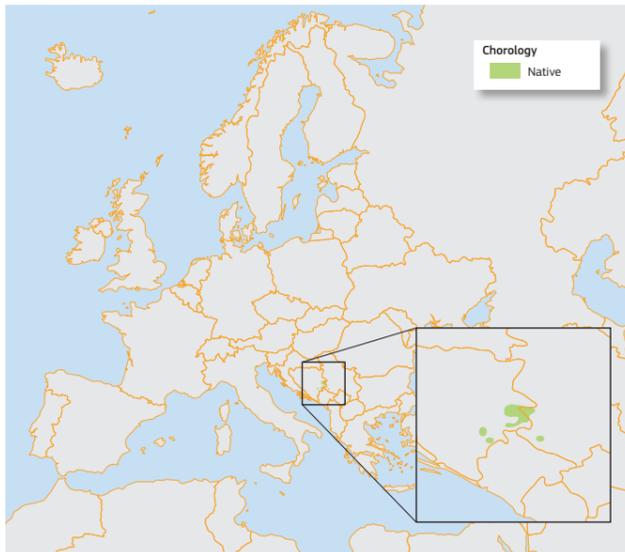


## Picea omorika in Europe: distribution, habitat, usage and threats

D. Ballian, C. Ravazzi, G. Caudullo

*Picea omorika* (Pančić) Purk., the Serbian spruce, is a living fossil tree restricted to a small area at the boundary of Serbia and Bosnia Herzegovina. It grows in cool temperate mixed forests on mountain slopes but also withstands poorly aerated soils. Poor regeneration, fire impact in the 19th century and forest tree competition together with climate warming in recent years has left the Serbian spruce with the status of endangered species. Its prominent columnar habit and silvery sheen, together with tolerance to pollution, make it a valuable tree for urban landscapes.

The Serbian spruce (*Picea omorika* (Pančić) Purk.) is a slender tree up to 50 m high and 1 m in diameter, featured by a distinctive narrow conical crown<sup>1</sup>. Root systems are very shallow and branched. Second order branches are curved downward and addressed to the main trunk. This strictly monopodial "spire-shape" is only typical in clean and mixed forests, cultivated individuals in open spaces becoming wide crowned. Like other spruces, young branchlets bear spirally-arranged swellings (**pulvini**) supporting the needles, but in Serbian spruce the first and second year branchlets are **pubescent**. Needles are 0.8-1.8 cm long and 1.1 to 1.8 mm wide<sup>2</sup>, basally truncated and horizontally compressed in two sides. Their lower surface has two prominent, white stomatal bands (**epistomatic** setting) of 4-6 lines each, giving the tree a silvery sheen. Pollen bears two wings, smaller than in Norway spruce (*Picea abies*)<sup>3</sup>; pollen morphology and pollination mechanism are not yet fully pinpointed<sup>4</sup>. Female cones are produced at the top of the crown<sup>5</sup>. They are first erect, then develop a pendulous, resinous, dark bluish-violet ovoid-oblong cone, reaching up to 6.5 cm long once ripe, but often less than 3 cm, thus resembling its Canadian relative black spruce (*Picea mariana*) and even the conifers of genus *Tsuga*. A cone may contain up to 90, nearly spherical seed scales, each containing two wind-dispersed seeds. The old cones remain on the tree for up to 2 years<sup>6</sup>.



Map 1: Plot distribution and simplified chorology map for *Picea omorika*. Frequency of *Picea omorika* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *P. omorika* is derived after Farjon and Filer, and Stevanović *et al.*<sup>32, 33</sup>.

