FOREST INSECTS **The spruce bark beetle is accelerating the transformation of Swiss forests.** Bark beetles have been killing more spruce trees than almost ever before. Human activities are partly responsible for this. Foresters are trying to make the forest more resilient by promoting more robust mixed forests in gaps in the forest.

Bark beetles play an important role in a healthy forest. By boring under the bark of dying trees, they perform important functions for the forest ecosystem such as enabling wood-decomposing fungi to establish on the trees. They also serve as food for other insects and birds. However, if a large number of trees are weakened, the beetles can proliferate rapidly.

Currently the situation is particularly bad. Many forests are full of withered conifers and cleared areas. After the drought of 2018, bark beetles multiplied en masse – in particular the spruce bark beetle *(Ips typographus)*. It killed thousands of spruce trees in 2019 alone – the equivalent of over 50,000 truckloads. This is the second highest figure ever recorded.

For further information on bark beetles, see: *www.wsl.ch/bark-beetle*

It has been a bitter blow for Switzerland's forest industry, where spruce is the most important crop tree species. The problem is, however, quasi homemade. In the Middle Ages, instead of cultivating the deciduous trees originally native to the Central Plateau, people began planting fast-growing spruce trees, which thrive well at higher and cooler altitudes. But with climate change, it is becoming too hot and dry for them, and the spruce bark beetle has flourished.

Recently, spruce trees have even had difficulties in their traditional habitats in the mountains. The warmer climate means the beetles can, in some ar-

The spruce bark beetle is the most frequent bark beetle species in Switzerland.

Photo: Beat Wermelinger, WSL

The effects of the dry year 2018 are still being felt: spruce infested with bark beetles in the Jura in July 2020.

eas, produce a second generation of offspring each year. “Some forests have been losing their protective function,” says Martin Bader from the Swiss Forest Protection Centre (WSS). Increasing populations of red deer and roe deer are further aggravating this situation. Their browsing destroys the young trees that would make the forests more resilient.

The Swiss Forest Protection Centre helps the forest services, local authorities and private owners diagnose beetle infestations, and advises them on appropriate measures to take. Since pesticides are banned in Swiss forests, potential breeding sites for the beetles must be minimised, Martin says. Infested trees should be felled and removed or debarked. To enable foresters to plan how to control the beetles better, WSL has developed a computer model to estimate the spruce bark beetle’s development. It shows the regional status of the beetle’s development. WSL researchers are using other computer models to try to forecast the likely impact of the beetles under climate change.

Computer simulation of bark beetle development in Switzerland: *www.borkenkaefer.ch*

The number of spruces at low altitudes will, in future, diminish, but they will probably not die out completely. Bark beetles have natural enemies, such as chalcid and braconid wasps, which are currently reproducing and decimating the beetles. According to Martin: “In one or two years – depending on the weather – the situation could ease.”

Promoting more robust mixed forests in gaps in the forest is thus important, explains Martin, to ensure trees can withstand both voracious insects and climate change better. Instead of growing spruce for timber production, it should be replaced by more drought-resistant conifers such as Scots pine or Douglas fir (see page 21). “The bark beetle is driving the transformation of the forest.” *(bki)*

Photo: Swiss Forest Protection