Title	**Predicted response of the lichen epiphyte Lecanora populicola to climate change scenarios in a clean-air region of Northern Britain**
Author	Christopher J. Ellis, Brian J. Coppins and Terence P. Dawson
Journal	Biological Conservation, Volume 135, Issue 3, March 2007
Abstract	Studies in the response of vegetation to predicted future climate change have focussed on vascular plants and are therefore largely unrepresentative of wider botanical diversity (i.e. comprising cryptogams; algae, mosses, liverworts and fungi including lichens). This paper presents a study to predict the response of a cryptogam species, the epiphytic lichen Lecanora populicola, to climate change scenarios. L. populicola is an easily dispersed species that occurs predictably in a widespread habitat, i.e. aspen stands. The study area was geographically constrained to a clean-air region of northern Britain. Thus, using the popular bioclimatic envelope approach, the projected climatic response of L. populicola is not expected to be confounded by air-borne pollution effects, or dispersal and habitat limitation. Non-parametric multiplicative regression was used to describe the response of L. populicola to seven climate variables, and an optimum model projected using UKCIP02 scenarios, comprising two time-frames (2020 s and 2050 s) and two greenhouse gas emission levels (low and high). Model predictions suggest an overall increase in the potential range of L. populicola, and, by association, several other 'Boreal' lichen epiphytes. Projected increases in the occurrence of L. populicola are associated with predicted summer drying, and indicate a putative threat to negatively associated 'oceanic' lichens.
Year	2007
Pages	396- 404
keywords	

Title	**Effects of enhanced UV-B radiation in the field on the concentration of phenolics and chlorophyll fluorescence in two boreal and arctic–alpine lichens**
Author	Jarle W. Bjerke, Dylan Gwynn-Jonesand Terry V. Callaghan
Journal	Environmental and Experimental Botany
Abstract	Lichens constitute a prominent part of the vegetation at high latitudes and altitudes, but the effects of UV-B radiation on these symbiotic organisms are not well known. In a northern boreal site (Abisko, northern Sweden), the usnic acid-producing lichens Flavocetraria nivalis and Nephroma arcticum were exposed to enhanced UV-B radiation, corresponding to 25% ozone depletion, for two and one growing seasons, respectively. They were compared with lichens grown under ambient UV-B and harvested fresh from the field. The treated thalli of F. nivalis had been transplanted from a site 24 km from the treatment site. From this source locality, untreated thalli were also harvested. Enhanced UV-B did not affect concentrations of usnic acid and the two depsides phenarctin and nephroarctin. A gradual decline of usnic acid, probably coupled to unusually long periods of dry, sunny weather, was observed both under enhanced and ambient UV-B and in untreated thalli. Photosystem II efficiency in both species was slightly reduced by enhanced UV-B. However, differences between seasons were larger than differences between treatments,

	which indicate that UV-B effects are minor in comparison to other climatic variables. Concentrations of UV-B-absorbing phenolics in lichens do not show a simple relationship to UV-B dose and therefore cannot be used as bioindicators of UV-B levels.
Year	2005
Pages	139- 149
keywords	

Title	**Potential effects of rising tropospheric concentrations of CO2 and O3 on green-algal lichens.**
Author	Balaguer, L., Valladares, F., Ascaso, C., Barnes, J.D., De-Los-Rios, A., Manrique, E. and Smith, E.C.
Journal	New Phytologist, 132
Abstract	
Year	1996
Pages	641- 652
keywords	