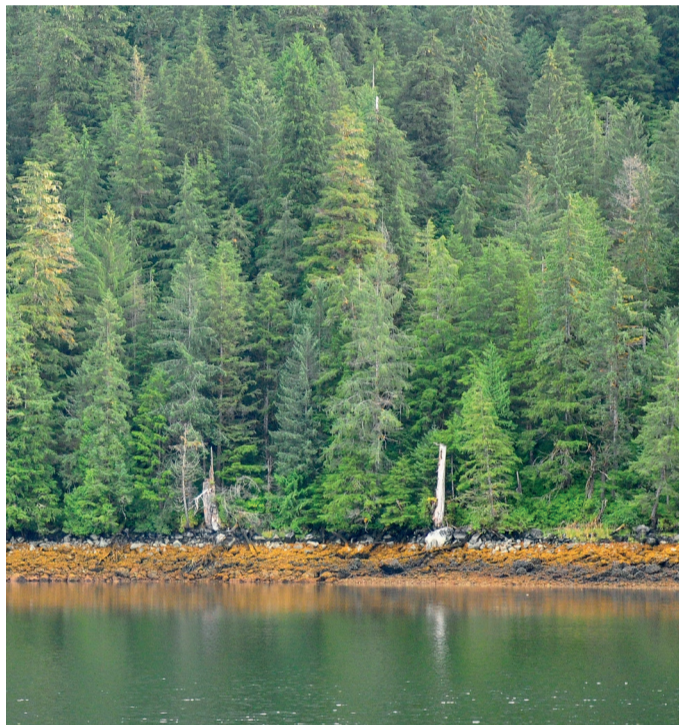


Picea sitchensis in Europe: distribution, habitat, usage and threats

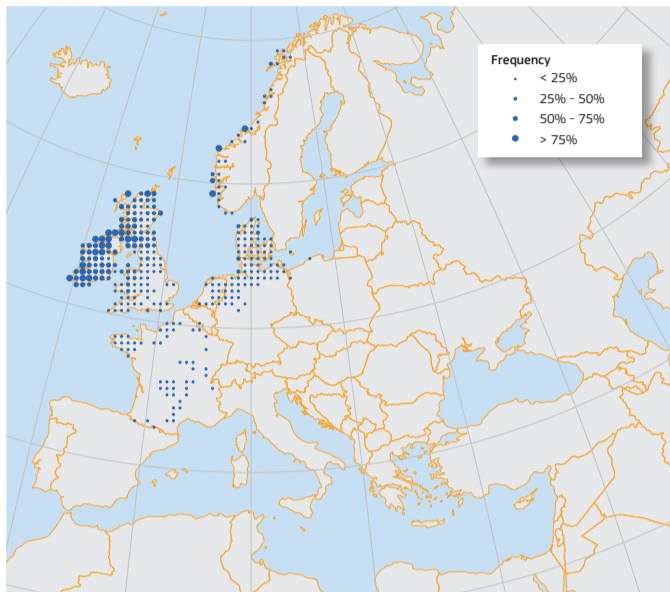
T. Houston Durrant, A. Mauri, D. de Rigo, G. Caudullo

Sitka Spruce (*Picea sitchensis* (Bong.) Carr.) is a large conifer native to North America and Canada, where it grows along the Pacific coast in areas favoured by maritime climate and high humidity. It is the largest of the spruces and can live up to 500 years, reaching heights of nearly 100 m. It is a fast growing tree that produces good quality timber, making it an important plantation tree in some European countries, notably Britain and Ireland.

Sitka Spruce (*Picea sitchensis* (Bong.) Carr.) is a large fast-growing conifer with a straight buttressed base trunk and an open, conical crown of horizontal branches¹. Unusually for a conifer, it is able to develop **epicormic** branches along the stem². It is long-lived (up to 500 years)³ and is the largest of the spruce species^{4, 5}. It can attain heights approaching 100 m in its native habitat, although in Europe it rarely exceeds 50 m^{6, 7}. The bark is thin and broken into large reddish to brown scales. The needles are rigid and sharp, 1.5-2.5 cm long and blue-green to light yellow-green in colour. It is wind-pollinated and starts to produce seed at 20-25 years of age⁸. Pollen cones are red



