Strengthening nature

We promote the protection of nature and species with our compensatory measures

Our commitment to nature and the environment

We enrich life for generations

Acting sustainably and responsibly is firmly anchored in our corporate strategy. Our aim is to bring economy and ecology into harmony, while pursuing sustainable, resource-conserving mining operations. This requires precise knowledge of the consumption of resources as well as the impact on the protected resources of soil, water, and air, and consequently limiting this impact as far as possible.

Inevitable interventions provide us with the opportunity to achieve significant added value for the respective habitat with qualitative compensatory measures as well as additional improvements in the vicinity of our sites. We, therefore, specifically focus on nature conservation projects with long-term potential, while supporting them from beginning to completion. Together with partners such as farmers, associations, and local nature conservation initiatives, we find the best solutions.

Our Central Environmental department and the specialist departments at the sites act as contacts and deal with regional nature conservation issues. Furthermore, we engage in environmental education measures and species-promoting projects.

Our appreciation of nature and the environment is illustrated by the selected projects presented below. They are just like our natural world: diverse and vibrant.

Dr. Burkhard Lohr
Chairman of the Board of Executive Directors
K+S AG

Overview of selected measures

Forests

According to the Federal Statistical Office, around one third of Germany's entire territory is forested. Extreme weather conditions, environmental influences, and the increasing demand for space for housing, infrastructure, and industry are, however, placing a heavy burden on forests and limiting their vitality as well as their functionality.

In the past, there have been repeated cases of overexploitation and clear-cutting; one of the reactions to this was afforestation with monocultures. These monocultures suffer visibly from environmental influences and the consequences of climate change: drought and storm damage, pest, and fungal infestation occur here on a large scale. The coniferous forest monocultures in particular, which are susceptible to wind and drought, were massively infested by bark beetles during the dry periods of recent years with large areas dying off.

In view of the acute extinction of species and climate change, forestry experts are developing long-term concepts for sustainable and climate-resilient forests. These concepts include new afforestation, forest conversion measures, and the increased formation of forest edges. The selection of tree species plays an important role here and is based on the forest habitat types found in the region. The Fauna-Flora-Habitat Directive - a nature conservation directive of the European Union - classifies 47 forest habitat types. 17 of these occur in Germany, such as the Hainsimsen beech forests, woodruff beech forests, and alluvial forests.

The economic activities of K+S only lead to interventions in forest areas if these are unavoidable after intensive examination of possible alternatives. If this is the case, high-quality compensatory measures such as new forest plantations and forest enhancements are implemented in accordance with national nature conservation legislation. These compensation areas are usually larger than those affected by the interventions and are supplemented by measures such as the creation of deadwood piles, hideouts, or pond systems.

Klietznick reforestation project

As compensation for the expansion of a tailings pile, an extensive alluvial forest complex is being created in Saxony-Anhalt together with ecologically valuable open areas.

In the Elbe floodplain near Klietznick in the district of Jerichower Land, K+S is collaborating with Landesgesellschaft Sachsen-Anhalt mbH to develop an almost 100-hectare floodplain forest complex. The reforestation areas will be counted as forest replacement areas and compensatory measures as part of the tailings pile expansion at the Zielitz site. They contribute to compensating for the loss of habitat for wildlife species by integrating open areas and richly structured forest edges. The entire polder area is being developed as a **typical floodplain habitat complex** with a very high proportion of forest. In the past, the polder areas near Klietznick were mainly used intensively as arable land. The 2020 flood protection concept of the state of Saxony-Anhalt, however, provides for the relocation of the dyke at Klietznick. This involves activating the polder areas as retention areas for the Elbe floods. The agricultural land was removed from the polder area and a large contiguous alluvial forest complex was developed in this area to mitigate the conflict of use between agriculture and flood protection.

The grassland complex in the heart of the area will be preserved as an open area and developed as a floodplain meadow with smaller water structures. Open areas along the flood channel system towards the Alte Elbe will also be created and developed as grassland.

Appropriate protective measures - such as a browsing protection fence - are planned for each section of the site for at least five years to ensure the development of the forest areas. If more than 15 percent of the forest areas are lost or if regulation measures against mice harmful to the forest are necessary, replanting is carried out. Grassland is established by means of at least two years of adapted maintenance through mowing or cupping.

Marsh harriers prefer to hunt in open land close to water bodies

Floodplain meadows with umbelliferous plants

Planning of an almost 100-hectare floodplain forest complex

Floodplain complexes are restored through large-scale afforestation, fringe formation and flood troughs

Formation of stepped forest edges

1 Reforestation measure Klietznick

Total area:
100 ha

Initial status:
intensive agriculture/field

Implementation:
since 2019

Habitat development goal:
alluvial forest complex, open grassland (alluvial meadows) with water structures

Fauna development goal:
habitats for wildlife species

Parties involved:
Landesgesellschaft Sachsen-Anhalt mbH

Promotion of natural succession

One measure in Wildflecken is aimed at the natural development of a succession forest characterized by soft deciduous trees.

The mixed forest on a **24-hectare windthrow** area near Wildflecken in the Hohe Rhön was destroyed by a hurricane. In 2013, the owner reached an agreement with the local forestry company not to reforest the area for 99 years, but to leave it to natural growth. It was, therefore, selected as a compensation area for an expansion of a tailings pile at the K+S Neuhof-Ellers site near Fulda.

Open windthrow areas resulting from storm events are a **natural part of the forest ecosystem**. They form the initial stage for natural reforestation (succession) with tree species such as birch, aspen, and willow - the so-called pioneer tree species. The predominant forests in Germany develop naturally from these pioneer forests. In practice, however, these windthrow areas are reforested as commercial forests with tree species such as spruce, Douglas fir, beech, and noble hardwoods and promoted by forest maintenance work. In the planned compensatory and replacement measure on the edge of the Wildflecken military training area, this practice is being turned on its head, as softwoods are being promoted over the emerging conifers. Through two maintenance interventions at the expense of the conifers, a softwood succession forest is to be created, which will remain free of use for almost a century.

Due to the long period of non-use by the Federal Forestry Office, an above-average supply of deadwood and biotope trees should build up. Softwood deciduous forests are less durable, the heartwood becomes rotten after a short time. This creates cavities that provide a habitat for cave-dwelling animal species. The deadwood serves as a habitat for wood-dwelling insects, fungi, plants, birds, and other animal species, some of which are highly endangered. The promotion of aspen (poplar) and willow as soft deciduous wood is expected to lead to an upswing in local butterfly species, with more than 30 butterfly species associated with these two tree species in particular. The conservation value of this project lies above all in its longevity, which favors a **broad spectrum of species**.

From an ecological point of view, such succession forests are of particular interest: Due to their shorter life expectancy and lower wood durability, they enter an ageing and decay phase early, which is valuable from a nature conservation perspective. In today's commercial forests, such ageing and decay phases are often underrepresented.

The mother-of-pearl butterfly lives on the edges and clearings of loose forests

Mixed forest damaged by a hurricane

2 Succession forest near Wildflecken

Total area:
24 ha

Initial status:
windthrow area mixed forest

Implementation:
since 2013

Habitat development goal:
natural succession, softwoods, deadwood

Fauna development goal:
local species spectrum, butterflies, birds, small animals

Parties involved:
Federal Agency for Real Estate Management, Reußenberg Federal Forestry Office

Creation of a biotope network on the Dreienberg

A belt of deciduous forest connects two nature conservation areas. This provides animals and plants with the opportunity of spreading better.

A new habitat for flora and fauna has been created just 6.5 kilometers away from the tailings pile in Philippsthal. The forest that had to make way for the tailings pile was replanted at this location and fulfills an additional task here: it promotes biodiversity by **connecting important habitats**.

This was achieved by connecting two wooded hilltops near Friedewald: the Dreienberg and the Landecker Berg are considered ecologically valuable areas. The two nature reserves, however, were isolated from each other without being connected. Sycamore maples, copper beeches, pedunculate, and sessile oaks as well as large shrubs were planted to change this - all of which are native to the area. Now the beech forests on the hilltops are connected by a belt of deciduous forest and offer animals and plants the opportunity to migrate. The ability of species to spread is important for their survival and for biodiversity. If they live in isolation from each other, inbreeding occurs and genetic impoverishment makes them susceptible to disease.

Other selected areas were left to their own devices and are now greening themselves: new forest will also grow on these areas. **The reforestation and succession areas as well as the broadly stepped forest edge** lead to a better exchange between the species and give them new space to live. Additionally, the Rehlingsbach stream adjacent to the corridor was restored; it had previously been enclosed and straightened. Now it can meander again, create gravel banks, and attract other animal and plant species.

Where previously there was only a small wood and a few trees, a **corridor of over 20 hectares** has been created: a green belt.

3 Biotope network on the Dreienberg

Total area:
20 ha

Initial status:
agricultural land

Implementation:
since 2007

Habitat development goal:
native deciduous forest

Fauna development goal:
promotion of native species

Parties involved:
farmers (private owners), Higher Nature Conservation Authority of the RP Kassel

Forest conversion for diverse forest structures in the Malchus Valley

In the Malchus Valley, a cultural landscape from times gone by has been brought back to life with a variety of valuable habitats. It also provides a habitat for endangered species.

The Malchus Valley is part of the large estate of Ludwigseck Castle and comprises a contiguous area of around 100 hectares of woodland, meadows, floodplains, and waterways, which still reveals historical structures. Most recently, the area was used intensively for forestry and agriculture. Conservationists recognized the potential, including the Higher Nature Conservation Authority. Together with the lord of the castle, it developed a concept for restoring the historic landscape structures, not least for the benefit of the flora and fauna.

Initially, the focus was on **restoring the park forest as a grove**: a park forest consisting of a mosaic of open areas with individual trees and groups of trees. The old trees, which were heavily crowded by spruce and deciduous trees growing through them, were cleared and their lifespan extended. Thanks to the increased incidence of light, a herbaceous layer of soil settled underneath. The soil suddenly awoke and now produces a variety of flowers. The forest meadows are kept open by grazing Galloway cattle. In this way, a centuries-old form of grazing has been revived in the forest habitat. It has the advantage of suppressing woody growth and promoting species-diverse herbaceous vegetation, which in turn serves as a habitat for numerous insects and small animals.

In the Malchus Valley near Ludwigseck Castle, old trees have been uncovered and provide shelter and food for many animal species.

The catalog of measures includes the removal of prominent individual trees and the restoration of the park forest with old lime, oak, and spruce trees as well as the creation of a new park forest on areas previously used for agriculture. For this purpose, landscape-defining individual trees, or groups of trees with oak and lime tree trunks were planted. The development of the park forest from stands of old trees, young stands and completely new plantings ensures continuity at different stages of development. Therefore, after the old trees have died, the next generation of trees has already grown up, producing dead branches, tree hollows, and other structures.

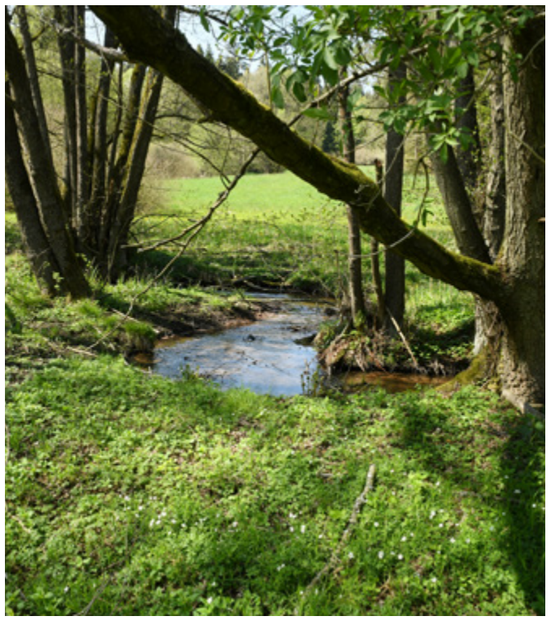
Dead branches are not cut out but remain in the trees. They provide **habitats for insects and reptiles** such as deadwood beetles and lizards. The old trees with their hollows, cracks, and forks offer nesting opportunities for songbirds as well as roosts for bats and woodpeckers. Alongside lime, oak, and beech trees, there are also spruce trees with branches reaching down to the ground. North American tree species such as the Weymouth pine can also be found. Their planting has a long tradition in the Malchus Valley and supports the **creation of a climate-resilient forest**.

Further measures include the restoration of rows of trees and avenues, the preservation of clearings in the forest, and the graduated design of forest edges. In the landscape depressions with streams, the lord of the castle left large areas of alder woodland to themselves. **Spring and swamp forests** were to develop here.

