



Lichen Indicator And Climate Change



What Is the Lichen Communities Indicator?

Lichens are an association of fungi and algae that grow on a variety of substrates including trees. They lack a vascular system and absorb water and nutrients passively from their environment. Because of this, lichens are particularly sensitive to environmental factors such as temperature, water availability and air pollutants.



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Lichen community composition and changes in composition can provide information about changes in air quality, climate, and biological processes. The lichen communities indicator was developed by the Forest Health Monitoring (FHM) program and is now being implemented by the Forest Inventory and Analysis (FIA) program. The indicator has two components – collecting samples for species identification (to determine number of different species per plot) and estimating species abundance (the number of times each species occurs). Samples are collected from woody plants and recently fallen trunks and branches. Samples are mailed to an expert for identification. Abundance within the lichen plot is recorded for each species. This information is combined with FIA tree data, environmental data, and measures of lichen community composition to suggest causes for variations in the lichen communities.

How Can Lichen Data Be Used to Monitor Climate Change?

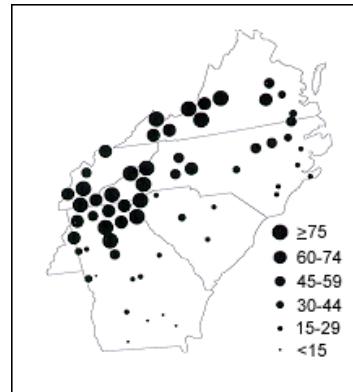
Two main uses of lichen indicator data are determining lichen abundance and diversity and identifying the relationships among lichens, climate, and air pollution. Lichen community data can be used to:

- Determine species abundance and richness by plot and correlate with climate values for plots.
- Develop biotic indexes – indexes based on lichen

community data from plots along climate and air pollution gradients across large regions. Gradient models have been developed for Colorado, California, the Pacific Northwest and the Southeastern United States. Models for other locations are under development.

- Determine regional diversity – number of species recorded in a large region, such as an ecoregion section – and correlate with regional climate.

Since the lichen plots are re-measured periodically, trend analyses can indicate changes in lichen communities brought about by changes in climatic conditions or other environmental stressors (e.g. air pollution or forest fragmentation). Because of their sensitive physiology, lichens are more likely to be affected by environmental changes than other plants. Changes in temperature or water availability will lead to shifts in lichen communities. Such changes, attributed to climate change, have already been reported in Europe. Repeated re-measurements of the lichen communities indicator should provide an early warning of response to climate change in US forests.



Regional distribution of scores on the climatic gradient as expressed by the lichen community. Larger circles indicate lichens associated with cooler climates. With climatic warming, the Circles would be expected to get smaller through time.

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FHM website: <http://www.fs.fed.us/foresthealth/fhm>

FIA website: <http://fia.fs.fed.us>