Michael Dietrich is using a magnifying glass to scan the bark of the tree, centimetre by centimetre. Although it is cold and foggy, he has spent the past ten minutes crouching beneath an impressive spruce. From time to time he carefully scrapes off a tiny piece of the bark with a knife and drops it into an envelope. After he’s finished examining the tree, he moves on to the next one, another spruce. Michael is a lichen expert. By summer 2021, he and four other WSL employees will have searched 500 forest plots to find lichens. The plots are part of the National Forest Inventory’s (NFI) network of permanent observation plots distributed across Switzerland. On each of the 500-m² plots – the size of about two tennis courts – experts carefully examine every single tree. “This can take a good five to six hours,” explains Michael.

About twenty years ago, Michael already surveyed the lichens in the same area. The data from this inventory was included in the first Red List of threatened epiphytic and terricolous lichens in Switzerland, published by the Federal Office for the Environment (FOEN) in 2002. Almost forty percent of the lichen species studied were classified as endangered at the time, a warning signal that the

Michael Dietrich is one of the five experts collecting field data for the revision of the Lichen Red List.
diversity of such inconspicuous organisms is also threatened. In the case of lichens, the organisms involved form a symbiosis consisting of a fungus and at least one green alga or a cyanobacterium. Even though they are mostly unspectacular, lichens provide habitats and nutrition for various animals and are excellent indicators of air quality. They are also indicators of forests that have been managed over a long period in a ‘close-to-nature’ way.

The Red List of lichens is currently being revised to find out how the frequencies of the species have changed since 2002 – and Michael is once again inspecting the steep mountain forest above Emmetten in Canton Nidwalden. Today, he is not, for a change, alone. WSL biologist, Silvia Stofer, who is coordinating the revision of the Lichen Red List at WSL, is accompanying him on this October morning. “I like to go along to the first fieldwork sessions when a new project starts so we can clear up any ambiguities in the data collection straight away,” she says. Michael calls her to tell her he has discovered something special. On the tree he is investigating, he has found small fruiting bodies growing at eye level. “Clearly *Lecanactis abietina*,” says Michael happily – the species is relatively rare in Switzerland.

After the fieldwork, Michael takes the envelopes with the pieces of bark to the WSL laboratory in Birmensdorf. Here Silvia and her colleagues analyse the lichens that cannot be determined with certainty in the field, as is the case with many of the 786 known epiphytic and terricolous lichen species in Switzerland. Silvia takes a piece of bark carefully out of an envelope and examines the lichen growing on it under the microscope. The identification of the species is anything but simple. “The size and shape of the spores or the...
shape of the tubes containing the spores often give clues as to the species,” says Silvia. To be able to identify a lichen, however, it must have fruiting bodies. If this is not the case, chemical analyses of its constituents can help.

**Data centres combine research and practice**

Once the lichen species have been identified, all the data Michael recorded at the site where they were found – such as the habitat, microhabitat or size of the lichen population – are fed into the computer and thus into SwissLichens, the Swiss Centre for Information on Lichens at WSL. SwissLichens provides an overview of the distribution and frequency of all lichen species known in Switzerland and serves as a basis for determining the conservation status of the individual species in the Red List. The data is publicly accessible. “One of the aims of SwissLichens is to make information about the distribution, conservation status and ecology of lichens accessible to the general public,” says Silvia, who heads the data centre.

In addition to SwissLichens, WSL also operates SwissFungi, the National Data and Information Centre on Swiss Fungi. SwissLichens and SwissFungi are affiliated to InfoSpecies, the umbrella organisation of the national data and information centres for biodiversity. Not only is there a Red List for lichens, but also for macrofungi, i.e. fungi whose fruiting bodies are visible to the naked eye. It was published for the first time in 2007. Around one third of the species studied were classified as endangered at the time. This list is also due to be revised. Andrin Gross, head of SwissFungi, is currently clarifying which data collection methods should be used.

**Sensitive organisms**

In addition to meticulously searching the NFI plots, the field teams also conduct exploratory tours in fourteen selected areas in Switzerland, each covering an area of 20 x 20 square kilometres. The aim is to find, in these areas, as many lichens that occur in rare habitats as possible. For example, some need warm, extensively managed meadows and others canyon forests.

Is the Red List of lichens longer or shorter than before? “We will find out when the data has been evaluated,” says Silvia. She assumes that there has been a shift in the frequency of species, as the influences lichens are exposed to today differ from those twenty years ago. At that time, issues such as acid rain were topical, but today the issues are climate change and the pollution of habitats with nitrogen. “Probably lichen species that are good at coping with nitrogen input from the air are more common today than they were twenty years ago,” she believes. The revised Red List will show how many of Switzerland’s epiphytic and terricolous lichens are actually endangered or even threatened with extinction. It will be published in 2022.