Today, cattle graze in the woods and on extensive pastures, as well as rare birds and small animals have been spotted again. There is evidence that the Malchus Valley provides habitats for some highly endangered species such as the gray woodpecker, the Bechstein's bat, and the gray long-eared bat. The owner of the castle also had the historic sightlines cleared so that the castle, the ponds, and striking solitary trees form a unique eye-catcher.

Species to be protected in the Malchus Valley:

Grey-headed Woodpecker (critically endangered)
Tree Pipit (endangered)
Yellowhammer (early warning list)
Grey Flycatcher (early warning list)
Woodlark (early warning list)
Barn Swallow (endangered)
Red Kite (early warning list)
Starling (endangered)
Woodcock (early warning list)
Broad-winged Bat (endangered)
Bechstein's Bat (critically endangered)
Common Noctule Bat (early warning list)
Brown Long-eared Bat (endangered)
Gray Long-eared Bat (threatened with extinction)
Fire Salamander (early warning list)
Grass Frog (early warning list)



Stream meadow with adjacent wetland forest

4 Forest conversion Malchus Valley

Total area:
80 ha park forest and 20 ha open land

Initial status:
forestry, overgrown park forest and change in use due to lack of cattle grazing in the former open land areas

Implementation:
since 2014

Habitat development goal:
cultural landscape with forest and open land, park forest with lime, and oak trees, park forest with deciduous and coniferous trees, grove groups, near-natural alder forests without forestry use

Fauna development goal:
woodland and forest bird species, bird species for semi-open landscapes, bats, amphibians

Parties involved:
private owners

Extensification of agricultural land

51 percent of Germany's total area is used as arable land, meadows, or pastures. Most of this is farmed intensively, with only around 9 percent being used extensively. In the interests of biotope and species protection, the German sustainability strategy calls for an increase of this proportion to 20 percent by 2030.

If a conventionally farmed area is converted to extensive farming, this means, among other things

- Restriction of fertilization
- Avoidance of pesticides
- Reduction of livestock
- Creation of flower strips in the field or as edge strips
- Increasing seed spacing
- Leaving stubble fallow
- Establishing arable fallow land

With these measures, a structural diversity is achieved on a structurally poor, intensively used area, which reduces the one-sided pollution of the soil as well as the accumulation of nutrients in the soil and groundwater. Besides the agricultural land, habitats are created for field and meadow birds, mammals, insects, and amphibians as well as many plant species. This creates a sustainable interaction between agriculture and nature conservation.

Furthermore, agricultural areas act as corridors connecting different habitats such as forests and bodies of water. A clearly visible consequence of extensively used areas is the increase in biodiversity. Other benefits that become apparent at second glance are the improvement of soil structure and ground and surface water quality.

In recent years, K+S has supported extensification measures on an area of over 140 hectares, thereby contributing to an increase in the food supply and breeding grounds for insects, birds, and mammals.

Diverse habitats in the heart of extensive agriculture

An intensively farmed corn field near Oberlengsfeld has been extensified and is now home to high-quality habitats for animals and plants.

It looks idyllic in the Kuppenrhön between Landecker Berg and the small village of Oberlengsfeld. Cattle graze on a pasture, insects frolic in the colorful flower strips next door, and the small pond landscape is home to mallards, grey herons, dragonflies, and amphibians. A few years ago, things looked completely different: a large area of intensively used corn fields dominated the landscape. Successful cooperation between the farmer, the Higher Nature Conservation Authority, and K+S made the change possible.

The previously single-use area was divided into different zones, creating 17 hectares of high-quality habitats for animals and plants benefitting from each other. When the farmer cultivates the field in spring, he leaves gaps for the skylark to breed undisturbed. He doesn't use fertilizers or weedkillers, but instead sows wildflowers and herbs in 10 to 15-metre-wide colorful flower strips. Large flocks of birds, rodents, and insectivores find food there even in the cold season. Insects hibernate in the stalks of herbs and hares seek cover here.

Previously single-use areas have been given a variety of structures for different animals and plants

The skylark is a ground-nesting bird and prefers varied vegetation

A shallow pond in the middle of a wet meadow is home to water- and marsh-loving species

The naturally occurring springs in the area have been opened and drainage pipes removed. This allows spring water to collect in shallow ponds and channels - an Eldorado for moisture-loving species. The grass frog has now reached one of the largest populations here in the district of Hersfeld-Rotenburg. Additionally, more than a dozen different dragonfly species have been recorded.

Regular on-site inspections record the species present and reveal a pleasing result: rare species such as skylark, snipe, yellowhammer, grass snake, and grass frog are now also colonizing the habitats.

The azure damselfly lives in slow-flowing waters such as overgrown streams and meadow ditches

Field extensification near Schenklengsfeld (5)

Total area:
22.3 ha

Initial status:
intensive corn field

Implementation:
2014 – 2020

Habitat development goal:
approx. 10 ha extensive arable land
approx. 1.5 ha of water and marshland
approx. 1.5 ha flower strips and winter forage area
approx. 6.8 ha extensive pasture
approx. 2.5 ha extensive wet pasture

Fauna development goal:
promotion of native animal and plant species, breeding birds, foraging guests such as red kites, amphibians, resting and migratory birds

Parties involved:
private owner (farmer)

Extensification of pastureland with riverbank renaturation in the Haunetal Valley

With the support of specialist planners, we have succeeded in restoring the small-scale, diverse landscape character and the habitats of many native species.

Idyllically situated in the middle of the Haunetal is the farm of a landowner who believes in the compatibility of landscape use and nature conservation. His land includes twelve hectares of intensively used pastureland along the Haune River, which offers an ideal location for the repopulation of native flora and fauna. The concept includes the extensification of the pastureland as well as the renaturation of the banks of the Haune River.

The extensive use of pastureland requires the grazing of a maximum of one head of cattle per hectare, as well as the avoidance of pesticides, organic and mineral fertilizers, mowing once a year, and the removal of drainage elements. Adjacent to the grazing areas, the banks of the Haune River have been shaped in a variety of ways at defined points: Alongside steep banks, flattened bank edges have been created to serve as cattle watering places. Existing beginnings of side arms were uncovered, desilted, and reactivated. These different watercourse formations provide habitats for repressed animal species.

Special biotopes were created on the large meadows by adding deadwood logs, piles of stones, and sandy areas. They are well accepted by drought-loving amphibians such as grass snakes and sand lizards.

Development of the Haune River

Natural, dynamic processes with erosion and sedimentation occur due to the removal of the bank protection. This results in the development of typical floodplain biotopes such as gravel and sand banks, pools as habitats for fish, and steep banks serving as breeding grounds for kingfishers.

Woodland succession with alders and willows is taking place on the banks. Fallen trees lead to changes in water flow and depth, triggering small-scale morphological changes. Furthermore, the Haune River serves as a connecting element for biotopes: Floating seeds of marsh plants are washed into the project area from still intact habitats upstream of the project area. The same applies to all animal species that drift during floods - including pupal stages of highly specialized ground beetle species, snails, larval stages of amphibians or small mammals on driftwood. Conversely, the area of action serves as a donor population for biotopes further downstream in the Haune floodplain.

The naturally developing bank of the Haune borders on the extensively used pastureland

Forest connection

The barrier-free connection of the pasture landscape to the adjacent forest promotes the development of species that require different types of habitats. One example is the common toad: In spring, it migrates from the forest to spawn in the ponds created on the wet meadows. Around 15 spawning female common toads are counted each year. A grass frog population has also established itself: Around 300 spawning bales can be sighted here every year.

Dry biotopes

Originally, gravel and sand areas created by weather events in near-natural, dynamic floodplains also provided a habitat for drought-loving reptiles. The special biotopes created with the addition of deadwood logs, rock piles, and sandy areas recreate these habitats and provide a home for the highly endangered sand lizard, for example. The adjacent railroad line extends these habitats and ensures that the area cannot be reached by walkers and dogs.

Waterlogging of the floodplain

The removal of the numerous drainage ditches has resulted in large areas of marshy land. The formation of wet meadows with reedbeds and open water banks promotes groundwater recharge and is a habitat for endangered species in the floodplains such as marsh plants, yellow-bellied toads, and marsh dragonflies.

Stone piles are valuable dry biotopes for reptiles

Extensive grazing

As a rule, one adult cow or horse per hectare is required for extensive grazing and maintenance of a high-quality pasture landscape in terms of nature conservation. The grazing intensity often has to be reduced depending on the season, for example in the event of prolonged drought or the risk of flooding. It must also be flexibly adapted to the site conditions and nature conservation criteria.

The maintenance concept consists of single-shower mowing, which is carried out at staggered intervals in the floodplain meadows and hillside meadows. Woody growth and the emergence of invasive neophytes - such as the poisonous Hercules perennial, ragwort, or Chinese knotweed - should be avoided. The farmer regularly monitors the area; a landscape planner documents the development of flora and fauna at regular intervals.

6 Extensification of pastureland in the Haunetal Valley

Total area:
12 ha

Initial status:
intensively used pastureland

Implementation:
since 2012

Habitat development goal:
semi-ruderal, extensive pasture landscape with waterlogging of the Haune floodplain, creation of special biotopes

Fauna development goal:
promotion of rare and endangered native species

Parties involved:
farmer (private owner),
Higher Nature Conservation Authority of the RP Kassel,
District Farmers' Association

Conservation of a rare calcareous grassland

Nutrient-poor grasslands have become rare in today's cultural landscape.
A corresponding biotope is being preserved on the Dreienberg.

Long ago, when shepherds roamed the pastures on the Dreienberg with their cattle to feed their sheep and goats, an exceptionally diverse plant community developed on grassland sites. The animals nibbled off the shoots and sprouts of emerging shrubs and kept the woody growth to a minimum. The animals' hooves also tore up the ground and created a patchy cover of vegetation. In turn, light- and warmth-loving species that thrived on the water-permeable limestone settled in these steppingstones of the west-facing slope meadow. This nutrient-poor, meagre site provided an ideal habitat for a diverse flora and fauna.

When landscape maintenance was discontinued over time, the meadow began to become overgrown with bushes, the grass became matted, and the rare species were lost. As a result, rough grasslands have become rare in today's cultivated landscape.

A landscape planner and the Dreienberg NABU local group have developed a concept for measures to preserve and further develop the valuable calcareous grassland biotope on an area of 0.9 hectares. Alongside traditional grazing with sheep, annual mowing with removal of the cuttings is intended to contribute to the long-term preservation of the biotope. The blackthorn hedge in the middle of the area was cut back in sections in winter outside of the bird breeding season and pruned to prevent it from ageing. This allows it to sprout new shoots and rejuvenate itself. The hedge structures at the edges have expanded into the area due to the lack of maintenance. Regular manual pruning should be carried out here and thorny, prickly shrubs such as rose, hawthorn and blackthorn should be pushed back. These measures serve to preserve the habitat of rare and endangered species and biotopes. Besides the characteristic nutrient-poor grassland species such as scabiosa, clover, quaking grass, brown allium, thistle and gentian, rare orchids such as the pyramidal orchid and mosquito orchid also benefit from this, and their populations are promoted.

7 Preservation of a calcareous meadow

Total area:
0.9 ha

Initial status:
endangered calcareous grassland

Implementation:
since 2011

Habitat development goal:
conservation of the calcareous grassland biotope

Fauna development goal:
orchids, rare grassland species

Parties involved:
NABU local group Dreienberg

The Langenschwarz field bird biotope

The massive decline in ground-nesting birds in recent decades prompted the conversion of an intensively used arable area into a field bird biotope.

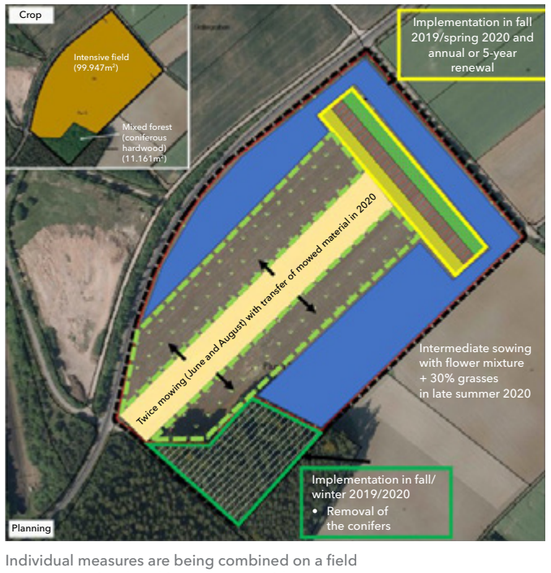
On an area of around eleven hectares in Langenschwarz to the north of Fulda, a compromise was reached that defuses the conflict between nature conservation and intensive agriculture: cultivation is still permitted, but in a more extensive form.

