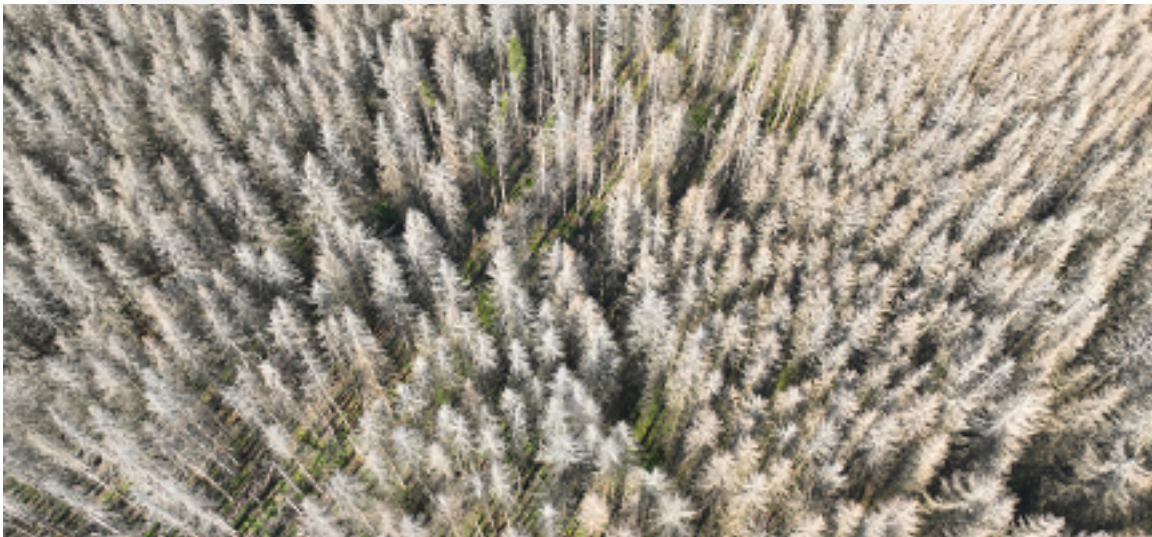


## Can a catastrophe for German forests turn into an opportunity?

*Drought, bark beetles and storms have destroyed more than 500,000 hectares of German forest in recent years. But this also created a huge outdoor laboratory for climate-resilient reforestation. Can the destruction actually save German forests over the long term?*

*Author & Photos: Thomas Krumenacker, editing: Katharina Jakob, translation: Gretchen Vogel*



*Large parts of the coniferous forests in the German low mountain ranges are dead.*

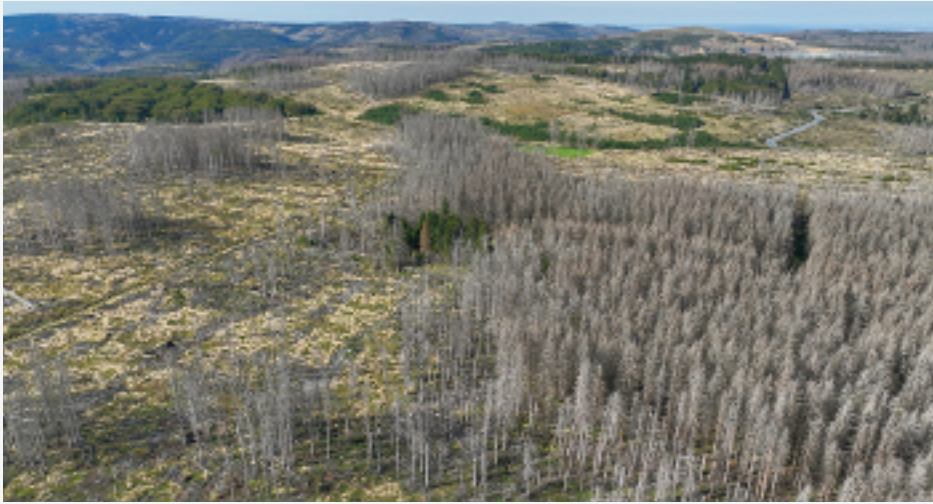
It's dead trees as far as the eye can see. Across Germany, many forest vistas are currently reminiscent of lunar landscapes. In the low mountain ranges called the Mittelgebirge — the Harz, the Black Forest and the Eifel — storms, drought, fires and bark beetle infestations have wiped out huge swaths of trees. Half a million hectares of dead forests will have to be regrown in the coming years.