### Distribution

Serbian spruce is restricted to a small area along the Drina River at the boundary of Serbia and Bosnia Herzegovina, with a total occurrence extent of only 4 km<sup>2</sup><sup>7-10</sup>. The main stands that grow in National parks in the Tara Mountains and an isolated population in the Mileseva River canyon in Serbia are protected, while in Bosnia and Herzegovina they are on its protected habitats<sup>11</sup>. Other isolated spots, each consisting of a few hundred individuals, occur between Višegrad, Rogatica and Srebrenica, and there are two isolated populations further south (Čajniće and Foča)<sup>10-12</sup>. Palaeobotanical records show that this **stenoendemic** pattern results from an overall reduction from a wide range spanning most of Central Europe during cool and moist temperate **interstadials** at the onset of the Last Glaciation, 100 000 years ago<sup>13</sup>. Serbian spruce survival in the Dinaric Alps during the Last Glacial Maximum is supported by its current genetic structure which retains ancient imprints<sup>6, 14</sup>.

### Habitat and Ecology

The modern habitat of Serbian spruce is too limited for a straightforward evaluation of species tolerance limits. The main habitats occur on steep, east, north and west facing, often rocky slopes, mostly on limestone, but also on serpentine, at an altitude of between 800 and 1500 m. It may form the dominant canopy in a closed forest together with Norway spruce (*Picea abies*) and black pine (*Pinus nigra*) at higher elevations, or with beech (*Fagus sylvatica*) at lower ones, but silver fir (*Abies alba*),

Scots pine (*Pinus sylvestris*), alder (*Alnus glutinosa*) and other broad-leaved also occur. The **mesoclimate** is oceanic, with cold winter temperatures and heavy snow followed by hot dry summers<sup>15, 16</sup>. The tree regenerates quite well after catastrophic fires, but suffers competition from broadleaves; thus only steep slopes and limestone cliffs are successfully re-colonised<sup>17</sup>. Serbian spruce also withstands poorly aerated soils in peat bogs, thanks to its ability to root in the upper layer, a common feature in spruces which are stress avoiders of anoxia<sup>18</sup>. This behaviour also recalls its Early Pleistocene ancestors, growing in ancient peatlands and recorded by *in situ* macrofossils<sup>19</sup>.

### Importance and Usage

Wood of Serbian spruce was valued as a technical wood because of its good quality. It was also used to make special kinds of pots for cheese<sup>1, 20</sup>. As a building material, its timber was mostly used for roof constructions. Today only its aesthetic features and tolerance to city pollution and to insect pests are of value<sup>21</sup>. This is why people use it more than other conifers in cities with high levels of pollution. Serbian spruce deserves a more prominent place in commercial and residential landscapes. It can be used in groups, as a single specimen, or even as an evergreen street tree. It has utility as a natural screen and selections with a narrow habit are suitable even for small urban landscapes. Serbian spruce represents a welcome alternative to the all-to-common Norway and Colorado spruce (*Picea pungens*). Today there are many cultivars of Serbian spruce produced in nursery gardens and grown in parks<sup>20</sup>.