From 2019, pesticides, liquid manure and mineral fertilizers were not used here, and the soil was initially depleted by growing winter grain. A species-rich smooth oat meadow was sown on a strip in the middle of this area; this marked the start of the transformation of the intensively used field into an extensively managed hay meadow (fresh meadow). From 2019 to 2022, the necessary measures were adapted step by step. The meadow was mowed twice a year and the mown material was used to reseed other arable land. The remaining arable land was sown in the second fall with an intermediate seeding consisting of a flowering mixture with 30 percent grasses.

Furthermore, a combination of several individual measures led to habitat improvements for ground-nesting birds, insects, and small animals. A generous annual flower strip, for example, was created in combination with an equally large winter forage area. Their locations are rotated annually to relieve the soil. A further five-year flowering border increases insect diversity and the food base for field birds. At the edge of the fresh meadow is a mixed conifer-deciduous forest, which will be developed into a mixed beech forest as part of the measure. Selected conifers will be removed, and new ones will be planted.

After three years of conversion, the measure has already largely achieved its goals. The following can now be found: a closed herb layer of site-appropriate plant species; characteristic low-nutrient indicators; at least five different field bird species as breeding birds; increased numbers of butterflies, grasshoppers, other insect species and small mammals. The development of the farmland bird population will continue to be closely monitored.

The maintenance and preservation of this cultivation is fixed for 30 years. During this time, many endangered bird species – such as the skylark, yellowhammer, yellow wagtail, meadow pipit, whinchat, partridge, and quail - will benefit from the breeding and feeding habitats. Finally, the red kite will also find a new hunting ground here.



Individual measures are being combined on a field that was previously cultivated on one side only

8 Langenschwarz field bird biotope

Total area:
11.1 ha

Initial status:
intensively used arable land

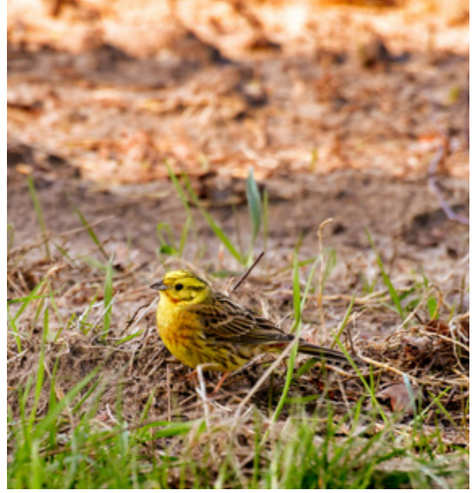
Implementation:
2019 – 2022

Habitat development goal:
approx. 9 ha extensive arable land,
approx. 1 ha flower strips (6,600 m²) and winter forage area (3,330 m²), approx. 1 ha beech forest

Fauna development goal:
promotion of native animal and plant species, ground-nesting bird species such as skylark, yellowhammer, yellow wagtail, meadow pipit, partridge; insects and small mammals

Parties involved:
private owner (farmer)

Avoidance of fertilizers, pesticides, and drainage are initial measures



Yellowhammers need open terrain

The Weidenau meadow bird conservation project

At the southernmost tip of the Vogelsberg district, a meadow bird conservation project was launched in 2016 in close cooperation with a local farmer.

A beautiful low mountain range landscape lies between the communities of Reichlos and Weidenau. The twelve-hectare area selected for the project includes meadows and previously intensively farmed arable land. Due to the frequent mowing of the meadows, the nests of nesting birds on the ground were destroyed. On the arable land, grain was sown so densely that the birds had no place to breed. One of the consequences of this was the decline in ground nesting birds, as the animals had fewer and fewer areas to retreat to.

Today, the farmer continues to cultivate the four hectares of previously intensively farmed arable land, but no fertilizers or pesticides are applied. There are now generous skylark windows on the land, forming gaps of around 20 m² in the grain field in which skylarks in particular, which are classified as endangered in Germany, can breed. Due to the annual and perennial flowering areas in the middle and at the edge of the arable land, they find enough food for themselves and their offspring. During the breeding season, they feed mainly on insects, grasses, and herbs, while in the cold season they eat fallen grain seeds. An additional ten-meter-wide winter feeding area made of grain was created especially for this purpose.

The nutrients introduced by manure and fertilizer were gradually removed from the previously intensively used meadow, allowing a species-rich grassland community to develop. The management of the approximately seven-hectare area was adapted to the timing of the mowing regime to protect native, rare bird species. The edges along the ditches and the outer areas are left out.

The rewetting measures in the valley axis not only benefit the lapwing; numerous wetland indicators such as marsh marigold, meadow knotweed, and meadow knotweed have also been able to develop. This is even more important as wet grassland has become rare in Germany. Bird species that need an undisturbed feeding and breeding habitat benefit from the flower-rich tall herb fallow around the plan area.

Selective measures such as this meadow bird protection project, in which farmland is extensively cultivated and combined with near-natural habitats, have a clear impact on the surrounding area. Birds, insects, and other native animals are becoming visible to people again and the song of the skylark can be heard more often.

Weidenau meadow bird conservation project
9

Total area:
12 ha

Initial status:
intensive meadow and arable farming

Implementation:
since 2016

Habitat development goal:
extensification of meadow and arable farming

Fauna development goal:
promotion of native ground-nesting birds such as skylark, yellowhammer

Parties involved:
farmer

Near-natural meadow extensification in the middle of a forest

A meadow with native grasses and herbs enriches an adjacent, large-scale nature reserve.

Looking at the map, the almost twelve-hectare area in the forest near Soislieden in the community of Hohenroda stands out: It is surrounded on three sides by a nature reserve. The fact that the once intensively farmed arable land and grassland would develop into a place of diversity is the result of excellent cooperation between a nature-loving farmer, the Higher Nature Conservation Authority, and committed planners. The area looks like a missing piece of the puzzle in a large, protected area, which is developing into an ecologically valuable clearing in the middle of the forest due to the near-natural extensification.

The aim was the creation of a meadow with grasses and herbs naturally occurring on the site - without the use of fertilizers or weedkillers. Due to the isolated location, natural recolonization with species of smooth oat meadow and calcareous grassland was not to be expected in the medium term. Seed was, therefore, obtained from nearby rough pastures and applied to the areas. This is because only native seed is perfectly adapted to the local soil and weather conditions. The diversity of native plants is particularly attractive to birds and insects as a food source.

The area is mowed twice a year to preserve the meadow habitat and prevent it from becoming overgrown. This involves mowing to a maximum height of ten centimeters with cutting mowers to protect the meadow fauna. Special mowing patterns are used to ensure that the animals have an escape route into the forest or the edges. The cuttings are removed so that less competitive species can develop. Cutting is carried out after the smooth oat has flowered to allow the grasses to seed. Only in this way can species-rich stands develop.

All these measures contribute to increasing and stabilizing native biodiversity, which also benefits many endangered species such as ground-nesting songbirds, wild bees, and butterflies.

The conversion to a species-rich nutrient-poor meadow is a long-term process

Meadow extensification in the middle of forest
10

Total area:
12 ha

Initial status:
intensive arable land and grassland

Implementation:
since 2015

Habitat development goal:
dry, one- to two-dry, species-rich smooth oat meadow of the Arrhenatherion association with transitions to semi-arid grassland (Mesobrometum) on limestone soils

Fauna development goal:
promotion of rare and endangered native species

Parties involved:
farmer (private owner),
Higher Nature Conservation Authority of the RP Kassel

Meadow rewetting

Peatlands are water-saturated areas in which plant residues are not completely decomposed in the absence of oxygen, resulting in peat. They play an important role as an ecosystem for CO_2 storage, the water balance, and as a habitat for animals and plants.

Around 4 percent of Germany's land area was originally covered by moors. For a long time, they were untouched wilderness, inaccessible, and unusable. With industrialization, drainage and land reclamation began. The quality of the soil was recognized; intensive use as arable land, pasture or forestry and the extraction of peat began. Today, only around 5 percent of the original moors are still intact, the rest have been drained, peat-cut, cultivated or used for agriculture and forestry. In contrast to fens, raised bogs have lost contact with aquifers and are fed exclusively by precipitation.

In the face of climate change, the functions of moors are becoming increasingly valued again. Efforts are being made to preserve and restore them, for example as part of the National Moorland Protection Strategy. This is because moors have a positive effect on the climate: Their soils store large amounts of carbon, their water surfaces have a cooling effect, act as filter as well as retention areas, and ensure groundwater recharge. In this way, moors mitigate the consequences of heavy rainfall, flooding, drought, and heat. They also provide a habitat for rare and endangered animal and plant species. The protection of numerous highly specialized species that only occur in moors - such as black grouse, moor frogs, peat mosses, or carnivorous plants such as the sundew - contributes to the preservation of biodiversity.

K+S therefore supports development projects that convert extensively drained arable land back into extensively used wet meadows.

Meadow rewetting near Wehrda

Previously intensively used arable land has been transformed into wet meadows. They contribute to the protection of a rare low moor.

As one of the rarest ecosystems in the country, the moor south of the village of Wehrda is threatened by gradual drainage. The only existing low moor in the district of Hersfeld-Rotenburg covers an area of around three hectares, is part of a fauna-flora habitat area and is strictly protected. It is fed by groundwater and provides a habitat for many highly specialized and endangered species.

This **unique habitat** is being preserved by working closely with a local farmer to develop an extensive 25-hectare wet meadow landscape around the moor. Due to the special shape of the terrain, it was possible to keep the water in the area and raise the groundwater level. For this purpose, the drains were removed, drainage ditches widened, and the captured springs renaturalized. Now, the landscape is adorned with water banks with reedbeds and sedge meadows, attracting numerous dragonflies, birds, and amphibians.

The more waterlogged areas around the spring outlets and along the course of the stream are now used as extensive wet meadows. Strips of reedbeds five to ten meters wide have been sown along the dammed ditches. These fringe structures are well accepted by whinchats, which use them as breeding grounds. Species that are adapted to the marshy area, such as snipes, water rails, toads, and grasshoppers, are now expected to return to the "mire meadow", one of the project area's names.

In summer, the inconspicuous meadow becomes a sea of butterflies, with numerous butterflies from the blue butterfly family thriving here. Here, under certain conditions. After all, they need the meadow knapweed and ants as food to live. The mowing periods are adapted to the development cycle of the dark meadow knapweed-ant blue butterfly to promote this increasingly rare, specialized habitat.

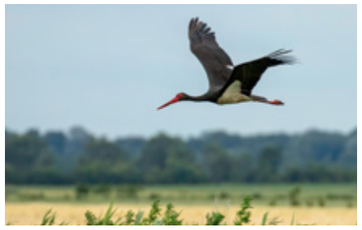
The fact that the newly created marshland is in the immediate vicinity of the forest also benefits common toads, grass frogs, and newts. While they spend the winter in the forest, they can safely migrate to the marshlands in spring and look for suitable pools to spawn in. The undisturbed forest also invites gray herons, black storks, and red kites to build their nests. The ten-meter-wide flower-rich meadow margins along the farm tracks provide even more breeding opportunities for meadow birds. They are also of great importance as a feeding and hibernation habitat for insects.

The marshland near the forest benefits common toads, grass frogs, and newts, among others

The once intensively used arable and grassland areas have, therefore, become a place of well-being for numerous animal and plant species; they form a large-scale network with the existing low moor.

The conservation concept has been implemented in five construction phases since 2015.

Open, freshly moist areas are home to whinchats and meadow blue butterflies



A unique habitat for black storks, banded damselflies, and many other creatures

Formerly intensively farmed and drained grassland requires several years for rewetting and vegetation change

11 Meadow rewetting near Wehrda

Total area:
25 ha

Initial status:
intensive arable and grassland area

Implementation:
since 2015

Habitat development goal:
wet meadow, extensive grassland, 5 m wide tall herb fringe

Fauna development goal:
dark meadow blue, meadow birds (meadow pipit, whinchat), tree frog

Parties involved:
private owner (farmer)

Nature conservation law assessment of interventions and compensation

The Federal Nature Conservation Act also governs the handling of interventions in nature and the landscape. It stipulates that such interventions must be prevented wherever possible. The polluter must compensate for unavoidable impairments through compensatory and replacement measures. This principle is specified in state regulations, which define assessment procedures that may differ from state to state. In most cases, the relevant nature conservation authorities apply two assessment procedures with the required local knowledge:

The **verbal-argumentative compensation calculation** derives the scope of compensation from the affected functions and values of the ecosystem. The impairments are assigned an appropriate compensatory measure, which also includes an estimated area size. The functional link between the impairment and the compensatory measure must be clearly presented. This means that the individual case must be considered very carefully.

