail, which traces a wide arc through Düna to Hörden. Upon reaching Hörden the gypsum karst area near Osterode has been crossed in a southeasterly direction. At the point where the Karst Trail crosses Hauptstrasse we find a bus stop next to the church.

Hiking In and Around Schwiegershausen

The village of Schwiegershausen, administratively part of Osterode am Harz, is home to almost 1,700 inhabitants. It is located to the south of the Karst Trail. Members of the community are active in a multitude of clubs and organisations. Among them are the Schwiegershausen Village Theatre group, which received the 2015 Harz Cultural Award given by the Regionalverband Harz, the Schwiegershausen History and Traditions Society, the Traditional Orchards Association and the local chapter of NABU. The TSV Schwiegershausen Gymnastics and Sports Club can look back over a club history of more than a century, having been founded in 1906. The club includes a hiking group with a current membership of almost 30. The group, working together with the local forestry and agricultural co-operative, has signposted three hiking loop trails around Schwiegershausen, two of which can be extended with connecting trails.

Sign for trail S3A


View from Schmachtberg Hill

The latter are particularly well-suited to exploring the gypsum karst area near Osterode. All three begin and end at the sports hall in Schwiegershausen. The best thing about loop trails: a hike can be started anywhere along the trail! For an initial exploratory hike, we recommend trail **S3A**. This code is found on the trail markers. These consist of easily visible, red/brown signs and markings on trees. Erwin Fichtner, head of the TSV Schwiegershausen hiking group, is confident: "No-one will get lost." For those who hike for exercise, the journey is the reward. Nevertheless, there are also a number of attractive points of interest. On the **S3A** trail extension these include the Hinterer Schmachtberg and Feldherren Hill lookout points, the latter of which is on the Karst Trail (see Infopoint "Am Rosenberg"). We begin at the trail parking area, located 100 m east of the road (L 523) between Osterode am Harz and Schwiegershausen, in the direction of Düna.

