

# Forest fires

## – once a natural disturbance

Photo: Historical forest image archive, SLU



◀ In the past, about 1% of the forestland found in Sweden burned each year, but today that figure is only 0.006%. This change threatens the survival of fire-dependent species. Controlled burns recreate environments transformed by fire. The fire history of an area is important if a controlled burn is to be conducted correctly.

The Tallhed fire. The forest burned in 1878. Afterwards, the land was covered in heather, blueberry bushes and reindeer lichen. The photo was taken in 1903 at Rensjöbrännan, Ölvdalen Crown Park, Dalarna.

Fire history is the study of how often forest fires have occurred within a given area together with their extent. By studying fire damage to a tree's growth rings, so-called fire scars, the fires can be dated. Forest fires were common from prehistoric times to the mid-1600s. Human activities, such as burning grazing land, increased the number of forest fires from the mid-1600s to the mid-1800s. The fires decreased in frequency once the forest gained increased economic value in and around 1850, which is also when fire-fighting became more effective.

### Forest shaped by fire

Fires have been a natural disturbance factor in Sweden's forests. The landscape changes after a fire, becoming more open, brighter and warmer, which affects the resident plants, animals and insects. Different species have adapted to take advantage of forest fires. One example is the pine tree, which is fire-resistant thanks to its thick bark and high crown.

Forests dominated by pine trees of different ages can be a sign of a forest shaped by fire. A forest fire can also result in a deciduous forest, as with less competition from the reduced number of spruce, rowan, aspen, birch and goat willow can establish themselves.

### Counting growth rings

Dendrochronology, which entails determining the age of a tree by counting its growth rings, can be used



Photo: Thomas Nordling, Sveaskog's image bank

▲ Modern clearing burn.

Photo: Daniella Andersson.



▲ Pine tree with fire scars. Here we can see that the forest has burned several times, in part because each fire creates a new callus on the fire scar, and in part because the fire scar wood is blackened.

to investigate historical fires. A fire scar is damage caused on the tree trunk after a forest fire. When trees continue to grow after a fire, the fire scar is encapsulated or covered by new living wood.

Fire scars are visible in the tree's growth rings, which means you can determine the years in which a tree has been damaged by fire. A single tree may have survived several fires and as such will have several fire scars. You can even tell which season the tree was burned.

### Pollen analysis

Pollen analysis enables us to study past fires stretching as far back as 9,000 years ago. A sample from, for example, a mire is taken using a large core sample drill. The sample contains mud and peat, which is separated into different layers. The pollen in certain layers is counted, the species identified and their ages determined. The pollen shows how the vegetation has changed over time and can, for example, reveal when people started farming nearby.

Charcoal particles from the same sample can also be studied to learn about past fires. Larger charcoal particles do not spread far from forest fires, which means that layers of charcoal are visible in the samples if there have been fires nearby.

### Fires from prehistory to the 1600s

Forest fires were commonplace from prehistory until the middle of the 1600s. These forest fires were extensive, many affecting more than 1,000 hectares, and they were often caused by lightning strikes.

In Sweden as a whole, an average of 1% of the country's forestland burned each year until the 1600s, while in Västerbotten County the corresponding figure was 0.8%.

### Fires from 1600 to 1850

The number of forest fires increased as settlers colonised parts of the country. The fires were more frequent, but not as extensive as before. Forest fires affecting more than 1,000 hectares dropped to about half of all fires. Many of the fires were probably caused by slash-and-burn agriculture and the burning of grazing lands. Since the fires were started close to previously burned forests, they remained relatively confined as forest fires do not spread as easily in recently burned forestland. In inland Västerbotten, fires increased to encompass about 1.4% of all forestland each year.

Slash-and-burn agriculture came into use after the Middle Ages in Sweden and entailed burning the forest either to clear it or to improve grazing and cultivation conditions. Burning the forest releases additional nutrients for the crops which are then cultivated. Rye was often sown in slash-and-burn agriculture. Although slash-and-burn was prohibited as early as the 1600s, it was not until the middle of the 1800s, when the economic value of the forest was fully recognised, that slash-and-burn truly came to an end.