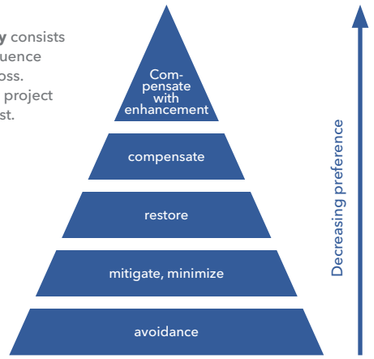
In the **biotope value procedure**, biotope types are assigned so-called biotope value points according to their nature conservation significance. Existing biotopes are compared with the value of the planning on the impact area, considering the size of the area. On this basis, a value is determined that defines the extent to which compensatory and replacement measures are to be provided. Overall, the biotope value procedure is based on a mathematical calculation.

Most federal states, including Hesse and Saxony-Anhalt, apply a combination of both methods, a biotope value method with an additional verbal-argumentative assessment for special functions of the ecosystem, such as water, air, soil, and landscape.

The need to provide **compensation under forestry law** arises from the "principle of forest conservation", which can be found in the forest laws of the federal states. Forest that is lost must be compensated for at least one-to-one by reforestation of the same area and as close to the site as possible.

Alongside nature conservation and forestry compensatory measures, **species protection measures** are also necessary if protected species are affected by the intervention. These measures usually must be implemented in advance, i.e., before the habitat is affected. This is to ensure that all relevant losses of function and area are compensated for in qualitative and quantitative terms.

The **mitigation hierarchy** consists of 5 steps defining a sequence to mitigate biodiversity loss. Avoiding the impact of a project on biodiversity comes first.



What are Red Lists?

Red Lists indicate which animal and plant species, plant communities, or biotope types are endangered. Such lists exist for the individual federal states as well as for the whole of Germany. They are compiled by groups of experts and published on the website of the Red List Center. On behalf of the Federal Agency for Nature Conservation, the Red List Center is responsible for the overall coordination and editing of the Red Lists in Germany.

The lists categorize all biotypes, animal, and plant species, indicate their occurrence in the respective areas, and provide a status report on their conservation status and endangerment situation. Red Lists are important sources of data for decisions in nature conservation law, landscape, and intervention planning. They are used as an indicator of the state of biodiversity. Official and institutional definitions of goals and measures for species protection are often based on information from the Red Lists. They are also helpful for informing and educating the public.

Worldwide Red Lists
Red Lists are compiled and published at a global level by the International Union for Conservation of Nature (IUCN). They provide an overview of the animal and plant species endangered worldwide and indicate development trends.

CATEGORIES

- **0** extinct
- **1** endangered with extinction
- **2** critically endangered
- **3** endangered
- **G** Assumed endangered, Status unknown
- **R** extremely rare
- **V** early warning list
- ***** non-endangered
- ****** certainly non-endangered
- **D** insufficient data
- **–** no occurrence
- **~** not assessed

What is Natura 2000?

Natura 2000 is an EU-wide network of protected areas and serves to preserve species, habitats, and biodiversity. It includes fauna-flora habitats as well as bird sanctuaries. The legal basis for this is the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC): they regulate the designation of protected areas, goals, responsibilities, and interventions.

Under these directives, EU member states are obliged to designate appropriate goals for each protected area and to identify species and habitats worthy of protection. They must draw up and implement management and action plans for their development and protection. The aim is to achieve a favorable conservation status in the long term. In Germany, both directives are considered in federal nature conservation.

The annexes to the Habitats Directive list habitats, animal, and plant species for whose conservation special protection areas must be designated, as well as animal and plant species requiring strict protection. Of the 231 habitat types worthy of protection in the EU, 92 occur in Germany, such as certain species of mudflats, moors, and deciduous forests.

The EU also lists around 1,000 animal and plant species with numerous subspecies that are worthy of protection. 138 of these are found in Germany, including species of peat moss and bats as well as the lynx and stag beetle.

The Birds Directive lists a further 193 European bird species – including migratory birds - for whose protection special measures must be taken. Of these, 110 are found in Germany, such as the red kite, black grouse, black stork, and osprey.

According to the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV), around 17.5 percent of Europe's land area is currently included in the Natura 2000 network. In Germany, the Natura 2000 protected areas cover around 15.5 percent of the land area and 45 percent of the marine area.

Further information can be found on the website of the Federal Agency for Nature Conservation (BfN).

NATURA 2000

Waters

Water occurs in a wide variety of forms. As watercourses, lakes, ponds, groundwater, floodplains, or wet meadows, it fulfills important functions and is one of the basic requirements for all life on earth. In times of climate change with increasing dry periods and extreme precipitation, water bodies and wetlands also perform important functions such as storing and recharging groundwater and providing floodplains. Floodplains, wet meadows, and natural shorelines also perform a filter function by retaining nutrients from heavily farmed areas of lakes or rivers.

The European Water Framework Directive governs the requirements for water protection above and below ground to bring water quality and water ecology to a good status. This is to be achieved through overarching action planning by the river basin communities. The responsible authorities must include these in their water development plans and implement them accordingly. Alongside chemical and biological facts, typical aquatic biocoenoses, bank and edge design of water bodies, their continuity and water body structure are also assessed.

In 2021, the ecological status of 24.7% of German lakes was classified as "good" or "very good" according to the Federal Environment Agency. At the same time, however, only 7 percent of watercourses were in "good" condition.

The most common negative influences include structural measures such as barrages and excessive nutrient and pollutant inputs. While inputs from wastewater discharges from sewage treatment plants and industrial facilities have decreased in recent years, the significance of diffuse substance inputs, for example from agriculture, has increased.

Water bodies with overgrown banks, open water areas, but also wet meadows and moors provide important habitats for numerous animal and plant species. Many of these are highly endangered and are protected. With appropriate measures on site, it is possible to reintroduce them - for example along the Werra River near the K+S Werra plant. Here, the yellow-bellied toad, bullhead, brook lamprey and black stork are once again to be found in large numbers.

By implementing a wide range of water protection measures, such as the constant reduction in the discharge of saline wastewater, riverbank restoration, and the removal of barrages, K+S acts in accordance with overarching action plans and achieves measurable regional effects.

The island in the Hautsee

This is something very special: a lake with an island that floats and changes position.

Lake Hautsee with its floating island has been designated a natural monument by the state of Thuringia. The island has been dormant for several years, however, as the large trees on its surface have made it heavy. They also shade the island and crowd out the rare flora that has developed on the peat body over the centuries.

The island was restored to its natural state in 2020 in a joint project with the Thuringian Association for Fishing and Nature Conservation, the Thuringian Species Conservation Working Group and Thüringenforst. The aim is to provide a new home for rare species worthy of protection. Pine trees were removed with a cable crane for this purpose.

The Hautsee, which has been a nature reserve since 1938, now supports species that were once at home here and of which only a few have survived. On land, the vegetation typical of raised bogs - such as the round-leaved sundew, cranberry and heather - is being given space to live again. Thanks to the relief, the peat body has the opportunity to move freely again when the water level of the main lake rises and to regain its special character as a natural monument.

On the deforested island in the Hautsee, species that were once native to the area can develop again

Restoring the banks of the Schwarzellerbach stream

A stream that is allowed to find its natural streambed provides food and habitat whilst also protecting against flooding.

"The Schwarzellerbach is a narrow stream in the middle of intensively used grassland in the Vogelsberg district of Hesse; its banks have been straightened and built up with massive stone fill. The adjacent meadow is intensively drained, mowed, fertilized, and used for grazing. No trace of biodiversity." This is one description of its condition in 2014.

The result of a cooperation between the landowner, a passionate conservationist, the Higher Nature Conservation Authority, planners, and K+S demonstrates that things can be done differently: over a length of 250 meters, the armour stones that once served as bank reinforcement were removed and the bank was created as a ten-meter-wide strip. The Schwarzellerbach can now develop naturally and find its own streambed in the floodplain. Any flooding can also be held back in the floodplain for longer. Several small ponds connect the newly created rivulet in the bank area and provide a habitat for dragonflies, toads, and frogs. These in turn provide food for the black stork. The meadow-side bank is kept open by mowing twice a year, which also provides good spawning conditions for grass frogs in the sunny bank area.

The adjacent meadows are watered naturally, as in earlier times. The drainage was removed. Fertilization has been dispensed with. This allows the spreading of plants adapted to a lower nutrient supply to spread. The wet meadow is mowed twice in the summer to maintain it as a habitat for species-rich flora and fauna - in such a way that the nutrients are removed from the soil and the meadow species can seed. The late hay meadow cut from mid-July not only leads to a natural reproduction of the plants; birds can also breed undisturbed and provide their young with insects right from the start. The second cut at the end of August is part of sustainable meadow management. Butterflies and grasshoppers feel particularly at home here, as do field birds.

The landscape is surrounded by meadowsweet, which blooms profusely in summer and exudes a honey-like scent in the evening. In the warmer months, whinchats and meadow pipits find space to breed there, while in winter it continues to provide food and shelter for animals as a five-meter-wide strip of fallow land.

The Schwarzellerbach has been restored to its natural streambed

Bank restoration of the Schwarzellerbach stream (13)

Total area:
approx. 1 ha

Initial status:
straightened stream banks, intensively used wetland, and fresh meadow

Implementation:
since 2015

Habitat development goal:
extensive wet and fresh meadow (5,875 m²), 10 m riverbank edge strip with side channel and pond (2,663 m²), 5 m meadowsweet tall herbaceous meadow (1,437 m²)

Fauna development goal:
black stork, meadow birds, amphibians, whinchat

Parties involved:
private owner

Development of small water bodies as feeding habitats

A small water body is the centerpiece of a new habitat for native wildlife. This measure combines first afforestation areas and open spaces with existing forests in a meaningful way.

In Mahlwinkel, a district of the community of Angern in Saxony-Anhalt, K+S has created a measure combining open land, forest, and water structures, in cooperation with Landesgesellschaft Sachsen-Anhalt mbH. The centerpiece is a small water body that is being developed into a feeding habitat for bats.

The approximately 0.2-hectare plant with surrounding bare ground is in a reforestation area of around 29 hectares and therefore in a location with natural water potential.

The greening of the bare ground is achieved through spontaneous vegetation with a few individual trees and shrubs. The afforestation includes differentiated forest edges, in particular oak-birch forest, English oak-hornbeam forest, and sessile oak/winter linden-hornbeam forest. The biotope structure of the watercourse is unique in the surrounding area; it serves as a habitat for amphibians and insects and is, therefore, also well suited as a feeding habitat for bats. The site is directly connected to the nearby forest areas and forest edges and is therefore one of the areas most frequented by bats. A high level of acceptance by the animals can therefore be assumed.

A water body was created in the middle of the forest and afforestation as a food source for the adjacent habitats

A new hunting habitat will be created on the total area of around 32 hectares with the initial afforestation, the bare ground, and the small water body in spatial connection with the nearby Heinrichshorster Forst. The establishment of other species-promoting elements will further enhance the areas - for example, perches for birds of prey or piles of brushwood and stones for reptiles and other small animals. This structurally combined measure will support the development of native species in the region.

Reforestation with perch for birds of prey

Stepped forest edge

Development of small water bodies as feeding habitat

14

Total area:
32 ha

Initial status:
intensive agriculture/field land

Implementation:
since 2015

Habitat development goal:
foraging habitat for bats, mixed oak forests, forest edges

Fauna development goal:
bats, insects, small animals

Parties involved:
Landesgesellschaft Sachsen-Anhalt mbH

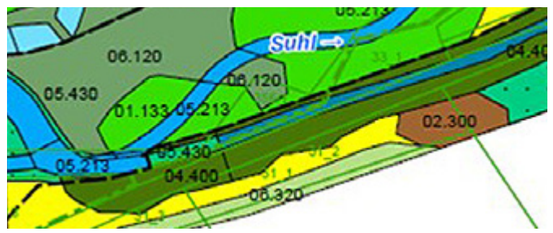
Near-natural landscaping of the Suhlaue stream

The Suhlbach was regulated for years, resulting in a watercourse without structure or life. Renaturation has turned it back into a habitat and restored its natural functions.

At first glance, the Suhlbach in the border region between Hesse and Thuringia appears to be a natural stream: irregular planting of alders and willows lines the banks. A closer look, however, reveals that it runs in too straight a line, weirs hold back the water, and the vegetation is very species-poor. The bed and the base of the bank are bordered by concrete half-shells and its course is limited. Concrete abutments form weirs and barrages which cannot be crossed by fish and other creatures.

The lack of species in the watercourse with its low water quality may be barely visible, but other effects are even more apparent: the regular flooding of the adjacent meadows and fields makes them temporarily unusable and floods the offspring of ground nesting birds.