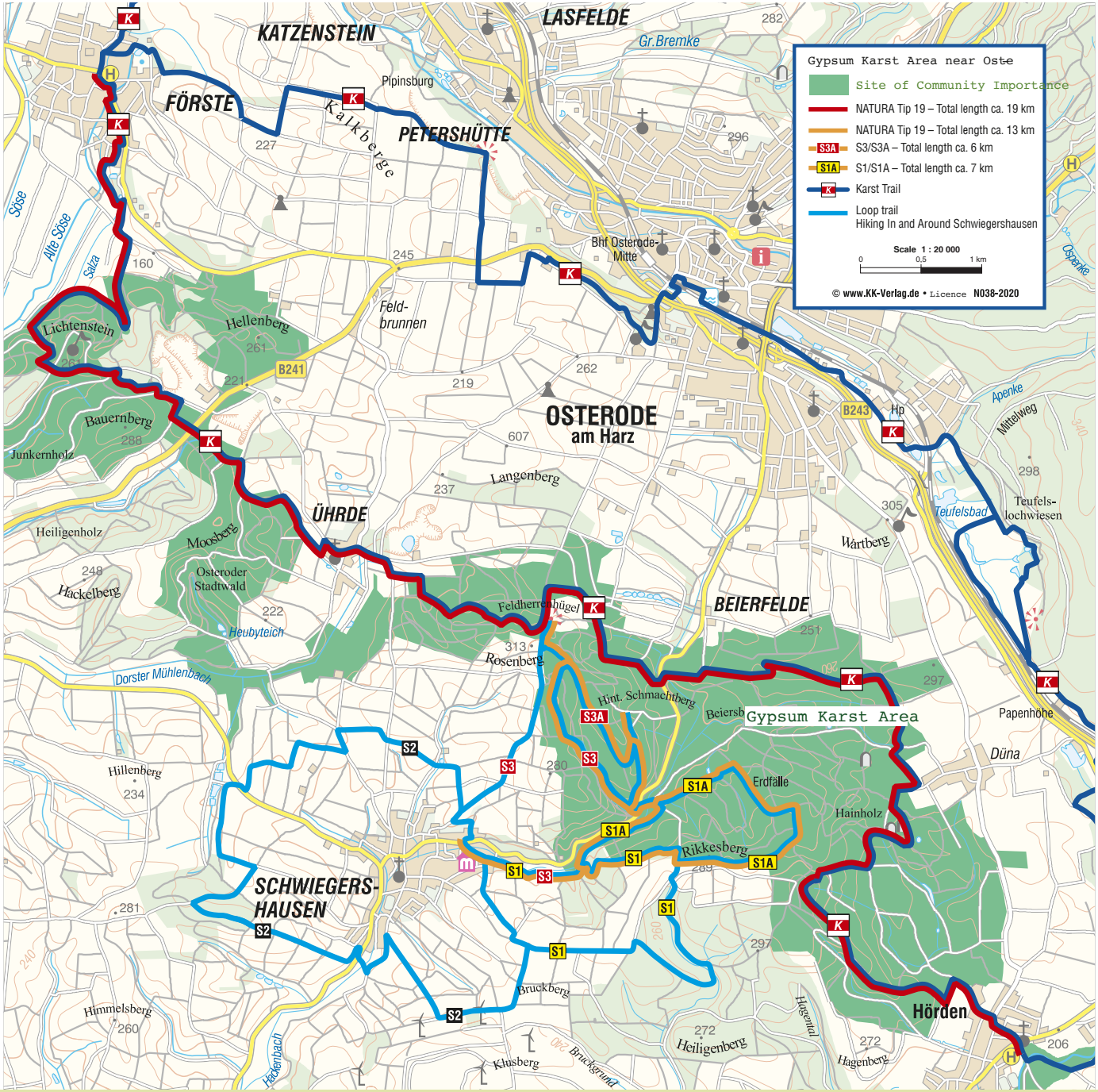
Hiking the Loop Trails

From the parking area we head to the bike path along the L 523 and turn left onto it. We follow it for a short distance, before carefully crossing the road and hiking along a wide forestry road for a short distance. We then follow the first sign we see for trail **S3A**, uphill to the Hinterer Schmachtberg lookout. If we wish to go on we turn sharp right. Our expectations of the view from Feldherren Hill will not be disappointed! We then follow the trail back to where we started. Our next hike begins at the sports hall on Sporthallenstrasse in Schwiegershausen. The trail leads east out of the village. Trails **S1** and **S3** follow bike trail T5 to begin with, which is paved as far as the "Shropshire Ranch" shelter. Just over 100 m later we reach a fork in the trail and bear right, heading uphill. We follow the unpaved road and, after an S-bend, are rewarded with a beautiful view in the direction of


Barn along the trail


Fields of sinkholes

Beierfelde and a bench to the right of the path. 400 m further on is an old barn on the edge of the forest and 200 m after that we bear right up the steep hill. At the top, on the forest's edge we have a clear view toward the wind turbines on Klusberg Hill. We then leave the main **S1** trail, which heads south, and take a sharp left to go east on the grass-covered **S1A** trail on Rikkesberg Hill and are rewarded with a wonderful view over the Gypsum Karst Landscape Nature Reserve toward Osterode and the southern edge of the Harz Mountains. Further east it is shaded as we head into the forest and continue uphill past old European beeches and back out into sunny expanses of meadow. The trail through fields of sinkholes leads back to bike trail T5 along the L 523 which we follow back to the sports hall in Schwiegershausen.


Gypsum Karst Area near Oste
Site of Community Importance
NATURA Tip 19 – Total length ca. 19 km
NATURA Tip 19 – Total length ca. 13 km
S3A S3/S3A – Total length ca. 6 km
S1A S1/S1A – Total length ca. 7 km
K Karst Trail
Loop trail
Hiking In and Around Schwiegershausen
Scale 1 : 20 000
0 0.5 1 km
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Feld-
brunnen
Bhf Osterode-
Mitte
B241
B243
OSTERODE
am Harz
Bauernberg
Junkernholz
Heiligenholz
Moosberg
Osteroder
Stadtwald
Hackelberg
ÜHRDE
Langenberg
Aperke
Mittelweg
Teufelsbad
Teufels-
lochwiesen
Wartberg
Hp
Feldherrenhügel
BEIERFELDE
Rosenberg
Hint. Schmachtberg
Beiersb
Gypsum Karst Area
Papenhöhe
Düna
Erdfälle
Hainholz
Rikkesberg
Dorster Mühlenbach
Heubyteich
Hillenberg
SCHWIEGERS-
HAUSEN
Himmelsberg
Bruckberg
Klusberg
Brucksgrund
Hagental
Heiligenberg
Hagenberg
Hörden
Ostanke