As if this task were not already demanding enough, forestry experts, forest owners and conservationists are faced with another, even greater challenge. Beyond the huge areas that are now bare, the forests in Germany must be redesigned so that they can survive climate change. A third of Germany is covered by forest, and much of it must fundamentally change if it is to survive.

"Forest conversion" is the keyword for this huge transformation. How should it be carried out? Are so-called disruptive events or calamities — especially infestations with bark beetles and other "pest insects" — really the biggest problems facing the forest? Or are bark beetles possible allies on the path to climate-stable and species-rich forests of the future?"

**This article appears as part of our project "Countdown Earth", a series on solutions for the climate crisis and biodiversity loss.**

The answers to these questions vary greatly depending on whom one asks. But scientists, forestry experts, forest owners and conservationists agree on one point: Things cannot remain as they are now. Germany's forests are facing a new beginning.



*500,000 hectares of forests throughout Germany need to be reforested.  
A chance for nature?*



*Intact forests with sufficient water retention are important greenhouse gas sinks as well as focal points of biodiversity.*

## **The climate-resilient forest**

If one wants to learn something about forest damage caused by storms, heat and, above all, the bark beetle, a hike with Sabine Bauling is an excellent first step. Bauling, who was until recently deputy head of the Harz National Park, has witnessed the transformation of the low mountain range from a deep green spruce forest into a dystopian landscape of tree corpses. And, over the past two decades, she has studied the ecosystem's steps toward natural reforestation.

On a narrow path on a Harz ridge, Sabine Bauling looks at a slope full of dead trees — killed by an infestation of bark beetles. Then she says something amazing. "Normally the bark beetle behaves quite well." Does this sound like sympathy for the forest's biggest pest, for an "enemy" against which the former Agriculture Minister Julia Klöckner deployed the Bundeswehr to blow up infected trees?

The national park manager doesn't really have any sympathy for the insect. But it is important, she says, to emphasize that what many people consider pest insects are also a natural part of the forest ecosystem. As so-called facultative parasites, bark beetles usually target trees that are already in distress due to age or other factors. The beetles fulfill an important ecological task, she says, especially in mountain forests where spruce trees are part of the native ecosystem. When they attack a large, old tree, the insects create space and light for natural regeneration — the forest of the future.

However, where monocultures have been planted in low altitudes that are generally unsuitable for spruce, the cycle between parasite and parasitized can get seriously out of control. When climate change is added to the mix, the result is devastating, as can be seen everywhere in German forests. "Heat stress, drought and storms as a result of climate change are the ideal allies for mass reproduction of the bark beetle in locations where spruce trees don't actually belong," Bauling says.

### **If it smells like a train station toilet**

The disaster in the Harz began in the early 2000s. In the summer of 2003, temperatures remained well over 30 degrees late into the evening even at the highest altitudes in the Mittelgebirge mountain ranges. There was no rain for months. "At the time, many Harz foresters didn't even really know what a bark beetle was," Bauling says. "Twenty years ago, hardly anyone suspected that the first small outbreaks were harbingers of a larger catastrophe."

The combination of monoculture forestry and climate crisis developed into a perfect storm for the Mittelgebirge when, in addition to further drought, there were superstorms like Kyrill, which in 2007 reached hurricane force on the Brocken, the highest peak in the Harz range. An estimated 80,000 cubic meters of wood were destroyed by this storm alone. A previously unimaginable amount — and ideal support for the spread of the bark beetle.



*Beech forests have almost disappeared in many parts of Germany.*



*Today, the Brocken in the Harz Mountains is synonymous with forest dieback.*

The combination of heat stress, drought, storms and bark beetles has only gotten worse. Between 2018 and 2023 alone, more than five million cubic meters of wood were felled in the Harz as an emergency harvest in order to salvage anything at all.

Bauling remembers well the peak of the bark beetle infestation. Above all, the "scent of creeping death" has stuck with her. The mixture of pheromones — the sexual attractants of beetles — and dying trees can best be compared with the smell of a train station toilet. The last time the Harz smelled particularly intense was two years ago, Bauling says. As she was driving from the national park to her nearby home one spring evening, what sounded like a sudden downpour hit her car roof. But there was no sign of rain. It was bark beetles. "It was as if someone had dumped bags of rice over my car," she remembers. "Like an explosion."

It isn't possible for the weakened spruce forests to survive such mass proliferation. "Healthy spruce trees are able to ward off a bark beetle attack by excreting resin and suffocating the invading beetle in its borehole," she says, but weakened trees cannot do this.