Nature conservation authorities, nature conservation associations, specialist planners, and K+S are collaborating closely to **restore the natural functions of the watercourse**. Over a length of around 2,300 meters, measures, divided into five modules, are being implemented to renature and restructure the stream.



Planning with varied bank and vegetation zones


The existing stream is straight and has little structure

First, the bed and embankment foot protections will be removed, the bed will be widened, and the banks will be partially widened and terraced. Pipework will be dismantled, water edge strips will be created, and shallow areas will be designed as alternatingly wet depressions. The existing weirs will be removed and the differences in height over long stretches will be overcome using stone channels.

The aim is to **restore a near-natural floodplain** with native vegetation such as wet meadows, reedbeds, and riparian forest. This will increase water absorption and delay water runoff, thereby preventing flooding. These structural improvements will also have a positive effect on water quality.

The stream will be allowed to develop naturally again – with different widths, depths, and flow velocities, barrier-free and low in nutrients. As a result, fish, microorganisms, birds, and amphibians will also regain their habitats.

Near-natural landscaping of the Suhlbach stream
15

Total area:
17.35 ha, length approx. 2,300 m

Initial status:
straightened course of the stream

Implementation:
since 2022

Habitat development goal:
structurally rich stream, near-natural floodplain vegetation with wet herbaceous meadows, reedbeds and riparian forest, extensively used fresh meadows, and pastures

Fauna development goal:
fish fauna, macrozoobenthos, otter

Parties involved:
Thüringer Landgesellschaft, NABU

Clear passage for fish in the Ulster River

A fish ladder near Räsa in the community of Unterbreizbach combines industrial water use and nature conservation.


The weir at Räsa used to consist of a high concrete barrage


Today there are several natural stone bars for the fish to overcome

The weir near Räsa (Thuringia) in the lower course of the Ulster River was built to secure the water supply for the Unterbreizbach production site. Weirs and barrages, however, play a major role in preventing fish migration. They separate habitats and impair the water quality in terms of temperature and oxygen content. As the function of the weir is still required, but K+S also wants to meet the requirements of water protection, a new solution was sought - and found in the form of a fish ladder: this made it possible to gradually reduce the previous height difference in the water over 90 meters.

The previous concrete construction was replaced by nine crossbars made of natural stone in a construction period of three months. Slots and wide gaps in the rows of stones allow fish and microorganisms to overcome the obstacle pool by pool. The success of this approach already became apparent when the authorities approved the project on site in fall 2021: at that time, the Ulster had little water and it was easy to observe how the fish swam upstream. Species such as bullhead and brook lamprey in particular, but also brown trout and barbel, benefit from the facility. Another plus point of the facility are the eight small pools created between the individual bars. They form quiet zones that are well accepted by the fish.

The stone bars, made of long natural stones without concrete, were anchored deep in the river bed to create a near-natural structure. They are extended beyond the banks by so-called fascines - fences made of wickerwork embedded in the ground - and are intended to prevent the banks from being washed away during floods. This is one of several measures that were subsequently taken in response to the catastrophic flooding in summer 2020 to prepare for future heavy rainfall events.

Following K+S's restoration of the Ulster in other places in the past, the weir at Räsa was the last major obstacle in the lower course of the river. This has now been removed and the Ulster is once again forming contiguous habitats. The resulting compatibility of water use and nature conservation, as well as the good cooperation between the authorities and the Company, motivates us to tackle further projects.

Construction of a fish ladder in the Ulster
16

Total area:
90 meters, system consisting of nine crossbars

Initial status:
weir made of concrete masonry

Implementation:
2021

Fauna development goal:
promotion of native fish species, such as brown trout, bullhead, brook lamprey, barbel, bluegill, chub, minnow, gudgeon, loach, western bullhead

Parties involved:
community of Unterbreizbach, Higher Water Authority

Watercourses with natural banks

In Kerzell near Eichenzell, a stream extension with flood troughs, a bypass, and an initial planting of floodplain forest have been created.

In 2013, K+S acquired a meadow near Kerzell for the installation of an underground pipeline. The poorly structured vegetation there with the adjacent, straightened Döllbach stream was suitable for upgrading this area in terms of nature conservation following the construction work. The aim was to create a protected area of almost two hectares for the regional flora and fauna. In late summer 2013, K+S began excavating a meandering channel as a bypass to the Döllbach, creating flood troughs and shaping the banks.

Today, alongside faster-flowing sections of water, there are also some swirl holes, known as scours, as well as partially flooded groups of islands with smaller scours in which puddles of water form from time to time. This provides a breeding ground and habitat not only for fish, but also for various insects and their larvae growing in the water. The bypass also provides ideal conditions for beavers. The steep walls created in some sections of the bypass offer the kingfisher ideal opportunities to create a breeding den; a gravel bank created on the bank serves as a breeding ground for the little ringed plover.

Furthermore, a pond was created in the southern area of the compensation area, which - depending on the water level – exposes a small area of land in the middle. The still water provides ideal conditions for spawning amphibians such as frogs, toads, amphibians, and newts. Grey herons and black storks therefore use the area for foraging and resting. Many insects and insect larvae also colonize the area in and around the pond.

In the area to the north, an initial alluvial forest planting of English oak, ash, hornbeam, bird cherry, small-leaved lime, and Norway maple was initiated. The central part of the compensation area, on the other hand, remains natural so that natural succession can take place; various grasses currently dominate here.

The area has since been entered in the official and publicly accessible Nature Conservation Register as a successful compensatory measure.

The straightened Döllbach stream has been widened with channels and flood troughs, benefiting fish and insects

Beavers also find good living conditions here

Gravel banks, shallow and steep banks alternate

Water frogs are settling here again

Stream widening with flood troughs near Kerzell

17

Total area:
1.9 ha

Initial status:
grassland with straightened stream course

Implementation:
since 2013

Habitat development goal:
watercourse with natural banks and meanders, natural succession, alluvial forest

Fauna development goal:
local species spectrum, amphibians, birds, insects

Did you know that …

… the **expansion of the tailings pile at the Hattorf site** (phases 1 to 3) will take up around 62 hectares of land …

… but K+S is implementing compensatory and replacement measures as well as reforestation and nature conservation enhancements on over 200 hectares of land?

… the **expansion of the tailings pile at the Zielitz site** (HKE II) is interfering with nature and the landscape over an area of around 253 ha …

… K+S is providing compensatory measures on an area of over 472 hectares, on which valuable species protection measures are being implemented alongside forest conversion and reforestation?

… K+S will reduce the tailings pile volumes at the Wintershall site by **developing and implementing new technologies** and, therefore, prevent a further application for a tailings pile expansion? This will facilitate the reduction of new land sealing.

… K+S has **invested 47 million euros** in nature conservation measures in the last 10 years alone and will continue to implement nature conservation measures worth several million euros annually in future years?

Species protection

Besides the large-scale restoration or enhancement of habitats, supporting individual measures for the targeted promotion of certain animal and plant species are important.

As population figures rise, the pressure on available land increases. This not only reduces the habitats for animals and plants, but also their activity and performance: the remaining areas have fewer species-specific biotopes, are less interconnected and are often disturbed by humans. With the decline in species diversity and species populations, services such as pollination, soil regeneration, and food supply for other living creatures are also reduced.

Nature conservation and species protection have become a global challenge. In the International Union for Conservation of Nature (IUCN), governmental and non-governmental organizations work together to jointly define measures and goals for the protection of species and the preservation of global ecosystems. Among other things, the IUCN is responsible for compiling the Red Lists (see page 29), categorizing protected areas, and coordinating continental projects to promote biodiversity, including measures such as the "European Green Belt". It has a significant influence on the Convention on Biological Diversity (CBD) and the implementation of the Washington Convention on Biological Diversity (WA).

In Germany, the National Biodiversity Strategy is the most important instrument for implementing international agreements. The classification of native animal and plant species in the endangerment categories of the Red List indicates that around 34 percent of native animal species and around 26 percent of native plant species are endangered. Intensive agriculture, infrastructure, and economic activities are considered to be the main causes of species loss.

Many companies not only pay strict attention to compliance with legal requirements but are also involved in species protection projects. K+S understands itself as a "partner of the region" and therefore concentrates on local species protection. The Company promotes native species in the immediate vicinity of its plant sites. This is demonstrated by the examples presented below.

Species protection for night hunters: The bat

The only actively flying mammals on earth have extreme habits: Bats are nocturnal, eat only insects, and hibernate for four months.

Of the 1,400 known bat species worldwide, around 25 are native to Germany – including the regions around the K+S sites. Due to their special habits, these animals are dependent on very specific environmental conditions: During the day, they rest and need shelter in crevices, caves, branch niches, or even artificial bat boxes. At night, they need hunting habitats where they can find enough insects. They therefore benefit from all measures that primarily serve to promote insects, such as the creation of flowering meadows, orchards, and field margins. Equally important is the presence of ponds and pools as watering holes and as places where many insects can be found.

Besides providing hunting habitats with resting places for the day, it is important to create winter roosts. Caves, crevices, cellars, or bunkers that are cold and damp but frost-free are suitable. Bats spend almost a third of the year there and wait upside down, usually sleeping in groups, for the end of winter. As soon as there are enough insects available in spring, they become active again.

The measures presented here aim to promote bat populations. It becomes apparent that the promotion of a key species cannot be considered in isolation: Species conservation always aims to protect several species and habitats.

The Malchus Valley: An oasis for bats

At Ludwigseck Castle, where Landgrave Ludwig I of Hesse had a fortified castle built 600 years ago, bats have once again made their home.

Bats have colonized the earth for more than 50 million years - humans have been around for just 40,000 years. Many bat species are endangered, especially by humans. One special place that has become a rare gem for bats is the park forest around Ludwigseck Castle.

There are 25 different species in Germany, 13 of which live in the 100-hectare Malchus Valley. Endangered species such as the brown long-eared bat, the pond bat, the fringed bat, the bearded bat, and the Bechstein's bat have been recorded. The very old park forest trees are full of life.

When dusk falls, they become active, flying silently through the night, and devouring insects in droves. Some of them particularly like to hunt on the banks of the Malchus pond and the Geisteich pond.

Others find moths and midges on the old oak avenue, at crossroads or forest edges. These areas are of elementary importance for the bats' routing and flight structure. The old gnarled trees are being cleared of the growth that is crowding them and thereby put in the right light, so to speak, to promote this and to allow more light into the forest. In the crevices, cracks, and caves, bats find resting places for the day as well as suitable winter roosts. Numerous insects and birds such as woodpeckers and owls also live here.

Where many other places have been afforested, the Malchus Valley still has forest meadows that are kept open by hay-making and mowing. The extensive use ensures species-rich vegetation, and the maintenance concept provides for the preservation of old trees and deadwood. Different habitats alternate: streams, alder-ash riparian forests, fresh forests such as the oak-hornbeam forest, clearings, lakes and dry slopes. These diverse habitats are oases for insects – and guarantee a rich food supply for bats.