Edible Dormouse *Glis glis*

This rodent from the family Gliridae hibernates for up to seven months a year. The edible dormouse, with a body length of up to 21.5 cm and weighing up to 280 g, is the largest of the European dormice. Its long, bushy tail of up to 19 cm functions as a blanket during hibernation. In their characteristic sleeping posture dormice nestle, rolled into a ball from the tips of their noses to those of their tails, in a nest of dry foliage. Dormice are social animals. During their active phase they feed on seeds, fruit, buds and bark, building up a layer of fat for the winter. Proximity to humans is accepted. As they are nocturnal, the presence of these little "poltergeists" is a questionable acoustic "pleasure". Their young are born in summer (July to September) with four to six young per litter.

Badger *Meles meles*

Their body length is similar, but in autumn a badger can weigh twice as much as a fox. The damage caused if a badger is hit by a car is correspondingly great. Unfortunately, such accidents are all too frequent. The large number of dead animals along the sides of roads demonstrates how widely the badger is distributed. When it comes to food badgers are not picky. They especially like earthworms. These, however, don't come to the surface until the nightly dew has formed. Therefore, the day can be spent in good company in the extensive, widely-branching sett. The cohabiting group consists of parents and the cubs from both the current year and the previous year (between two and four per litter). Setts remain in the control of a single family across decades and are continuously extended. In this way badger "manors" are formed with extensive systems of passages.

Edible Dormouse

Western Barbastelle Bat

Badger

European Green Woodpecker

Western Barbastelle Bat *Barbastella barbastellus*

With a little luck it is possible to observe bats flying at dusk. To identify the exact species is almost impossible for the lay observer, however. The western barbastelle is small and dark-coloured, almost black. Characteristic are the pug-like face and short, wide ears which meet at their base. The whitish tips of the hairs on their backs gives their fur a frost-like shimmer. Their diet consists of insects, principally small moths and other soft-bodied insects which fit into their small mouths. Their homes are holes: tree hollows in summer and karst caves in winter. They reach sexual maturity within their first year. Females give birth to one or two young between June and July which are suckled for up to six weeks. The mating period is in late summer.

European Green Woodpecker *Picus viridis*

It is estimated that there are fewer breeding pairs of European green woodpeckers in the whole of Lower Saxony than there are inhabitants of Dorste, Förste and Schwiegershausen together. Green woodpeckers love ants, especially meadow ants. A green woodpecker's tongue is over 10 cm long and has barbs on its sticky tip. It is the ideal tool for gathering ants. Green woodpeckers are dependent on old broadleaf trees in which to make their nesting holes. In the period from April to May females will incubate between five and eight pure white eggs in their nesting hole. Males take part in raising the brood. Parents are monogamous for the breeding season. They cannot conceal their presence. Their loud, laugh-like mating calls are unmistakable. Their undulating flight is also distinctive; between wing-beats their wings are pressed to their bodies. Green woodpecker nesting holes quickly find new occupants.

White Wagtail *Motacilla alba*

A woodpile or a raised hunting blind: both are acceptable as nesting locations. Even in close proximity to humans white wagtails find a way to construct a well-hidden nest, in a niche somewhere in a barn, stable or house. In the countryside they are known as "the little man of the fields". At the end of February and beginning of March, when farmers prepare their fields for summer crops, white wagtails return from the Mediterranean area, where they overwinter. Then we can admire these black-and-white beauties as they bustle about on the ground with their long, ever-wagging tails, on the hunt for insects. They prefer to do so on flat ground with little vegetation, on the banks of waterways, along paths or in quarries. They also like to spend their time near grazing animals. Their clutch of eggs usually numbers five or six. The male sits on the nest for some hours during the day, at night it is always the female.