Coastal temperate mixed forest dominated by Sitka spruce and western hemlock (*Tsuga heterophylla*) in Misty Fiords National Monument (Ketchikan, Alaska). (Copyright Kimberly Vardeman, commons.wikimedia.org: CC-BY)

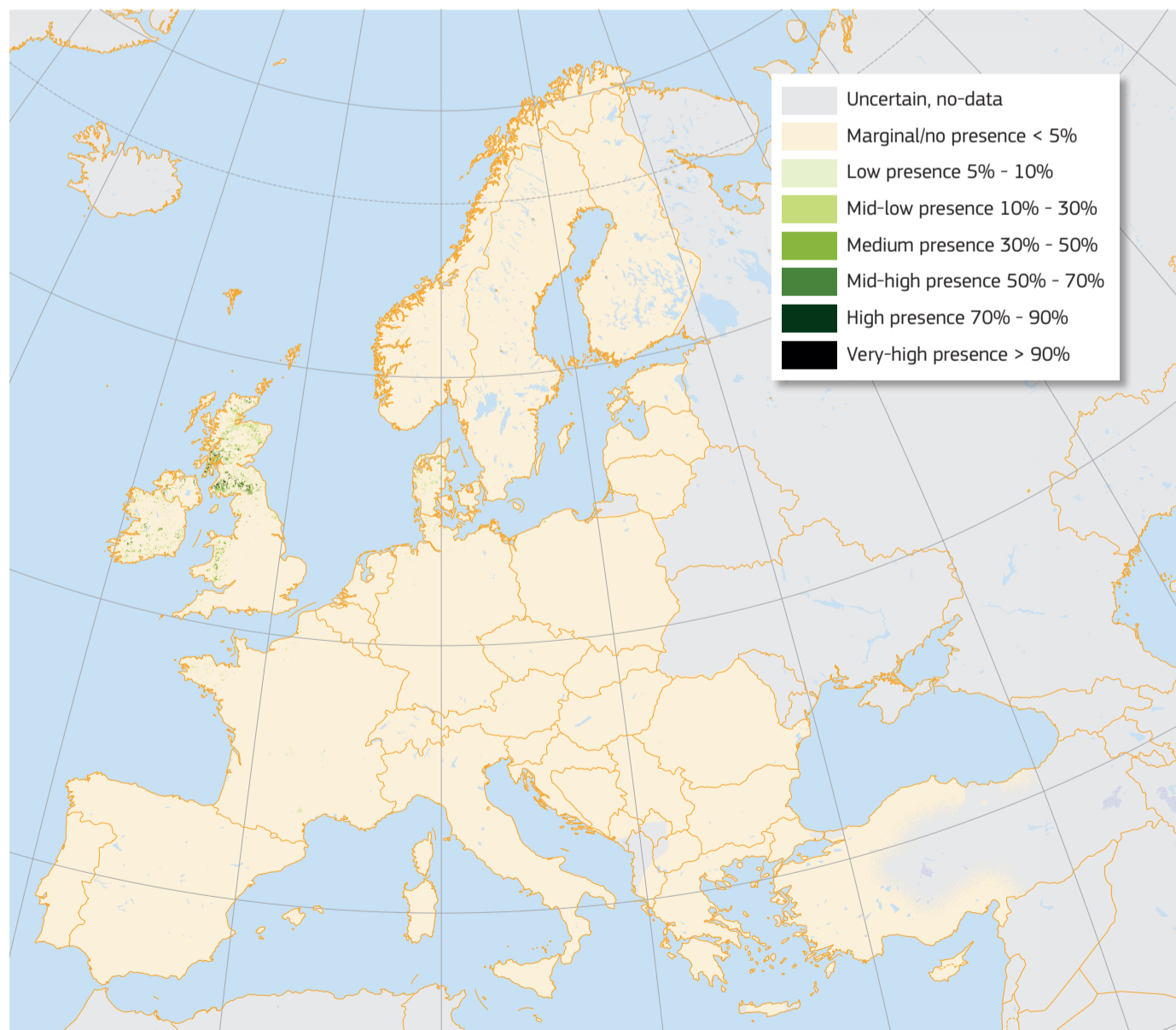


Map 1: Plot distribution map for *Picea sitchensis*.
Caption: Frequency of *Picea sitchensis* occurrences within the field observations as reported by the National Forest Inventories.

and between 2 and 4 cm long⁴. Seed cones are from 5 to 10 cm long, composed of papery scales with wavy, irregularly toothed margins and producing seeds from 2 to 3 mm long with a wing of around 8 mm in length⁹.