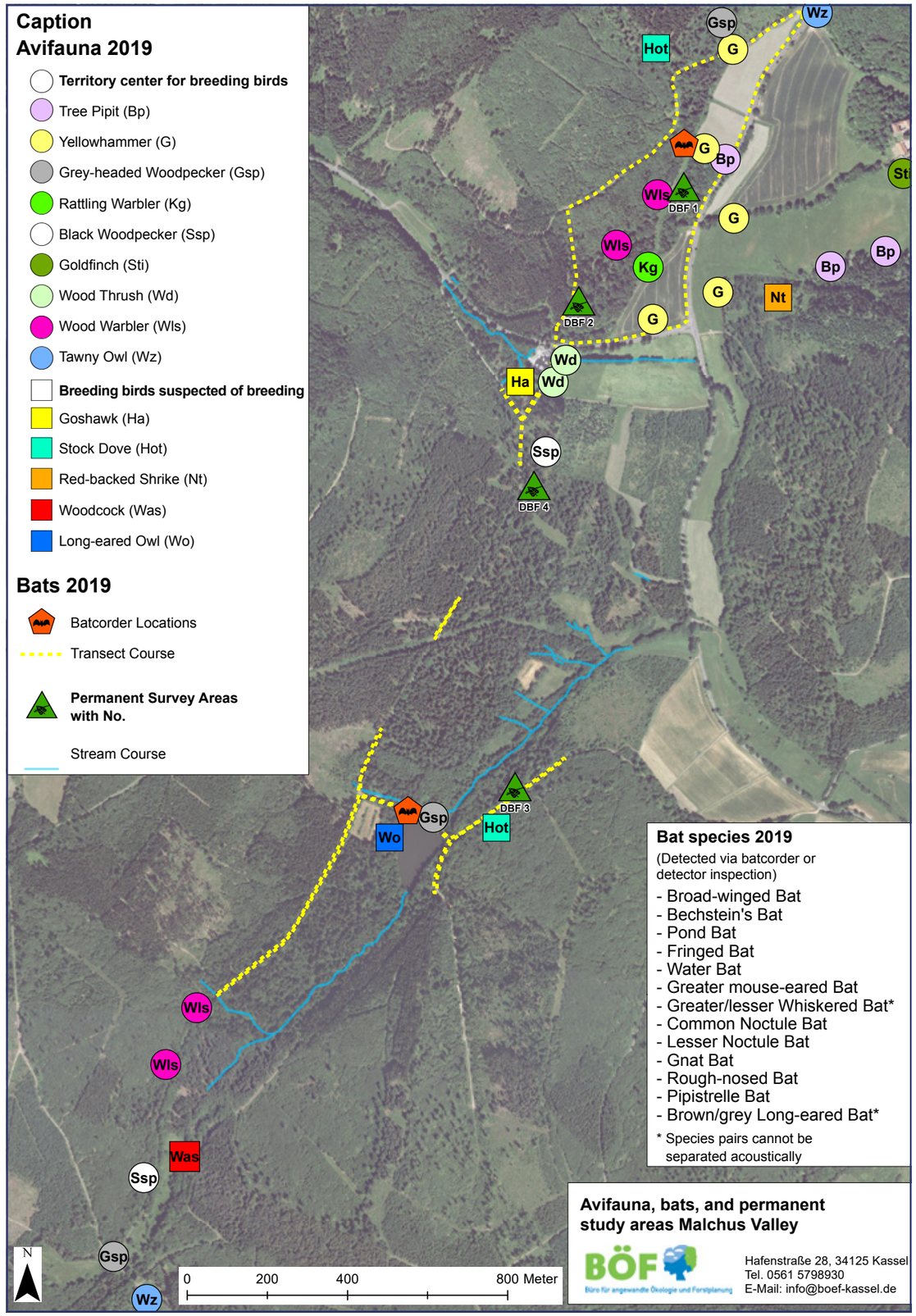
The rare pond bat is well camouflaged

An ultrasonic detector records the calls and helps to identify the different species

Open areas in the forest are kept free through extensive grazing

Old wood as a bat habitat

The historic oak avenue is being restored with replanting and serves as a guide for bats



Avifauna mapping in the Malchus Valley in 2019

Well-hidden and undisturbed

With the bat bunker at the Friedrichshall tailings pile, a species-appropriate replacement roost has been created.

An old bunker made of concrete pipes had stood embedded at the foot of the Friedrichshall tailings pile for over 40 years. As there was no use for it, bats and other small animals colonized it and it developed into a popular winter roost. It is not known how many and which species were present.

As part of the covering of the tailings pile, however, the bunker had to be removed and a replacement secured. With the support of the NABU local group in Burgdorf Lehrte, a species-appropriate replacement habitat was created in 2020. It is located a few meters from the foot of the current cover - well hidden under a mound of earth, embedded in the natural surroundings. If you don't know the location, it will be difficult to find. The current bunker is brick-built, equipped with perforated bricks, and fitted with species-appropriate entrance slits. It is well sealed and can only be entered by the caretaker.

Bat monitoring will provide information on which species are using the winter roost. Bat experts are certain that once the concrete smell of the new structure has been overlaid by the smell of earth, the bunker will be an ideal place for many species to hibernate and spend the winter.

A bat bunker was integrated at the foot of the green tailings pile Friedrichshall

The species-appropriate replacement roost is only accessible to experts

Old bunkers are home to bats

During the Second World War, they were used to protect employees of the plant; today they provide a habitat for bats.

On the K+S site near the Wintershall site near Heringen at the Werra River, there are two air-raid shelters, each around 300 meters long. They are still very stable today. Furthermore, constant temperatures and high humidity prevail there - and these are excellent conditions for winter roosts for bats, butterflies, snails, spiders, woodlice, wasps, and other insects.

Dedicated K+S employees have worked hard to set up the bunkers as winter habitats. Restoration and additions to the equipment were necessary to open the tunnels for species protection: The dilapidated entrance areas of the tunnels had to be renovated and fitted with bat-friendly entrances. Bat perforated bricks were attached to the tunnel ceilings to provide the animals with sheltered dwellings and non-slip surfaces. The bunkers were blocked off and declared quiet zones. Now you can discover a wide variety of resting animals on the ceilings, walls, and floor in winter, which awaken to new life in spring.

Unfortunately, the entrances to the tunnels are often broken into by geocachers or the curious. Signage and reinforced locks are used to prevent such disturbances and other uses.

The air-raid shelter tunnels are already included in the bat winter monitoring, which is jointly organized by the Higher Nature Conservation Authority and the Hesse State Association for Cave and Karst Research. The data collected indicates the population development of native bat species. Among others, the brown long-eared bat, the greater mouse-eared bat, and the water bat are regularly discovered in the K+S tunnels.

This effective species protection measure was made possible by the excellent cooperation of a wide range of stakeholders pursuing a common goal - including employees of the construction company at the K+S Wintershall site, the Higher Nature Conservation Authority RP Kassel, members of the Rhön Biosphere Reserve, the Bad Hersfeld Speleologists' Club, Hessen Forst, the NABU district association Hersfeld-Rotenburg, and the Fulda Working Group for Bat Protection.

Air-raid shelters serve as winter quarters for bats

Species protection measures increase the value of an existing forest

In an existing deciduous forest, many habitats are secured and supplemented by species protection measures.

An "H" marks the mostly old trees. They are located in Stöckig, a small, wooded area near the Hattorf plant site in the district of Hersfeld-Rotenburg. "H" stands for habitat tree, derived from the Latin word "habitare" meaning "to inhabit". A tree cannot receive a higher award. The older trees are, the more they are marked by life: dry branches break off, cracks and rot form. In the process, they develop their very own structures - and become a habitat for other species.

In 2014, 110 habitat trees and groups of trees were taken out of forestry use in cooperation with the forestry authority. At the same time, nests for birds of prey, dormouse boxes, and bat roosts were added to the already naturally occurring tree cavities and crevices in the trunk. Nesting aids were also provided for the tawny owl, stock dove, and many other small birds associated with the forest habitat.

The forest receives special care to support the development of its natural structures. On a total of 23.3 hectares, site-appropriate trees such as copper beeches, English oaks, and sycamore maples are given space to grow. The aim is to create a species-rich and stable mixed deciduous forest that can not only withstand the increasing drought but is also ecologically valuable as a forest community.

The effect of the species protection measures on animal species such as bats and small birds is being monitored.

The common noctule lives primarily in forests and inhabits hollows in old trees

Habitat trees enhance the forest

Preserving memorabilia

Nowadays, a collection of old boundary stones serves as a reminder of the former inner-German border. An old border tower fulfills a new task for species protection.

The Hattorf site with its potash tailings pile is in the federal state of Hesse on the border with Thuringia. With the expansion of the tailings pile there, the former inner-German border was covered up and boundary stones had to be removed. The former border line is an important reminder, however. K+S has, therefore, developed a concept in collaboration with the Land Management Office and the Monument Protection Authority to preserve it visibly. In 2008, a lapidarium was erected from the twelve boundary stones to be relocated, reproducing the course of the border on a scale of 1:20.

The former border tower, which is in the immediate vicinity, was preserved and converted with the support of the Lower Nature Conservation Authority for the protection of native species. Its north-west and south-west sides were renovated and nesting boxes for a wide variety of bird species were installed. The watchtower now fulfills a new, sustainable function. An "avenue of annual trees" flanks the access path to the border tower. It consists of specimens of the respective "Tree of the Year" from 2008 to 2016 and is well signposted to provide information about the various native trees.

The historical elements with the mighty tailings pile in the background make this place very special.

"It combines the memory of the past with the future challenges of preserving biodiversity and at the same time maintaining economic activities in the long term."

Sebastian Arnold,
Head of Nature Conservation and A/E Measures,
Werra Integrated Plant

A former border tower is home to nesting sites

Peregrine falcon nesting site at the shaft tower

The Zielitz potash mine has been a breeding ground for birds and bats for years. Birdwatchers and experts can even observe the peregrine falcons on webcam.

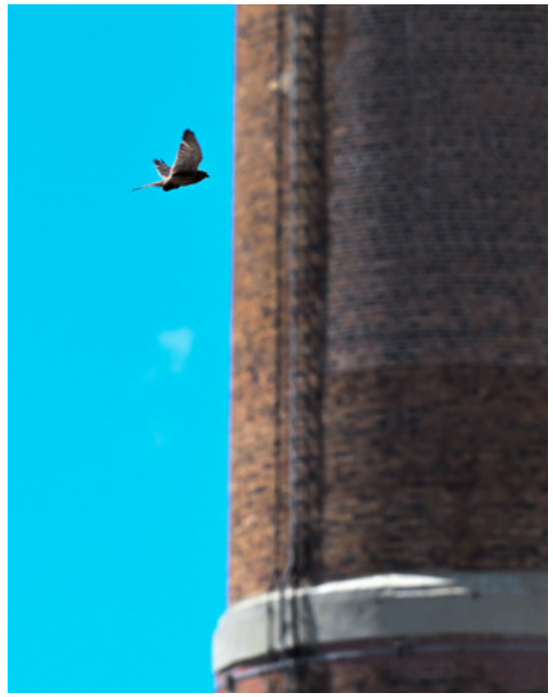
The Zielitz site has been voluntarily protecting species for more than two decades. With a variety of measures such as breeding sites, prefabricated nesting stones, or façade tubes on the plant buildings, it has succeeded in permanently settling kestrels, swifts, and bats on the plant site. The area surrounding the potash plant offers the birds a varied landscape with a rich food supply and therefore ideal opportunities for rearing young birds.

More than 400 nestlings of kestrels alone have been ringed on site. The plant and its surroundings also provide favorable living conditions for the rare peregrine falcon. In 2000, the first nesting niche for this falcon species was set up in the Zielitz shaft tower at a height of 45 meters. There is a ledge in front of it, which the peregrine falcons use for feeding and flight training. The first pair of peregrine falcons bred on the shaft tower at the plant in 2010.

Motivated employees initiated the installation of a camera at the shaft tower nesting site in 2011. The birds' behavior, including brood care and raising their young, can now be followed live on the www.wanderfalken-zielitz.de website. The insights into the lives of the strictly protected birds also provide experts with new knowledge about wild peregrine falcons. Furthermore, the young falcons are ringed every year by an expert from the “Wanderfalkenschutz e. V.” working group for scientific research.

Peregrine falcons are among the largest members of their family and are found all over the world. Thanks to a variety of conservation measures, there are now around 500 breeding pairs of peregrine falcons in Germany.

Peregrine falcon offspring can be observed almost every year



The peregrine falcon finds a nesting niche at the Zielitz shaft tower

Insects

Massive insect mortality is triggering a decline in other animal and plant species. It is therefore necessary to protect their habitats for the preservation of entire ecosystems.

There are well over a million species of insects. Although they always have six legs and a three-part body, they have very different shapes, colors, and sizes. Their lifestyles are also very different: most of them fly, others walk on water, while still others prefer ground layers for reproduction and foraging.

The role of insects as pollinators is well known. Since pollination has also been valued economically, their recognition has continued to grow: according to the Bavarian Association for the Protection of Birds and Nature, their pollination service is estimated to account for around 10 percent of global agricultural yields each year. In fruit growing alone, insects are responsible for 90 percent of yields. Less well known, however, is their role as recyclers of carcasses and dead wood. They return the nutrients from these to the soil – these processes contribute significantly to the formation of fertile soils.

The massive extinction of insects and the reduction in insect species have led to a decline in other animal and plant species. Birds and small animals that depend on this food source are particularly affected. If their numbers decline as a result, this in turn has an impact on the next links in the chain – a chain reaction sets in.

The conservation of entire ecosystems begins on a small scale. It is, therefore, essential to restore the habitats of insects.

Honey from the potash bee

A safe place for bees: The Zielitz potash plant is home to numerous bee colonies every year. An experienced beekeeper accompanies the project.

The number of German beekeepers has been on the rise again since 2017. As bees and other insects pollinate well over 80 percent of flowering plants, this is both a welcome and necessary development. At the same time, however, bee theft has become a problem for beekeepers: In some cases, entire bee colonies are stolen from their locations.

A cooperation between the Zielitz potash plant and the Bördebiene apiary was agreed in spring 2015 to prevent this. The aim is to help protect the environment and safeguard the bee population in Saxony-Anhalt. The bee colonies were stationed on the fully fenced plant premises to protect them from theft.

