

Natural disasters give rise to biodiversity

Forest covers about a third of the area of Switzerland, and therefore plays an important role in species conservation. For the past century, forest area has increased and stands have grown denser, while more open areas of woodland with their rich biodiversity have decreased. Only forest fires and storms interfere with this development.

In our latitudes, forest is the final stage of plant succession in almost all environments below the Alpine zone¹. The only natural challengers of this dominance are forces such as storms, floods, avalanches or wildfires. Thus, the landscapes of the present day are the result of thousands of years of human intervention⁸.

The use and management of land are our principal means of opposing the encroachment of shrub and forest. Moreover, we make huge efforts to contain the natural forces that threaten our infrastructure and protection forests: river engineering works prevent flooding, avalanche barriers stabilise great masses of snow, and forest fires are so well controlled that they normally only affect small areas. Storms are the only force beyond our control.

But the huge force of these events does not spell disaster for nature, even if the affected areas are radically altered. Various species immediately begin to occupy these new, restructured areas in the early stages of succession¹. Amongst them are many pioneer species that have suffered under the shift from nature's unpredictable reign to the highly-controlled shaping of landscapes by humans.

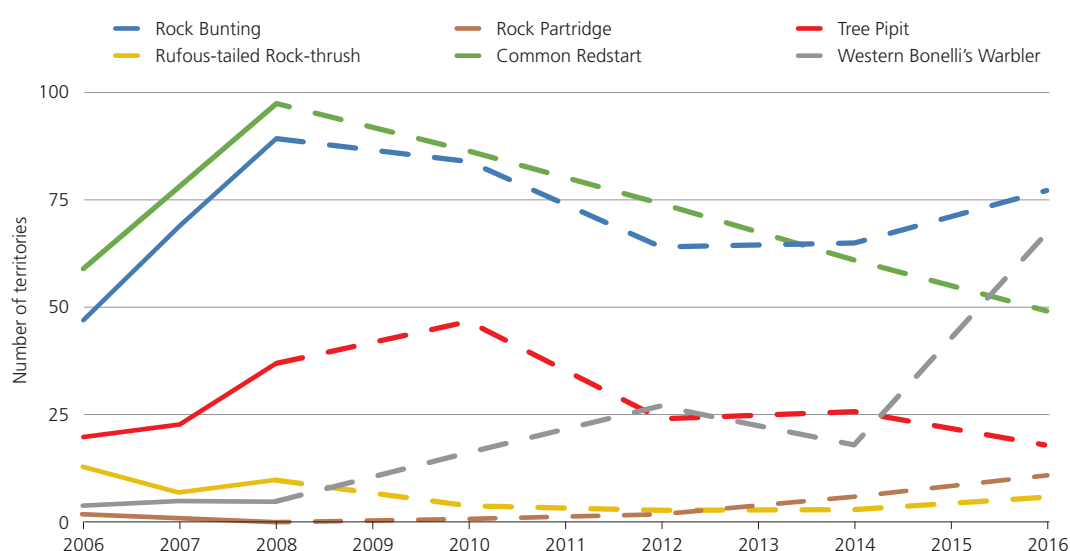
New life after the fire

Forest fires are ignited by lightning or human behaviour; they mainly occur in the central and southern Alps, especially in Ticino, but also in Valais and Grisons^{6, 15}. Since the beginning of the 20th century, 160 fires that affected an area of at least 100 ha have been recorded. In the past 20 years, however, their frequency has dropped significantly, totalling only 13 cases. Two of these areas affected by wildfires have been studied in terms of their bird communities: 310 ha of woodland and meadows at 800 to 2100 m near Leuk VS, destroyed by fire on 13 August 2003^{7, 9, 12, 15}, and 130 ha of forest at 650 to 1520 m near Visp VS, which burnt down on 26 April 2011^{4, 9}.