White Wagtail

Marsh Tit

Common Toad *Bufo bufo*

The approach of a rival is met with the typical threat posture: lowered head and raised hindquarters. However, humans have absolutely nothing to fear. The secretions from their wart-like glands protect their skin from colonisation by damaging microorganisms. The crepuscular and nocturnal common toad hides during the day. Surprisingly, this most common among our native toad species can also be found in very dry habitats, far from any large bodies of water. They can cover large distances by walking, hopping only when they are disturbed. Wet weather during spring will draw common toads to their spawning waters. Roads that must be crossed, and which, during the evening and night, slowly release the warmth of the spring sunshine, are energy filling stations for them. These poikilothermic animals use them as resting places on their arduous journeys, oblivious to the dangers they present.

Common Toad

Marsh Fritillary

Marsh Tit *Parus palustris*

Just as the green woodpecker and the grey-headed woodpecker are easily confused, so it is with the marsh tit and the willow tit. It is difficult for the lay observer to confidently identify the two species. In contrast, experts don't even have to see the birds, so distinctly different are their calls and song. Those wishing to ascertain the presence of marsh tits will have to leave the warmth of the hearth early in the year. The unobtrusive "grey tit" begins to sing in February. Once their eggs have been laid, the small songbird falls silent. Thanks to a reclusive lifestyle and exceptional knowledge of their territory, marsh tits have a relatively high life expectancy and can live 10 years or more. They remain loyal to their territory once it is established and live in mature broadleaf forests, in parks or in cemeteries. During winter they occasionally visit feeders near their breeding territory.

Marsh Fritillary *Euphydryas aurinia*

This butterfly of the Nymphalidae family is endangered throughout Germany and is strictly protected. The markings and colouration on the upper side of the wings – brownish with swathes of light- and dark-orange – is very similar in both sexes but, as a whole, extremely variable. A row of black spots near the outer edge on the underside of the rear wings is characteristic of the species. The wingspan of this warmth-loving butterfly is 35 to 38 mm. Butterflies of the single generation per year fly between April and July. The black, prickly caterpillars feed within communal webs. On dry grassland they principally feed on pigeon scabious, less frequently on other species in the Dipsacoideae and Gentiana genera. In wetter areas they feed principally on devil's-bit scabious. In August the tiny caterpillars build a cocoon in which to overwinter. In the following year they feed solitarily.

Maidenhair Spleenwort
Asplenium trichomanes

In 1546 Hieronymus Bock, the famed Lutheran preacher, doctor and one of the "fathers of botany", named this plant "red rockfoil". Rockfoil indicates where this fern is typically found: half shaded, frequently rocky locations on calcareous or siliceous stone where nitrogen-poor soils form. Maidenhair spleenwort is perennial, growing to between 5 and 30 centimetres in height and is rhizomatous. They have simple pinnate fronds. Both the stipe and rachis have small pinnae and are coloured glossy red-brown to black-brown almost to the tip, hence the earlier name "red rockfoil". The pinnae are between 2 and 12 mm long, round or oval, somewhat asymmetrical, bluntly dentate on their edges, and arranged on a single level. Each frond has between 15 and 40 pinnae on short petioles which may be positioned opposite or alternately.

Bee Orchid *Ophrys apifera*

It is among the rarest and most highly endangered plant species in Germany despite the fact that it is incredibly undemanding. However, in a wealthy country like Germany, a country in which the soil is copiously supplied with nitrogen, either directly or indirectly, that is precisely the problem. Experts call this problem eutrophication. The rich supply of nutrients in the soil creates an advantage for plant species which are more highly competitive. Such species overrun the available land, and not just land used for agriculture. Orchids simply do not receive enough sunlight in such conditions. The bee orchid is a perennial, herbaceous tuber, growing to a height of between 20 and 50 cm. Two to four leaves, 6 to 13 cm long, are arranged in a rosette. The green leaves have a silvery sheen. The leaf rosettes develop in early autumn.