The pattern of a bark beetle attack is always the same: Male beetles embark on a flight to find a suitable spruce tree. As soon as they have found one, they drill a tunnel into the tree bark. They excrete scented pheromones that attract both females and other males. The new beetles dig additional tunnels, and the females lay their eggs in them. Once the larvae hatch, they eat their way out of their breeding niches through the bark. For the host tree, the visit is usually deadly.

### **Clearing out dead wood? Not in the national park**

While in many commercial forests attempts are made to treat trees with chemicals before infestation and entire infested areas are completely cleared to prevent the beetles from spreading further, these interventions were out of the question inside the national park. When dead wood is removed, the forest is deprived of key ingredients for natural regrowth. Dead wood is the basis for the humus of the future. It also provides seedlings with vital shade, prevents soil erosion and stores moisture.

As the tree death became more and more severe, the pressure grew on the national park managers to intervene and remove the affected trees from the forest. "Tourism was declared dead, and it was not easy to make people realize that all you need is time and trust in the natural processes," says Bauling. The park officials stood firm — and the dead trees stayed in the forest.



*Sabine Bauling from the Harz National Park in front of her "climate-resilient forest."*

Time has proved Bauling and her colleagues right. Anyone who visits the scenes of mass tree death today, less than 20 years after the first widespread damage, cannot help but be amazed. Fresh green forest welcomes visitors where the dead trees used to be piled up. "Welcome to the new climate-resilient forest," says Bauling happily.

This forest developed by itself, without human intervention and exclusively through natural regeneration — and under the new climatic conditions. It has little in common with the centuries-old image of the Harz Mountains. Instead of the shady darkness of a dense coniferous forest, a sparse deciduous forest grows here, dominated by the brilliant white of young birch trunks and the cheerful light green of birch leaves fluttering in the wind.



*"Climate-resilient forest": After just a few years, a colourful forest grows on the areas of dead spruce plantation. The birch trees prepare the field for the slowly growing beech and oak forest.*

"Nature has really thrown our human blueprint — that of a pure spruce stand — out the window and developed its own plan," says Bauling. "We are experiencing a forest shift of historic proportions. We are witnessing something very special."

In the meantime, she has led many of the previous skeptics into the regrowing forest to show them the results of non-intervention. "Things have calmed down because you can see that something new is coming. It will be different. It will be colourful." A light birch forest is deeply

appealing, she says, "not as depressing as a dark spruce forest," and not detrimental to tourism at all. In fact, the Harz is currently overrun with tourists and officials are worried about overcrowding.

So, in retrospect, is the bark beetle more of an opportunity than a catastrophe? Bauling doesn't want to go that far. "It was a catalyst on the way to a more ecological and stable forest," she says. "There are many reasons to be optimistic about the future," she says, as her gaze wanders over a vast landscape still full of dead trees.

## **New tasks for forest owners**

Private owners own 48% of the 11 million hectares of forest in Germany. One of them is Cornelius Meyer-Stork. The 60-year-old from Bielefeld bought 260 hectares of forest immediately adjacent to the Harz National Park more than 20 years ago. It was mainly spruce forests, and 40% of the area has now died off.

"At first you are a bit paralyzed and have to process it," he says, recalling the time when the full extent of the spruce dieback in the Harz became clear. He had taken out a loan to buy the land, but he managed to pay that off two years ago. "Thank goodness, since now I would have a hard time repaying it," he says. Like many forest owners, Meyer-Stork has not only taken a financial hit, but is also burdened by the fact that the traditional cycle of give and take between generations has been interrupted as the spruce



*Cornelius Meyer-Stork sees new income opportunities for forest owners in the remuneration of climate services provided by forests* Credit: personal photo

trees die. "As a forest owner, you live from the trees that were planted generations ago. You sell wood that you didn't produce yourself, but with the clear conscience that you are planting something new that the next generation or the generation after that will harvest," he says. "This generational contract has been broken due to the bark beetle damage. The next generation will be able to sell significantly less."



*Natural regeneration: A beech tree grows from the stump of an old tree.*

However, Meyer-Stork has by no means given up. He believes that a changed social understanding of forests will also create new income opportunities for the owners. "Anyone who has a forest today earns their income from selling wood and a few hunting leases," he says. "In the future, it may be more about preserving the forest in general — its ecological value or its functions for climate protection." He sees hopeful signs in this direction. Just a few years ago, hardly anyone talked about forests as a storage place for carbon. "Certificates for this are already being traded today, and new functions have been added that may lead to income in the future."