The forest-fire area of Leuk provides the most remarkable findings due to its size and exposure, but also thanks to the variety of biological studies conducted there, some of them over the long term. While the studies document the disastrous temporary consequences for the local avifauna, they also show, for the first time in central Europe, the extremely positive effects on the demanding species of the Red List and priority species list¹⁰. One thing became clear very quickly: the juxtaposition of patches of bare ground, one-year-old plants with an ample seed supply, and blackened tree stumps offering perches and cavities provides nest sites and food for a large variety of birds (as many as 50 species in 2016). Territory density reached a first peak after five years. As natural succession progressed, deciduous trees replaced the Scots pines and spruce trees that had dominated before the fire¹⁵, in turn changing the composition of the avifauna. The bird communities were successively dominated by Rufous-tailed Rock-thrush, Common Redstart, Rock Bunting, Tree Pipit and Rock Partridge, whereas true woodland birds, especially Western Bonelli's Warbler and Eurasian Blackbird, only slowly increased in number. The forest-fire area of Visp is characterised by the same continental climate as Leuk, but it is located on the north-facing rather than south-facing slopes of the Alps. There was a similar dominance of Common Redstart and Rock Bunting in the first few years (2012–2015). But unlike in Leuk, warmth-loving species such as Rock Partridge and Rufous-tailed Rock-thrush were absent⁴.

The regenerative force of chaos

Of all natural disasters in central Europe, winter storms cause the most damage in forests. However, in the past two centuries, only six such events were considered catastrophic¹³, including storms



Number of territories from 2006 to 2016 of six typical bird species on the 310-ha-large area near Leuk VS at 800 to 2100m, affected by fire in August 2003. The species successively reach maximum abundance. Overall abundance was greatest in 2008–2010 and 2016. After 2008, surveys were conducted every two years (dotted line).



Bertrand Posse

The wildfire in August 2003 above Leuk VS completely altered the area, as this view taken 14 years later, in June 2017, shows. Deciduous woods now cover three quarters of the area, quite different from the former pine stands on the lower slopes, spruce forest in the middle, and larch stands in the upper reaches of the area.

«Vivian» from 26 to 28 February 1990, producing five million m³ of damaged timber, and «Lothar» from 26 and 27 December 1999, with 12.5 million m³ of damaged timber or about 3 % of the total Swiss timber stock¹⁶. Storm «Lothar» primarily affected areas on the Central Plateau and in the Pre-Alps, storm «Vivian» areas in the Alps and Pre-Alps. Most areas were cleared or left as they were, with no significant effect on the density of new growth. Altitude, on the other hand, did influence the speed of natural reforestation¹⁴. In some areas affected by the storms or by earlier events, bird communities have been monitored throughout the stages of forest succession^{2, 3, 5, 17, 18}. In the early years, the richness of breeding birds depends mainly on the physical environment such as region, altitude or exposure. With time, these location-specific differences become blurred, as the growth of trees attracts widespread woodland species such as European Robin,

Eurasian Blackbird, Song Thrush or Common Chaffinch, whose population density is more strongly dependent on forest structure.

The frequency of storms and the threats they pose for forests have increased in central and northern Europe in recent decades, a trend that is expected to continue¹¹. Depending on the extent of such events, the predicted trend could have a positive impact on bird communities, especially on those scarcer species that rely on a mosaic of different forest structures or open stands. These species are at a disadvantage today as forests continue to grow denser, but given the chance, they are able to rapidly colonise suitable habitats.

Bertrand Posse



Damaged forest areas in the wake of storms «Lothar» (1999, red) and «Vivian» (1990, black). A large part of the affected areas was completely laid to waste. Federal Office for the Environment (FOEN).

¹ Blondel (1979); ² Christen (2018); ³ Glutz von Blotzheim (2001); ⁴ Hintermann & Weber AG (2016); ⁵ Mollet et al. (2017); ⁶ Pezzatti et al. (2017); ⁷ Posse & Sierro (2007); ⁸ Ramade (2012); ⁹ Rey (2015); ¹⁰ Rey et al. (in prep.); ¹¹ Seidl et al. (2014); ¹² Sierro & Posse (2011); ¹³ Usbeck et al. (2010); ¹⁴ Wohlgemuth & Kramer (2015); ¹⁵ Wohlgemuth et al. (2010a–b); ¹⁶ WSL & BUWAL (2001); ¹⁷ Zollinger (2015); ¹⁸ Zollinger (2016)