Maidenhair Spleenwort


Hart´s-tongue Fern


Bee Orchid


Fragrant Orchid

Hart's-tongue Fern
Asplenium scolopendrium

With shining eyes those interested in botany discover, as they peer into a medieval castle well, a hart's tongue! This species from the family Aspleniaceae can't be found in large parts of Germany. It is listed as "strictly protected" under the Federal Species Protection Regulations and appears on numerous Red Lists. Due to its undivided fronds it is easy to distinguish the hart's-tongue fern from all other European ferns, which generally have pinnate fronds. It is most commonly found on light-to-shady, seeping wet, steep slopes with northern exposure, in calcareous, base- and humus-rich ravine forests dominated by ash, maple and lime trees. It also sometimes colonises scree piles and moist walls of calcareous stone, for example in cemeteries or in wells.

Fragrant Orchid
Gymnadenia conopsea

The fragrant orchid, or chalk fragrant orchid, produces its inflorescence from May to July. The individual flowers, ranging from pink to dark crimson, secrete large amounts of nectar. As the opening of the nectar spur is less than 1 mm wide, only butterflies and moths can gain access. To attract these pollinators the fragrant orchid exudes scent. 45 different scent compounds have been identified so far. Not all of these are exuded at the same time – some are only exuded during the day and some only at night. But then, why should scent compounds be exuded at night when they only attract butterflies? Nature gives nothing away for free, especially not in resource-poor habitats which is where most indigenous orchids grow! The tiny seeds weigh only 0.008 mg each.

Wild Garlic *Allium ursinum*

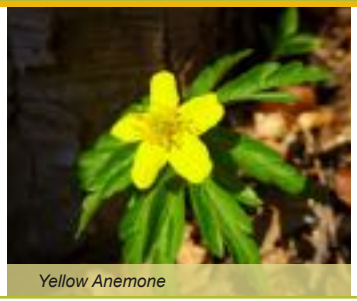
Leek is a well-known vegetable. The cultivated form is descended from the wild leek, a medicinal and spice plant native to the Mediterranean area. In contrast, wild garlic, or bear leek, never grows in a field and can only be grown in a garden when forest-like conditions, even if only on a small scale, are available. Wild garlic doesn't flourish where agriculture is practised, but rather in places where bears once roamed: in the wilderness or in semi-natural forests. Wild leek or wild garlic: the two species are related (genus Allium). They contain the amino acid alliin. The lachrymator allicin, produced from alliin when alliums are chopped or crushed, has an anti-bacterial effect in the stomach. On the basis of their mild garlic flavour alone, however, the leaves are a popular wild edible from early spring until flowering begins in April.

Yellow Anemone *Anemone ranunculoides*

It blooms at the same time as the wood anemone. Both are considered heralds of spring, which produce leaves and flowers before the forest canopy blocks direct sunlight. The main flowering period of this herbaceous perennial is in April. Where the wood anemone produces only one flower (rarely two) per plant, the yellow anemone produces between one and three (most commonly two). These have five yellow tepals, numerous stamens and are located at the end of a 10 to 30 cm long stalk. The yellow anemone, all parts of which are poisonous to humans, grows on the floor of oak-hornbeam or Asperulo-Fagetum beech forests. Their seeds have nutrient-rich elaiosomes and are spread by ants. In the SCI Gypsum Karst Area near Osterode, small groups of yellow anemones most often grow together with liverwort and lily of the valley.

Wild Garlic

White Wood-rush



Yellow Anemone

Liverwort

White Wood-rush *Luzula luzuloides*

If it was part of a species-rich herbaceous layer in a native (beech) forest, its inconspicuous appearance would make it easy to overlook. In reality it is often an "eye-catcher" because, more than any other, this shade or half-shade plant is found together with European beech trees, even on poor-quality, acidic, and, occasionally, stony substrate. The perennial plant is particularly conspicuous in the winter months, its fresh green easily visible among the red-brown fallen leaves. The white wood-rush, or oakforest wood-rush, tolerates large temperature and humidity fluctuations throughout the course of both days and seasons. Its leaves are distinctly fringed. It produces a paniculate inflorescence in June and July. Its nutritious seeds, with their elaiosomes, are spread by ants, among others.

Liverwort *Hepatica nobilis*

Like the yellow anemone, the liverwort belongs to the family Ranunculaceae. If a child is inspired to paint a picture of a flower, it could well be a liverwort. The flower has a simple form: six to nine matching blue petals and a green centre with the carpels, surrounded by a ring of stamens. It does not secrete nectar. Bees, beetles and hoverflies collect the pollen. Flowers last just over a week. The plant itself, however, lives a long time. It is between four and seven years before it blooms for the first time, doing so in March. The flowers open in sunlight, close again when it rains and at dusk, and the petals continue to grow. Consequently, the flowers grow larger from day to day. At the end of the flowering period new leaves begin to grow which will last through the following winter.

