

An Unusual Frost in September 1972

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In the ordinary course of events the adverse effects of low temperatures in forestry in Ireland are experienced mainly as a result of spring frosts, and perhaps to a lesser degree winter frosts with particular species.

In this regard many will remember the frost of 1961 when temperatures as low as -7.8°C (Grass Min.) were recorded on the night of May 27th and 28th. This frost, not always as severe as -7.8°C was widespread throughout the country and considerable damage was caused to the new shoot growth in young crops of Sitka spruce, Norway spruce and Douglas fir, and in some cases silver fir was killed outright. Older foresters will remember the persistent low temperatures in December 1939 and January 1940 when there were 15 days of ground frost in December and 19 days in January, temperatures as low as -11°C . were recorded in many places. These were the frosts which desiccated the foliage of *Eucalyptus globulus* in the eastern coastal regions, and elsewhere many tender species of the genus were wiped out completely (Mooney 1960).

Frost is a continual hazard of course in the nurseries in the winter and spring months, but here the danger is mainly from "frost lift" from which seedlings are protected by lath covers from September to May.

However, on the night of September 7th and 8th, 1972 an exceptional phenomenon took place and a frost occurred which did considerable damage to the green foliage of young conifers. The first and most dramatic reports of this event came from Donadea Forest in Co. Kildare where the appearance of one plantation at Killyon (Dunfiirth) was described as if a fire had passed through it. Later investigations revealed that this same frost had damaged Sitka spruce, Douglas fir and Scots pine in many places throughout the country. From assembled information it seems that damage from this frost was observed as far west as Gweesalia, on the west Mayo coast, Cloosh Valley in Co. Galway and as far south as Mallow in Co. Cork but, although sub-zero temperatures were recorded from many places the severest damage was observed in the region of Counties Kildare, Meath and Westmeath.

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Foresters who have thirty years or more of experience in the field are unanimous and positive in asserting that no frost phenomena of this sort had ever occurred in their time.

In this regard therefore the records from the Agrometeorological Bulletin of the Irish Meteorological Service from September 1972 are of relevance and interest. The report states that "the month was very dry and sunny" but goes on to say that "the air frost which affected places in the Midlands and West on the 8th was one of the earliest autumn air frosts on record, at Birr this was the earliest air frost for over a hundred years". From the 1st-10th September Grass Minimum temperatures of -5°C . or lower were recorded from Carlow, Mallow, Killarney, Tralee, Kildare, Ballinamore, Ballinrobe, Dunsany and Wexford but there were low temperatures also for several days at the end of the month.

Damage to young plantations is, however, generally attributed to the 7th-8th September period and was recorded mainly on Sitka spruce, Scots pine and Douglas fir, the last being very severely damaged in some places. Except for minor damage in a few places Norway spruce seems to have been unscathed.

At Killyon property of Donadea Forest where damage is regarded as being particularly bad it has been possible to make closer observations than at other places. The plantation was laid down in 1970 and at the time of the frost had almost completed three growing seasons. The site was a virgin raised bog at an approximate elevation of 85m O.D. and had been duly ploughed and fertilised with ground rock phosphate in preparation for planting. The species available with seed origins were as follows: Sitka spruce (Forks, Washington), Contorta pine (Cloosh Valley, Co. Galway), Scots pine (Brandon Park, B.F.C. plus stand), Scots pine (Killyon, Co. Kildare) and western red cedar (Hoquiam, Washington). The damage on the Sitka spruce was widespread and estimated to have affected 60% of the crop in greater or lesser degree. It was characterised by total browning of the individual needles over most of the tree but particularly on the side branches. Usually, however a rosette of needles around the buds remained green and as far as could be ascertained the buds were not damaged. Nevertheless damage was erratically distributed over the plantation and some trees remained unscathed for no obvious reason, though there was some suggestion that the tallest trees in a height range of 35 cm to 180 cm were less discoloured. Scots pine with a height range of 35 cm to 155 cm was similarly affected. The total visual effect was well described as resembling the aftermath of a fire because there was a very strong red tint in the general needle browning. To foresters in this country it is very remarkable indeed that Scots

pine which has been regarded as absolutely frost hardy should prove vulnerable. A very interesting feature was the fact that a small area of planted Scots pine originated from seed collected from 120-year-old trees at Killyon was undamaged. Contorta pine, except for some very infrequent suspected cases was undamaged as was also the western red cedar.

The Grass Minimum temperature recorded for the night of 7th-8th September at Lullymore, 8 miles away on a comparable site, was -6°C and may be assumed to apply to Killyon.

Results of a study of the annual pattern of basal area growth for Sitka spruce, Scots pine, Norway spruce and contorta pine carried on from 1961 to 1967 (O Muirgheasa 1964, Robinson and Purcell 1972) show that the growth of these species ceases sometime between the 19th and the end of October and that although 75% of the growth has been accomplished at the end of July the trees are still quite active in September. The late (lammas) shoot growth of Sitka spruce that occurs in September and October of some years is well known.

This occurrence of autumn frost damage would appear to be in agreement with the findings of Nielson *et al* (1972) that under forest conditions Sitka spruce shoots are most susceptible to damage by freezing in September/October, even more so than in spring or summer and that hardiness rapidly develops in October and early November.

At the present time (March 1973) both the Sitka spruce and Scots pine at Killyon have lost the red tint displayed by the needles immediately after the frost and have become a dull brown, and to some extent the needles seem now to be falling from the Sitka spruce.

The damage caused by the frost of September 7th/8th 1972 may not kill many plants, and with the Sitka spruce full recovery may be expected ultimately, but there is no doubt that there will be considerable retardation of growth both in the Sitka and Scots pine. A severe spring frost in May 1973 could now seriously threaten the survival of the Sitka spruce.

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