Wood Decay Hazard in Canada Based on Scheffer's Climate Index Formula

by

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Abstract

Scheffer's formula for determining the overall decay hazard in above ground wooden structures was applied to Canada. For the most heavily populated areas of southwestern British Columbia, southern Ontario, southern Quebec and the Maritimes, the decay hazard fell into Scheffer's revised intermediate decay hazard range of 35 to 70. Based on the weather station data used, Cape Scott at the northern end of Vancouver Island, had the highest decay hazard level of 79.7. This contrasted with a decay index of 0.6 at Alert, NWT at 82°N latitude.

Keywords: Decay, decay hazard, wooden structures, wood preservation, wood deterioration, meteorology, Canada.

Résumé

La formule de Scheffer pour déterminer le risque absolu de pourriture sur les structures de bois édifiées au dessous du sol, a été appliquée au Canada. Pour les zones les plus densément peuplées du sud-ouest de la Colombie Britannique, le sud de l'Ontario, le sud du Québec et les Maritimes, la valeur de l'indice de risque de pourriture selon l'échelle révisée de risque intermédiaire de Scheffer, se situe entre 35 et 70. Selon la station météorologique utilisée, Cape Scott, à l'extrémité nord de l'Île de Vancouver, a obtenu le niveau le plus élevé de risque de pourriture avec une valeur de 79.7. Ceci contraste avec la valeur de risque de 0.6 à Alert, T.N.O., le long du 82° de latitude nord.

Mots clés : Pourriture, risque de pourriture, structure de bois, préservation du bois, détérioration du bois, météorologie, Canada.

Introduction

In assessing wood decay problems in North America, it is important that biologists and wood preservers have an overall understanding of the decay potential. Also, as the public's environmental awareness develops simultaneously with decreasing resources, the need to maintain a balanced perspective on resource utilization and conservation becomes increasingly important. As suggested earlier (Scheffer 1971), preservative treatments of wood must relate to climate in some objective manner, and to a large extent this depends on temperature and rainfall as two important factors in the decay process. Most fungi that decay wood do so more rapidly at higher average temperatures and relative humidities. On this basis, Scheffer established a "climate index" formula for decay hazard in above ground structures in the United States. This formula has now been used to establish the decay indexes for Canada. The word combination "decay index" is used in this paper instead of "climate index".

Methods

The decay index calculations were based on Scheffer's formula

$$\text{Climate Index} = \sum_{\text{Jan.}}^{\text{Dec.}} \frac{(T - 35)(D - 3)}{30}$$

where T is the mean monthly temperature (°F); D is the mean number of days in the month with 0.01 inch or more precipitation; and

$$\sum_{\text{Jan.}}^{\text{Dec.}}$$

is the summation of products for the respective months, January through December. The climatological data on temperature and precipitation were derived from Canadian Climate Normals (Environ. Can. 1982). Weather station data were selected that represented large population centres and separate geographical areas.

Based on the decay index values, three decay hazard zones were established as follows: low hazard < 35, intermediate 35-65, and high hazard > 65 (Scheffer 1971). Later studies, based on the actual decay in houses, suggested that the upper limit of the intermediate decay range be increased to 70 (DeGroot and Esenther 1982); however this change is of little consequence in Canada.

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Results and Discussion

The decay indexes for each provincial site are given in Table I and the decay hazard zones are shown in Figure 1. The coastal regions of British Columbia have the highest rainfall and most moderate temperatures. Consequently, the northern tip of Vancouver Island, Cape Scott, has the highest rating of 79.7 and thereby ranks in the highest decay hazard level (> 70). The Queen Charlotte Islands just south of the Alaskan Panhandle have, with one exception, intermediate decay hazard ratings: 55.9 at Masset and 58.0 at Sandspit. The exception, the island of Langara just north of Graham Island, has a rating of 71. The most heavily populated regions in southwest British Columbia have ratings that vary from 45.6 at the Vancouver International Airport, to 52.3 at the Vancouver Harbor. Victoria, at the southern end of Vancouver Island, is rated at 40.9. The climatic diversity of British Columbia is further reflected in low ratings of 14.4 at Atlin and 19.7 at Lytton.

The Prairie Provinces of Alberta, Saskatchewan, and Manitoba have decay indexes from a low of 23.5 at Lac la Biche, Alberta, to a high of 34.9 at Winnipeg, Manitoba, and are in the lowest decay hazard category (< 35).