But Meyer-Stork doesn't want to give up completely on silviculture. "There are 70,000 tree species on earth. Something will grow," he says. He is open to an ecological conversion of his forest, but he also sees limits. He has cleared some of his harvested or killed-off areas. The practice is ecologically highly controversial, but the government subsidizes it. On the other hand, he hasn't planted spruces for a long time. He experiments with coniferous trees — including non-native species such as Douglas fir — and selects the trees that have suffered little or no damage after three or four dry years. "It has probably never been so difficult to start a forest," he says, "because you just don't know how it will develop."



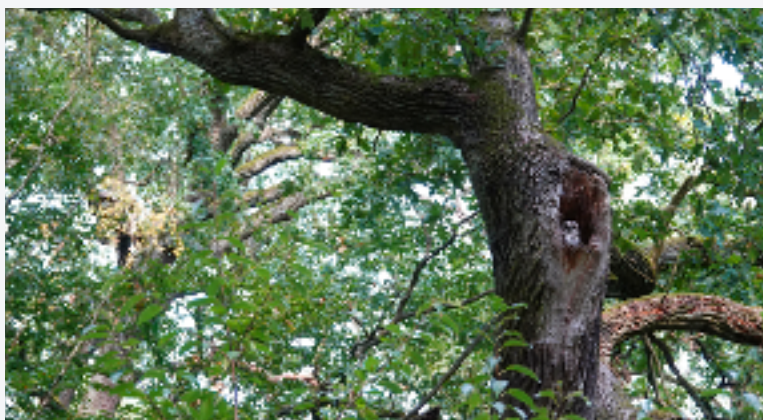
*Monotony in its purest form: uniform pine forests without undergrowth are worthless for biodiversity.*



*The successes of years of forest reorganisation are visible everywhere in Brandenburg: regrowth forest already dominates the lower tree layers.*

## **On the ecological value of the forest**

Foresters 400 kilometers further northeast are also trying a new approach to climate change. Brandenburg is pine country. In many places there are monotonous plantation forests with trees of the same age, size and height. But it's worth taking a closer look here too. While much of the region still looks like a pine monoculture when viewed from above, the tree layers below the crowns reveal a different picture: a colorful jumble of birch, beech, linden and oak trees. Many of the trees are already four or five meters high. The diverse undergrowth in the Brandenburg forests is the result of forest conversion efforts that began here in the mid-1990s. Progress has been slow, but it is visible.



*Forests are important habitats for dozens of bird species.*

"Nature wants to move towards oak, birch and beech," says Dietrich Mehl. In his mid-fifties, Mehl heads the Reiersdorf State Forest Forestry Office. With almost 23,000 hectares of forest, it is one of the largest in Brandenburg. Around 32% of Germany's forests are owned by the federal states, second only to private ownership.

In a few decades there will no longer be any pure pine forests here. That's the goal, at least, for Mehl and the 15 forestry offices that report to him. Pine trees still make up around 65% of the top layer of trees. Only 9% are beech trees. But deciduous tree species already predominate in the lower, rejuvenating layers.

Mehl sees the most important task of forestry as building an ecologically stable and therefore climate-resilient forest. The economic goals that have long been so dominant are now being pushed back. "The cubic meters of wood produced is increasingly no longer a suitable measure for how economically successful you are," he says. The ecological services of forests for people and nature are becoming increasingly crucial in times of climate change and the biodiversity crisis. "Clean air, clean water, biodiversity, humus formation — I am firmly convinced that all of this also has economic effects," Mehl says. These effects cannot yet be properly quantified in monetary terms. Nevertheless, more and more people are becoming aware "that ecologically stable forests must be our main goal and no longer just supplying wood as a raw material."



*Dietrich Mehl inspects young beech trees that were sown five months earlier.*

Mehl has ensured that logging in his areas has been significantly reduced. He considers the amount of annual wood yield, which is



set 10 years in advance, to be outdated in times of rapid climate change. After the hot summers of 2018 and 2019, for example, he stopped the felling of beech trees completely, even though that contradicted official plans. But following those plans, he says, would have endangered the forests.

Is he optimistic that ecological forest conversion can win the race against climate change? "The forest is making quite a vital move towards change," says Mehl. And can an ecological forest also be economically lucrative? "It has to work," says the forester. "Because we won't be successful economically if things go wrong ecologically."

The research for this article was funded by  
Hering-Stiftung Natur und Mensch

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