Photo: Daniella Andersson.

▲ Burned forest following a controlled burn at Skatan Ecopark in Västerbotten. Ground vegetation has started to spread inwards from the periphery of the burned forest.

### Fires from 1850 to today

Forest fires became less common as of the mid-1800s, a result of the increased economic value of the forests. Firefighting became more effective and fires were extinguished faster thanks to improved transportation in the forests. During the early 1900s, bike trails were built in the forests, with forest roads being laid from the 1950s onwards.

Photo: Sveaskog's image bank



▲ **Controlled burn.**

By the end of the 1800s, forest fires in inland northern Sweden had dropped to about 0.25% of all forestland each year.

In Sweden today, 0.006% of forestland burns each year, and in Västerbotten County the figure is even lower. On average, the fires are as small as one hectare. The drop in forest fire frequency has changed the landscape, with the formerly ubiquitous pine now dominated by spruce. Forest fires have created environments on which some species depend, and so the less frequent fires have adversely affected such fire-dependent species.

One general problem is that areas which have previously burned every thirty to fifty years are now seldom affected by fire, perhaps only every few hundred years instead.

### **Fire-dependent species**

Species that depend on habitats created by forest fires are called pyrophilic species. Fewer and smaller forest fires have threatened such species, and some have simply disappeared. Several of the affected species are red listed. In the past, it was standard practice to log forests shortly after they were struck by fire, which meant that such species did not get to benefit from the fires. Following a forest fire, competitive species are heavily impacted, allowing other species to thrive.

Most fire-dependent species are insects and fungi. There are about 50 fungi that only grow on recently burned land. There are also about 40 insects that are directly dependent on recently burned forest, and some 100 insects that benefit from the environments created by forest fires.

Because wood-boring insects increase in numbers in burned forests, foraging woodpeckers who nest nearby also benefit. For the white-backed woodpecker, which is red listed in Sweden, the deciduous forests established after a fire comprise an important habitat.

### **Controlled and clearing burns**

Controlled burning was introduced in the 1990s. The controlled burning of forests recreates natural habitats for pyrophilic species, contributing to biological diversity.

Clearing burns are another important method for species that require recently burned forests, although this method is essentially used to release more nutrients in clearings after they have been logged. The difference is that with a clearing burn the trees are first logged and with a controlled burn the trees are allowed to remain standing. Controlled burns are used in nature reserves to protect threatened species and to recreate the forest's original ecology.



One general problem is that areas which have previously burned every thirty to fifty years are now seldom affected by fire.



Photo: Mattias Nyström, SLU. Historical forest image archive, SLU

▲ **Drones are used for both research and teaching purposes. The drone is equipped with both a standard camera and a thermal camera. Here data is being collected during a course in controlled burning at SLU in Umeå. The thermal camera provides a good overview of the fire's progress and can be used to quickly localise hot spots during extinguishing work.**

## Fire history is important

Fire history shows that forest fires have been a natural part of forest ecology. Controlled burning has resulted in increasing populations and wider distributions of several fire-dependent insects in recent years.

If controlled burns are to be effective, it is important to consider the fire history when deciding which areas to subject to controlled burns. If an area has burned frequently in recent times, it can be advantageous to burn it again to benefit pyrophilic species. What's more, the fire history can be important when planning the time intervals and rotation of future controlled burns.



The controlled burning of forests recreates natural habitats for pyrophilic species, contributing to biological diversity.

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## visa skogen

Project PINUS, a project for innovative experiences in managed forests, aims to gather the tourism industry, the forest industry and forestry academia in efforts to create opportunities for tourism in managed forests. Project PINUS began in August 2016 and runs until November 2019. The Museum of Forestry in Lycksele is the project owner.



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