Distribution

Sitka Spruce is native to the west coast of North America where it extends along the north Pacific coast from southern Alaska to northern California^{4, 5, 9}. It was introduced in Europe in the 1800s and it is now planted in more than 16 countries worldwide¹⁰. The majority of the area planted is in the United Kingdom where it comprises over 25% of the national forest area¹¹ and is now the most widely planted conifer^{3, 12}, and Ireland (52% of national forest area³) but it is also important in Denmark (comprising 16% of the softwood timber harvest¹³). Sitka Spruce



Map 2: High resolution distribution map estimating the relative probability of presence.

is also planted in Iceland and Norway where it was introduced at the beginning of the twentieth century¹⁴.

Habitat and Ecology

The natural range of Sitka spruce is a maritime climate with high humidity⁵. It normally requires a minimum of 1000 mm of rainfall per year and cannot tolerate a dry, Mediterranean climate³. Unlike several other conifers it is tolerant of exposure and salt spray, making it particularly suitable for planting on wet coastal upland sites⁵; however it cannot tolerate atmospheric pollution². It is usually planted along the northern and western coasts of European countries, which provide a similar environment to that of its native range³. It grows on a variety of soils but prefers deep, moist but not waterlogged soils⁵. Sitka spruce shows a noticeable soil-acidifying ability¹⁵. It is a pioneer species that can quickly colonise disturbed sites (e.g. following landslides^{1, 16}).



Large specimen in the coastal forest of Vancouver Island (British Columbia, South West Canada). (Copyright Roland Tanglao, www.flickr.com: CC-BY)

Importance and Usage

Although relatively rare at European level it is commercially very important in some countries, particularly in the United Kingdom and Ireland, and to a lesser extent in France and Denmark³. The timber is pale in colour and long fibred, making it suitable for paper production. It is light and easy to work with and its good strength to weight ratio makes it suitable for fencing, pallets and general construction⁷. Early aircraft frames, including the first Wright brothers' aeroplane were made of Sitka spruce wood¹³. Due to its long fibres, high strength-to-weight ratio and absence of knots its wood is also an excellent conductor of sound,



Yellow-green needle-like leaves in a new shoot. Sharp needles make this species less suitable as a Christmas tree than the popular Norway spruce. (Copyright Axel Kristinsson, www.flickr.com: CC-BY)



Close-up of a growing seed cone.
(Copyright Axel Kristinsson, www.flickr.com: CC-BY)



Sitka spruce plantation in Heiðmörk Reserve near Reykjavik (South-West Iceland).
(Copyright Axel Kristinsson, www.flickr.com: CC-BY)

therefore widely used for soundboards in musical instruments (e.g. guitar, piano, violin^{13, 17}). Sitka spruce may be suitable for bioengineering applications due to its high tensile root strength¹⁸.

Threats and Diseases

Sitka spruce is prone to windthrow on certain soil types, particularly in established plantations in the United Kingdom², while elsewhere in Europe it has been shown to be more wind-resistant on deep soils than other conifers such as *Picea abies*⁹. Fortunately the white pine weevil, the most serious pest in North America, is not currently present in Europe³. However, the green spruce aphid can cause significant damage⁸, and the species is susceptible to fungal attack when injured^{5, 9}. The large pine weevil (*Hylobius abietis* L.) is among the most serious pests affecting young coniferous forests in Europe¹⁹. Sitka spruce partly coexists with the natural niche of this weevil, to which it is highly susceptible¹⁹⁻²¹.



Ripening mature seed cones; they are usually 5 to 10 cm long.
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Front detail of guitar model made with Sitka spruce wood.
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Field data in Europe (including absences) ● Observed presences in Europe ●

Autoecology diagrams based on harmonised field observations from forest plots.