In the immediate vicinity of the plant, there is a wide range of habitats for honeybees - from acacia and lime trees to rapeseed fields. In the summer months, up to 15 beehives are located on the plant's tailings pile. The locations of the hives are carefully selected year after year. The site managers consult with the experienced beekeeper on safety aspects, operational issues and the local situation. The beekeeper also looks after the bee colonies and bottles the honey. Around 200 to 300 kilograms are collected each year.

The regional acacia, lime, and rapeseed honey can be purchased under the name "Honig von der Kalibiene" ("Honey from the potash bee") in the plant's staff restaurant and directly from the beekeeper.

Honeybees collect pollen undisturbed in the green belt around the tailings pile

The bee sponsorship on the roof of the corporate headquarters

K+S AG has been sponsoring bees with the Kassel city beekeeper since 2019. Four bee colonies live on the green roof of the Kassel Group headquarters.

Within a radius of up to three kilometers, they perform their work as pollinators and pollen collectors: the four bee colonies that make their home on the green roof of the K+S building in Kassel all year round.

There was skepticism before they settled here: occupational safety and health protection aspects had to be considered, as the bee colonies are located in the immediate vicinity of the offices and the company restaurant. In the summer months, people like to sit outside on the terrace at lunchtime and feared an increase in bee visits. But it has now become clear: The bees are much more interested in the abundance of flowers in the leafy Bad Wilhelmshöhe district, the Dönche nature reserve or the castle park than in the employees' lunch.

The sponsorship is used, among other things, to impart knowledge about bees and insects in general and to emphasize their importance for the ecosystem. Groups of children from the company kindergarten as well as employees enjoy the regular guided tours. When the bee year comes to an end, the harvest is given to employees in return for a donation. The donation is always for a specific purpose and benefits a regional, insect-promoting measure, such as scientific studies on insect occurrences by the Kassel Natural History Museum or the creation of flowering meadows in urban areas.

The K+S bee sponsorship raises awareness among employees and their families of the global problem of bee mortality and insect decline in a practical way; it provides information on what everyone can do to combat this.

The green roof provides a good start for the bees in the green surroundings

The beekeeper shares his knowledge with children and others on guided tours

Meadow extensification leads to new life

Beetles, snails, grasshoppers, dragonflies, moths, birds – they have all quickly colonized an area in the north of the Rhön biosphere reserve that is now once again lush with flowers.

Just a few years ago, heavy agricultural machinery could still be seen here, carrying out intensive, large-scale arable farming, with measures to increase yields at the forefront. Now the once cleared area has become a place of structural diversity.

The once structurally poor field lies in the middle of a forest near Soislieden. The edges were cultivated over a width of ten meters and sown with wild herbs. The newly created forest edge now forms a transition between forest and open land and, from a nature conservation perspective, forms a valuable link between two habitats. Additionally, 4,600 m² of flowering meadows were planted along both sides of the paths.

The restoration of a finely structured cultural landscape with an adapted mowing regime ensures the survival and reproduction of many species. Herbaceous plants and wild grasses remain present all year round as a structure and are mowed alternately. While the flowering border on one side of the path is mowed one year, the other side remains untouched. The next year, the opposite happens. This provides birds, insects, small mammals, and other animals with a place to live, breed, and forage at any time of year.

This habitat is further enhanced by the 3,000 m² wildflower strip in the middle of the field. Every year in March, half of the summer grain is sown and left untouched until March of the following year. Especially in winter, this area provides animals with a good food supply and sufficient cover. With its open patches of soil and loose, structurally rich stands of plants, fallow land is an ideal breeding and nesting site in the cultivated landscape, providing a refuge and source of food.

Blue butterflies, fritillaries, and thistle butterflies are already common. Wild bees, butterflies, and grasshoppers are increasingly common. The year-round fringe structures are particularly important for the biodiversity of the overall area and enhance the landscape with their wealth of flowers.

A once structurally poor field blossoms

The blue butterfly owes its name to the color of its upper wing surfaces

The small fox belongs to the butterfly family

Not only the ground bumblebee feels at home on the flowers

26 Flower strips in the middle of grassland

Total area:
21,520 m²

Initial status:
intensive arable land and grassland

Implementation:
since 2015

Habitat development goal:
forest fringe community (9,211 m²), annual flower strips (3,111 m²), flowering meadows (4,599 m²)

Fauna development goal:
habitat for insects (butterflies, grasshoppers, etc.), small mammals and birds (e.g., feeding biotope for the red kite)

Parties involved:
farmer (private owner)

Near-natural landscaping of the plant site

Numerous flowering and green strips have been created at Sigmundshall in recent years. Many of these are the direct result of employee initiatives.

Nature and species conservation has been an important topic at the Sigmundshall plant for years. Numerous measures have been initiated by employees. The focus of species protection measures is on the promotion of insects and bats, based on the complete avoidance of pesticides and insecticides. Flowering meadows and wild shrub beds have also been created. Furthermore, there are areas around the foot of the tailings pile reserved for the development of natural succession, in accordance with the ongoing greening of the tailings pile. The food supply for bats is therefore systematically promoted. A winter roost will soon be created in a former supply tunnel alongside the summer roosts that have already been installed.

On the **initiative of an employee**, the site created flowering areas for insects: The first flowering strips were created over several hundred square meters in 2020 to reduce the amount of mowing required for the green areas on the one hand and to provide a food source for insects such as wild bees, bumblebees, and colorful butterflies on the other. The sown flowering mixture of annual and perennial, low-maintenance, and frugal varieties can survive for several years in one location and provides insects with pollen and nectar as well as protection for laying eggs and a place to hibernate.

Small rodents and birds also find a food supply in fall as the seeds of the annual plants fall.

One example of the creation of **additional green strips** is the approximately 30-metre-long area along a reservoir: shrubs such as yew, snowball, and ornamental apple as well as wild roses were planted here, and a perennial flowering border was sown. This provides insects and wild bees with food and a place to hibernate. In another bed covering around 140 square meters, wild perennials such as mullein, yarrow, knapweed, and mallow attract bees, bumblebees, and butterflies. A partridge has also discovered the newly designed area for itself. Deadwood elements were incorporated to create additional habitat and a pile of stones was created as a shelter for lizards.

The **selection of native perennials** and shrubs plays a central role in all plantings, particularly to meet the needs of local insects and wild bees. These in turn serve as food for bats, birds, and reptiles, which multiplies the promotion of biodiversity.

In the future, vacant plant areas at the Sigmundshall site will continue to be evaluated, potentials will be exploited, and redesigned in a near-natural way without restricting the plant site. After all, these examples demonstrate how easily areas can be enhanced.

Green strip along the factory road

Bee pasture at the Sigmundshall plant

The area has been leveled with gravel for the wild perennials

A partridge has also discovered the bed

Protection of amphibians and reptiles

Many amphibian and reptile species in Germany are highly endangered. Their protection should be a high priority.

They often seem a little scary and uncontrollable to the observer: frogs, amphibians, toads, lizards, and snakes. They are shy and rare, yet their variety is astonishing, and their shapes, colors, and lifestyles are highly diverse. They have been around much longer than humans: Amphibians have lived on earth for around 360 million years - even before the dinosaurs – and reptiles for around 290 million years.

Amphibians and reptiles are cold-blooded animals: they cannot keep their body temperature constant on their own but are dependent on the ambient temperature. The warmer it is, the more mobile they become. When the outside temperature drops in winter and the food supply becomes scarce, they go into hibernation or torpor. Only when the hours of sunshine increase, they become active again.

Amphibians have water-permeable skin and are bound to water bodies and wetlands in certain life cycles, such as during the breeding season. They lay their eggs in water and the young animals go through their first stages of development there. Reptiles, on the other hand, lay eggs in a solid shell on land - or in their own bodies. There they are warm and well protected, and the young are then born alive. In contrast to amphibians, the skin of reptiles is usually protected from evaporation by scales, and they are therefore better adapted to life on land.

Germany is home to 21 amphibian and 15 reptile species with numerous genera. Many of them are on the Red List (see page 29) – such as the yellow-bellied toad (critically endangered), the grass snake (early warning list), the adder (critically endangered), the sand lizard (early warning list) and the tree frog (endangered). It is therefore important to restore and protect their habitats.

A habitat for yellow-bellied toads

A toad that prefers to live in small puddles:
when it was discovered in the middle of a construction site,
conservationists organized its relocation.

It's just the size of a matchbox and its heart-shaped pupils are its trademark: On the hunt for ants, beetles, and other insects, the yellow-bellied toad leaves its hiding place as soon as it gets dark. It needs small, rapidly developing water bodies to survive and reproduce. In today's floodplains, however, these hardly exist any more.

In 2013, yellow-bellied toads were discovered on a construction site near the Heringen potash site. As it was clear that they could not stay there, K+S quickly and unbureaucratically made a neighboring plot of land by the railroad tracks available. The German Nature and Biodiversity Conservation Union (NABU) created three yellow-bellied toad biotopes in this Werra floodplain, which were quickly accepted by the frogs. Since then, the small ponds at the sunny location have been regularly uncovered and cleared of vegetation to provide ideal spawning conditions for the animals.

Back in 2014, K+S hosted a conference of the Arbeitsgemeinschaft Amphibien- und Reptilienschutz in Hessen e.V. (Working Group for the Protection of Amphibians and Reptiles in Hesse) and is committed to improving the habitat situation of the yellow-bellied toads, which are highly endangered throughout Germany.

Inconspicuous water holes are home to rare animals

Yellow-bellied toad with typical heart-shaped pupil

Dragonflies also colonize the waters

Three yellow-bellied toad biotopes were created near Heringen, which the animals quickly accepted

The adder biotope at Lake Haunesee

A richly structured area near Marbach in eastern Hesse promotes the diversity of reptile species.

The area at the Haunestausee was originally intended for a parking lot extension. Planning changes by the local authority, however, made it available. Therefore, it was possible to use it for a compensatory and replacement measure with an unusual appearance.

The area of around half a hectare was not planted or reforested but was intended for the promotion of reptiles. For this reason, stone walls, gravel areas, heaps of earth, and piles of stones were erected. A pond and wild meadow seedings complement these elements. The result is a richly structured area in a small space, which is particularly beneficial for the endangered sand lizards and adders, as well as other insects and birds. The reptile habitat is framed by a railroad embankment and meadow areas with other biotopes, which together form a valuable natural network as far as the Haune.

The implementation of this measure was facilitated by the community of Petersberg through the provision of the area as well as the NABU local group Petersberg, which conducted the high-quality technical planning.

A large, dark gravel area stores warmth for reptiles and is supplemented by small biotopes such as piles of stones and dead wood

Stone pile as a small biotope

Adders well camouflaged

Shy sand lizard

The deadwood is well accepted by many wasp species

29 Adder biotope at Lake Haunesee

Total area:
0.53 ha

Initial status:
fallow land

Implementation:
since 2015

Habitat development goal:
open space, rock piles, natural succession

Fauna development goal:
reptiles and insects

Parties involved:
NABU local group Petersberg, community of Petersberg

Greening of tailings piles

White tailings piles result from depositing unusable salt residues from potash production. With special covering methods, they can be turned into green hills with potential for species conservation.

For some, they are part of the landscape, visible from afar, for others they are a foreign body: the white mountains in the Werra Valley, in the Hanover/Hildesheim region and near Magdeburg. They consist of salt residues from potash production for which there is no further use. When precipitation falls on the tailings piles, saline tailings pile water is produced, which is collected and disposed of in drainage or perimeter ditches.

This disposal, however, is associated an environmental impact – and K+S has set itself ambitious targets for reducing it. Covering with site-specific tailings pile covering methods has shown excellent results: They incorporate greenery or enable the formation of vegetation layers that increase evaporation capacity and therefore significantly reduce rainwater contact with the body of the tailings pile. This results in reduced volumes of tailings pile water and unique new habitats for plants and animals.

Before the covering of a tailings pile is implemented, the material suitability, soil mechanics, stability, greenability, and evaporation performance of the potential covering materials must be thoroughly tested and verified. Once suitable materials have been found, they are applied using site-specific covering methods – for example, on the Sigmundshall tailings pile using a thin-layer method parallel to the side or on the Friedrichshall tailings pile using a thick-layer covering in a berm structure. Seeding, planting, and natural succession subsequently lead to a green tailings pile. Depending on the microclimate, different habitats for plants and animals are created.

The Friedrichshall tailings pile is green and lively again

Where the potash tailings pile used to be a foreign body in the landscape and ecology, a new habitat has been created by covering the pile.

It began as a large-scale experiment in the mid-1990s and can now be called a successful project: The first complete technical covering of a medium-sized potash tailings pile in the world can be found at the Friedrichshall site in Lower Saxony; it created a green habitat near the town of Sehnde, east of Hanover, which is unusual for a former industrial site.