### Threats and Diseases

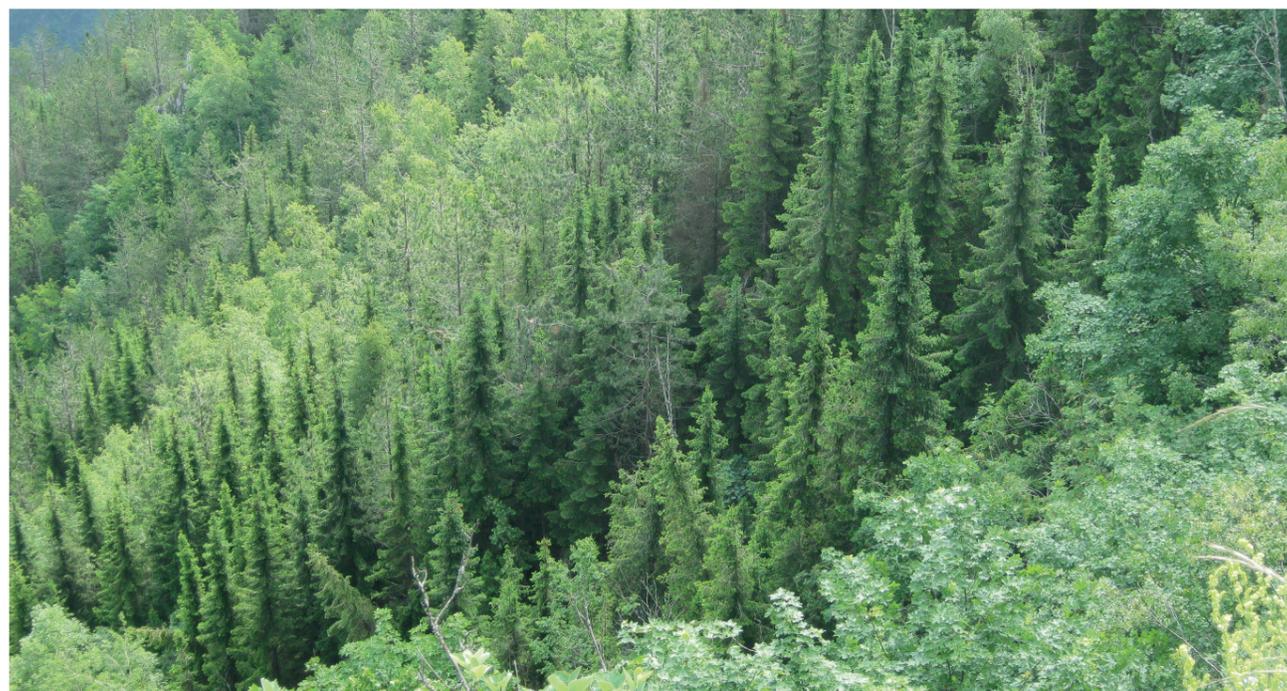
The current population decline is related to its inability to compete with other tree forest species<sup>12</sup>. The small range of Serbian spruce, composed of isolated populations, and the occurrence of self-fertility affect the genetic structure which is specific for each of the populations, given genetic drift and depression<sup>10, 22, 23</sup>. However, other results show relatively high genetic variation, which is characteristic for conifers<sup>24</sup>. The biggest issue for Serbian spruce is fires, which have reduced its spread during the last century<sup>7, 11, 25</sup>. Another problem is a small number of fertile trees and poor natural regeneration, which may be even worsened by climate change<sup>10</sup>. For this reason Serbian spruce now has the status of endangered species<sup>12</sup>. Currently there are no reliable data about insects and diseases which attack Serbian spruce, but there is some information about some of the pests which are attacking introduced samples in North America. Some sources list aphids, mites, scale and budworm as potential insect problems; however so far there are no reports of these pests significantly affecting the trees in Pennsylvania. The large pine weevil (*Hyllobius abietis* L.) is among the most serious pests affecting young coniferous forests in Europe<sup>26, 27</sup>, and Serbian spruce partly coexists with the natural niche of this pest<sup>26</sup>. The Serbian spruce is susceptible to the bark beetles *Ips typographus* and *Dendroctonus micans*<sup>28-30</sup>. It is also vulnerable to *Gremmeniella abietina*<sup>28, 31</sup> and may be subject to attacks by *Pristiphora abietina*<sup>28, 30</sup>. The white pine weevil (*Pissodes strobi*) also has the potential to seriously affect Serbian spruce if not controlled<sup>1</sup>.



Dark bluish-violet female cones at the top of the crown. (Copyright Ifar, commons.wikimedia.org; PD)

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Serbian spruce in Bosnia Herzegovina where it codominates a mixed forest with several broadleaves. (Copyright Dalibor Ballian; CC-BY)

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Ballian, D., Ravazzi, C., Caudullo, G., 2016. *Picea omorika* in Europe: distribution, habitat, usage and threats. In: San-Miguel-Ayanz, J., de Rigo, D., Caudullo, G., Houston Durrant, T., Mauri, A. (Eds.), *European Atlas of Forest Tree Species*. Publ. Off. EU, Luxembourg, pp. e0157f9+