Common Dog-violet *Viola riviniana*

In German it is called "Hain-Veilchen". In his translation of the Bible, Martin Luther used the word "Hain" in its original meaning of "managed, open forest". Such forests were never far from settlements with open land, where the synanthropic common dog-violet can also be found. In open meadows its growth, however, is stunted. The common dog-violet is a deciduous, herbaceous perennial, which can reach heights of up to 30 cm in open forest. "... and make the little violets bloom for us by the brook!" These words by the poet Christian Adolph Overbeck have a melodic quality of their own. Wolfgang Amadeus Mozart set the poem to music and the first verse of the song betrays the peak flowering season – the sweet month of May. The effects of global warming mean, however, that we can now see the striking lavender-coloured blooms as early as April.

Cowslip *Primula veris*

Like some other early-flowering plants, the cowslip prefers warm, sunny locations where they produce their flowers from April to May. These flowers are arranged on the upper end of the stem in such a way that they resemble an ancient key. Among its folk names is "key of heaven". In old records they were often called "St. Peter's key" or "herb peter". The key is the main symbol associated with St. Peter, who was said to have been given control of the keys to heaven. Once he is said to have lost the keys, which fell to Earth. On the spot where they landed grew St. Peter's key, the key of heaven. Since then, this flower, one of the first to appear in early spring, has unlocked the earth, so that other flowers can appear.