Ontario, Quebec and the Maritime provinces have largely an intermediate level of decay hazard in the heavily populated areas. Of those weather stations considered, Chicoutimi, Quebec, has the highest rating at 52.2. Of interest were the ratings of 27.0 in Grand Falls, N.B., and 42.6 in Fredericton, N.B., only 150 kilometres apart.

The northern decay indexes for the Yukon and Northwest Territories were substantially lower than those of the rest of Canada. These values seem to realistically reflect both the cold temperatures and the low decay activity one might expect at these latitudes.

Figure 1. Decay hazard zones for above ground wooden structures in Canada.

Table 1. Decay hazard indexes for above ground wooden structures in Canada.

Alberta			
Banff	28.4	Frobisher Bay	8.0
Calgary	28.4	Holman Island	3.0
Edmonton	32.5	Norman Wells	20.6
Edson	33.8	Resolute	1.2
Grand Prairie	30.2	Sacks Harbor	1.9
Jasper	30.6	Yellowknife	15.5
Lac la Biche	23.5		
Lethbridge	24.4	Nova Scotia	
Medicine Hat	24.1	Halifax Int'l. Airport	38.0
Peace River	25.3	Sydney	42.3
Red Deer	32.3	Yarmouth	32.0
British Columbia		Ontario	
Atlin	14.4	Big Trout Lake	30.9
Bella Coola	52.4	Cornwall	43.0
Campbell River	34.6	Fort Frances	40.0
Cape Scott	79.7	Geraldton	35.5
Castlegar	34.6	Kenora	37.7
Cranbrook	23.0	Kingston	39.4
Dawson Creek	30.3	Kitchener	33.7
Fort Nelson	31.3	Lansdowne House	35.9
Hope	54.2	London	44.0
Kamloops	25.6	Moosonee	35.3
Kelowna	27.6	North Bay	42.3
Langara	71.4	Ottawa NRC	41.2
Lytton	19.7	Owen Sound	42.9
Masset	55.9	Pembroke	33.0
Merry Island	51.4	Petawawa Nat'l. Forestry Inst.	40.6
Nanaimo	40.1	Pickle Lake	39.5
Ocean Falls	63.3	Red Lake	36.0
Osoyoos	19.2	Sarnia	42.2
Pemberton	37.4	Sault Ste. Marie	34.8
Penticton	23.6	Sudbury	37.9
Port Alberni	46.2	Thunder Bay	35.5
Powell River	36.5	Timmins	38.6
Prince George	35.0	Toronto Int'l. Airport	37.1
Prince Rupert	55.9	Windsor	45.3
Revelstoke	30.7	Winisk	18.8
Sandspit	58.0	Prince Edward Island	
Steward	32.0	Charlottetown	41.1
Sumas Canal	64.3		
Telegraph Creek	24.0	Quebec	
Vancouver Harbor	52.3	Chibougamau	40.3
Vancouver Int'l. Airport	45.6	Chicoutimi	52.2
Victoria	40.9	Eastmain	26.2
Williams Lake	26.6	Forestville	40.0
Manitoba		Fort Chimo	18.4
Brandon	24.5	Fort George	15.9
Dauphin	31.6	Gagnon	35.6
Grand Rapids	27.4	Gaspe	25.7
Norway House	26.8	Havre Ste. Pierre	26.0
Swan River	27.5	La Tuque	47.4
The Pas	29.0	Maniwaki	42.0
Virden	25.1	Matagami	40.6
Winnipeg Int'l. Airport	34.9	Montreal Int'l. Airport	48.9
New Brunswick		Nitchequon	31.0
Bathurst	37.4	Quebec City	48.2
Fredericton	42.6	Rimouski	34.1
Grand Falls	27.0	Sherbrooke	47.8
Moncton	40.4	Val d'Or	40.7
Newfoundland		Saskatchewan	
Churchill Falls	34.4	Hudson Bay	29.0
Gander Int'l. Airport	43.1	La Ronge	32.3
Goose Bay	38.2	Meadow Lake	34.1
Hopedale	19.9	North Battleford	27.2
St. John's	40.6	Prince Albert	28.8
Northwest Territories		Regina	28.3
Alert	0.6	Saskatoon	26.9
Baker Lake	7.7	Swift Current	26.1
Fort Good Hope	13.4	Yukon	
Fort Liard	23.1	Carmacks	21.8
Fort Resolution	12.7	Dawson	19.4
		Haines Junction	10.5
		Watson Lake	27.2
		Whitehorse	18.6

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In terms of eventually establishing standards for providing decay protection in wood frame construction, the kind and extent of treatment required depends on being able

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