It began with the delivery of material from the expansion of the nearby Mittelland Canal and its use as covering material. Even back then, the aim was to reduce the amount of rainwater entering the salt body and therefore **reduce the amount of saline tailings pile water**. Since then, this has been reduced by around 85 percent.

The Friedrichshall tailings pile is green and species-rich again

Covering was done in berm construction with non-hazardous rubble, which was processed at a specially set up recycling site. It serves as a drainage layer to drain water from the covering body in a controlled manner. A layer of soil was built on top of this and the vegetation growing on top covers the tailings pile. In this way, most of the precipitation falling on the tailings pile evaporates or is kept away from the tailings pile core by the drainage layer and directed to the edge ditch.

Step by step, the tailings pile cover grew in height and width, as the covering material cannot be piled up as steeply as the salt flank. Seen from the side, the covered tailings pile now looks like a stepped pyramid. About 90 meters above the town, the Sehnde town council has erected a summit cross to mark the mountain.

In the meantime, a **diversity of vegetation** with almost 200 identified species has developed on the comparatively small area through the natural spread of plants typical of the site. Artificial greening measures such as spraying, seeding, or local planting, which were carried out to stabilize the surfaces and protect against erosion, hardly play a role here. Even during the covering work, it was observed that new, not always local species quickly appeared after completion of a section. The reason for this lies in the material of the top covering layer, which originates from natural soils such as gardens, fields, playgrounds, or similar places. These contain seeds, fruits or parts of plants that have been introduced into the top layer. Especially in the first few years after completion of a construction phase, a wide variety of vegetables or ornamental plants can often be observed on the cover, which are often only annual plants, but which contribute to the varied overall impression of the covered Friedrichshall tailings pile. Long-term and sustainable vegetation, on the other hand, tends to grow from local sources. The natural transportation of plant seeds by wind or bird droppings leads to the introduction of various plants from the immediate surroundings of the tailings pile, which can quickly develop and spread on the cover.

Today, the plant cover on the covered Friedrichshall tailings pile is completely closed by **vegetation in various stages**. Alongside a continuous herb layer, there are shrubs and the beginnings of forest growth. The potential of this development depends on the one hand on the natural site factors such as the slope, the exposure, or the humidity, and on the other hand on the age of the different sections of cover.

Over the next few years, a further increase in vegetation diversity can be expected until a natural balance is established across the entire covered tailings pile body and natural succession occurs. Further observations will provide information on the development of vegetation and the stages of succession on an exposed, artificially covered tailings pile. Even today, just a few years after completion, deer, foxes, hares, and pheasants can be photographed with a wildlife camera. In the air, red kites can be observed, which are on Germany's list of endangered species in Germany.

"The development on site confirms that covering is the right approach and that animals as well as plants are reclaiming the once white mountain."

Ralf Boppert,
Managing Director of K+S Baustoffrecycling GmbH

Covering the Friedrichshall tailings pile (30)

Total area:
42 ha with cover

Initial status:
28.4 ha potash tailings pile, residual salt

Implementation:
since 1990

Habitat development goal:
trees, shrubs, herb layer

Fauna development goal:
native species of open land and forest, such as hares, deer, foxes, rodents, insects, and birds

From a white mountain to a species-rich habitat

The Sigmundshall tailings pile has been developed into a biotope with great biodiversity because of the tailings pile greening.

Potash production leaves behind unusable residues – mostly rock salt – which also had to be stored on tailings piles in Sigmundshall during active mining operations. When precipitation hits this tailings pile, it produces saline tailings water, and this has to be disposed of. Greening the tailings pile has long been considered to reduce this. Direct greening of the tailings pile surface – this also applies to salt-tolerant plants known as halophytes – is not possible due to the high salt content. The most effective way to achieve a significant reduction in water in the tailings pile, however, is to green the body of the pile. It is therefore necessary to encase the tailings pile with a thick layer of green material. As early as 1993, there were considerations as to which materials could be used to create a thin-layered, slope-parallel, and stable cover.

A suitable material was found in the secondary aluminum industry – in the recycling of aluminum in combination with smelting salts. It turned out that the resulting residual material was suitable for covering the tailings pile in terms of both environmental compatibility and stability. After the greenability could also be proven, a first field test was carried out in 1997 on the southern slope of the tailings pile. Following successful results, covering has been applied on a large scale since 2002.

Greening

As the cover material still contains a certain amount of salt, it is only sown after about two years, after leaching and settling. A commercially available grass mixture consisting of four types of grass is generally used: Perennial ryegrass, red fescue, tussock grass, and sheep's fescue. The seeding enables the rapid formation of a more or less closed vegetation cover. Ryegrass (Lolium perenne) plays an important role in this, as it emerges after a few days and then acts as a nurse for the subsequent species.

The application of the covering material to the tailings pile already significantly reduces the tailings pile water, and the effect increases with the developing greenery.

From a nature conservation perspective, natural revegetation without any pre-seeding would perhaps be desirable, but due to the difficult growing conditions for plants on the covered tailings pile, this would take years. A permanent tailings pile cover without seeding would be eroded by wind and precipitation. The vegetation cover therefore fulfills two functions: It improves soil stability and increases evaporation capacity. The sown areas are fertilized in the first two to three years and watered if necessary to support the development of the vegetation cover. This ends after the formation of a closed vegetation cover and the associated stabilization of the covered tailings pile area. From this point onwards, the natural development (succession) of the plants and the associated natural colonization by animals can be seen – with a sometimes surprisingly rapid increase and change in species.

Ryegrass, which is so important for the initial phase of revegetation, may have been displaced by other types three years after sowing. According to annual records, numerous plant species immigrate. The new species are brought to the tailings pile by deer, hares, badgers, mice, birds, beetles, snails, or even by wind and humans. More robust species prevail and displace less competitive species. It is not yet clear whether the maximum number of plant species on the tailings pile has already been reached. As long as covered areas are added and there are gaps in the vegetation, further species can immigrate.

The developments to date on the Sigmundshall tailings pile have been scientifically monitored from the outset and documented in annual reports. In 2009, the annual record of plants growing directly on the tailings pile began. By 2023, the total number amounted to 217 species, including 38 woody plants; 13 woody plants were introduced through experimental plantings, including the vine (Vitis vinifera), which was planted on the south side in 2009 and still thrives there today. Over the last ten years, the species diversity of the woody plants has been between 29 and 36, many of which are likely to come from the wooded strip that surrounds large areas of the tailings pile.

Crop species such as pears, cherries, plums, cherry plums, and walnuts probably come from surrounding gardens. These also include flowering shrubs such as various rose species and butterfly bushes.

A tailings pile greening system absorbs rainwater and reduces the formation of saline tailings pile water

In the start-up phase, the greening is irrigated, as here on the tailings pile top

Large cabbage white butterfly on alfalfa

Of the total of 179 herbaceous plants, 93 to 130 species were found annually in the last decade. The larger number compared to the woody plants can be explained by various developments. In recent hot years, damp areas and therefore many plant species have disappeared (e.g., white ostrich grass). Many plant seeds that were planted on the tailings pile were able to germinate but were unable to establish themselves permanently (e.g., red foxglove or meadowsweet). Other species did not survive the winter (e.g., zinnia), and numerous small-growing species were unable to withstand competition from taller species. It is also possible that selection is due to predation by animals such as mice, snails, hares, and deer.

With its great biodiversity, the Sigmundshall tailings pile is a special biotope in an agricultural area. For almost 25 years, it has been developing into a species-rich habitat for animals and plants on an almost pure salt tailings pile, which has been coated with a technogenic substrate. Rare species, such as the Carthusian carnation (Dianthus carthusianorum), the swallowtail butterfly, and the endangered shaggy rose beetle, have also found a niche in this very exposed location. The development will continue for decades to come, and its special features will be visible from afar due to its exposed location.

Detailed information can be found in the publication series "Ökologie und Umweltsicherung" in issues 19 (2000), 20 (2001), 25 (2005), 35 (2013) and 36 (2018).

Prof. Dr. Helge Schmeisky
Environmental Protection, Witzenhausen, Germany

Species-rich vegetation is constantly changing on the exposed sides

K+S NATURE CONSERVATION **TAILINGS PILE COVERING WITH VEGETATION**

The greening began on shorter tailings pile sides and has been successfully expanded

Greening of tailings piles at the Sigmundshall site

31

Total area:
42.2 ha with cover

Initial status:
40 ha potash tailings pile, residual salt

Implementation:
since 2002

Habitat development goal:
grass communities, native shrub, and herb layer

Fauna development goal:
native species of open land and forest, such as hares, deer, foxes, rodents, insects, and birds

Protection for storks

The Zielitz potash plant has always had a heart for storks – whether it's the establishment of new nests for white storks or the repair of existing stork roosts at lofty heights. Besides expert bird knowledge, what is needed above all is operational technology. This is exactly where the plant's fire rescue team comes into play: with its turntable ladder, it ensures the protection of storks in the region.

Young birds in Zielitz

Nesting sites for kestrels and swifts were set up at the Zielitz potash plant when the facade was renovated in the 1990s. The kestrels and young peregrine falcons are ringed every year, and since 1999 over 400 young birds hatched at the Zielitz plant have been recorded. Other bird species such as tits, starlings, and sparrows also benefit from the 337 nesting stones in the facades of the plant buildings, which have been transformed into attractive habitats.

Children protect bats

The "GlücKSkinder" – the youngsters from the company kindergarten at K+S AG in Kassel – regularly take part in an intensive study of the way of life and protection of bats with around 30 children in 2018. They built nesting boxes and went on an excursion to the nearby Habichtswald forest, where they placed them in suitable locations under the guidance of a local NABU group.

Wintershall orchard meadow

Around 17 hectares of orchards were planted at the eastern foot of the Wintershall tailings pile back in 2001. They were a compensatory measure for necessary infrastructure construction. Since then, a valuable biotope has developed that forms an impressive visual contrast to the tailings pile.

Falcons are very welcome at the Neuhof-Ellers site!

The Neuhof-Ellers plant has been providing a habitat for falcons for years. At a lofty height of 60 meters, there is a falcon box on the chimney of the drying plant, which is well accepted for breeding and raising the young.

In 2019, the plant entered a partnership with a local falconer who raises young birds that have been pushed out of the nest by their parents until they fledge.

When the falcon box showed clear signs of weathering and a rotten base in 2021, the plant management had it replaced immediately. This is because the chimney is an ideal breeding site and the surrounding plant grounds in green surroundings guarantee good food sources.

The local NABU group advised K+S on the choice of falcon box and is delighted to see how the chimney is fulfilling its additional purpose, as is the entire site workforce.

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PUBLISHER
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34131 Kassel, Germany

CONCEPT
Stephanie Lambach
Environmental Law, Permits and Regulatory Affairs
K+S AG, Kassel

AUTHORS
Corporate headquarters Kassel
Stephanie Lambach, Environmental Law, Permits and Regulatory Affairs

Werra integrated plant
Sebastian Arnold, Head of Nature Conservation and A/E Measures
Ellen Kohlepp, Nature Conservation and A/E Measures

Neuhof-Ellers plant
Patrick Rebbe, Environmental Protection and Permits

Zielitz plant
Thorsten Kowalowka, Communications & Brands
Kimberly Kühne, Regional Management
Kerstin Schulz, Environmental Protection and Permits
Dr. Alexandra Wölk, Environmental Protection and Permits

Sigmundshall plant
Christina Bauch, Ideas Manager
Sandra Gerhardt, Environment/Permits

Inactive Plants
Ralf Boppert, Managing Director K+S Baustoffrecycling GmbH
Dr. Fabian Schemmel, Plant Manager K+S Baustoffrecycling GmbH

Other
Prof. Dr. Helge Schmeisky, Environmental Protection Witzenhausen

EDITOR
Dr. Ute Heinemann
Communication + Coaching
Frankfurt am Main

LAYOUT + DESIGN
Robert Klose
Grunewald GmbH, digital and print media, Kassel

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Page 8: Development plan for initial afforestation in Klietznick,
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K+S is a partner to the region

The mining of crude salts is always associated with interventions in nature and the landscape. K+S examines every new project for feasible alternatives to minimize this impact as far as possible.

If the interventions are unavoidable, K+S implements compensatory and replacement measures in return. In cooperation with local farmers, associations, and nature conservation initiatives, the Company selects nature conservation projects with long-term benefits. These always offer the opportunity to achieve added value for the respective natural area close to the site.

This brochure presents examples of various projects from recent years, including measures to extensify agricultural land, restore water bodies as well as moors and forests.

K+S Aktiengesellschaft
Bertha-von-Suttner-Str. 7
34131 Kassel, Germany

www.kpluss.com