Common Dog-violet

Hawthorn

Cowslip

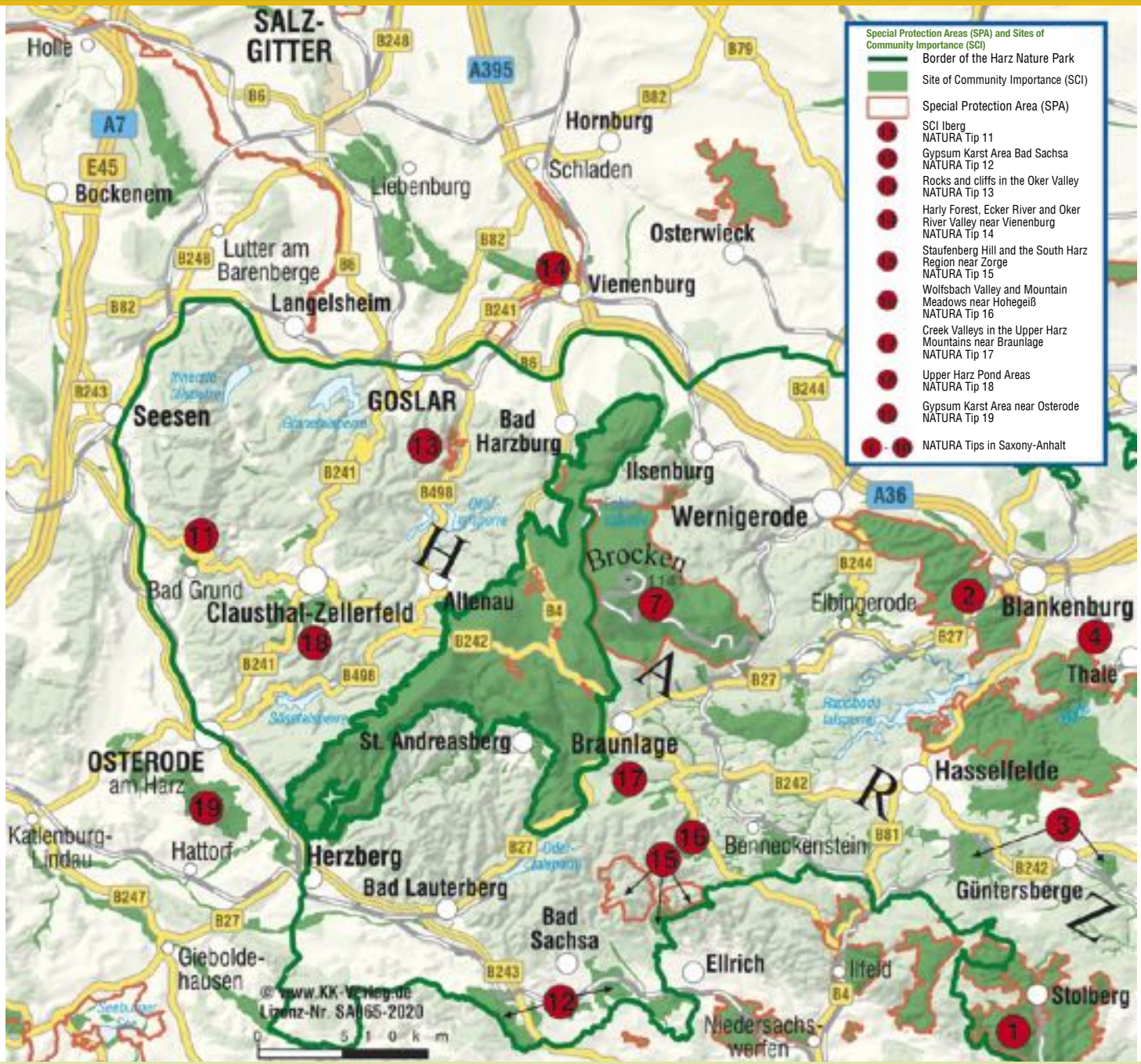
Clustered Bellflower

Hawthorn *Crataegus spec.*

Hated and loved: hawthorns. Belonging to the family Rosaceae and the sub-family Amygdaloideae (the stone fruits), they are part of the group of host plants of the pathogen which causes a much-feared plant disease, one that must, by law, be reported. It is the bacterium *Erwinia amylovora*, responsible for fire blight. This disease, which found its way to Europe from America via the south of England a little over 200 years ago, threatens valuable orchards. The bacteria can overwinter on hawthorn. Besides the beauty of these shrubs or small trees and the purity of their mostly white flowers (May-June), there are a preponderance of uses for hawthorn. The various medicinal properties of the genus Crataegus are highly valued. The three species which occur in Central Europe are very difficult to tell apart. Many songbirds nest in the protection afforded by their thorny branches. The caterpillars of 54 species of butterfly live on hawthorn!

Clustered Bellflower *Campanula glomerata*

This plant is rare in the Harz Mountains, occurring in mountain meadows, semi-dry grassland and dry locations in marshy meadows. Its striking deep violet-blue flowers are produced from June to the beginning of September. It has its bell-shaped flowers to thank for its name, which are produced in tight clusters. Its range stretches from Europe to Mongolia and it is also found in the Caucasus and Iran. The herbaceous perennial can grow to a height of 60 cm. It has sturdy, angular stems with a red tinge, basal rosettes of heart-shaped leaves and sessile cauline leaves which are lanceolate and scabrous. Upper leaves are glabrous, their edges dentate or notched. The clustered bellflower is frequently visited by native bees. It is also a commonly cultivated plant in stone gardens, with a wide variety of flower colours.



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REGIONALVERBAND HARZ E.V.

The Regionalverband Harz is a non-profit association whose members include the Districts of Goslar and Göttingen in Lower Saxony, Nordhausen in Thuringia, Harz and Mansfeld-Südharz in Saxony-Anhalt, as well as the World Heritage-listed city of Quedlinburg. It currently has 130 sustaining members. These include local authorities, clubs and other associations, as well as businesses and entrepreneurs. The Regionalverband Harz is the trustee of the nature parks in the Harz Mountains and, together with its partner association in Königslutter, is responsible for the UNESCO Global Geopark Harz • Braunschweiger Land • Ostfalen. In an area spanning state borders, the Regionalverband is committed to the protection and development of the natural and cultural treasures of the Harz Mountains region. The publications of the Regionalverband Harz encourage the public to discover these treasures.

NATURA 2000

Natura 2000
in the UNESCO Global Geopark

The Regionalverband Harz's project "Learning to Read the Landscape" has the particular focus of increasing awareness of the Natura 2000 areas (both SCIs and SPAs) in the Harz region.

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