

One Piece of the Research Action: Theodore Roosevelt NP

By Ray "Skip" Snow

As early as 1859, the declining lichen flora of South Lancashire (Britain) was attributed to increasing air pollution and, in 1866, it was concluded from studies in Paris that lichens might serve as practical indicators of air quality. Since then, studies in over 400 scientific publications and from areas in Europe, Japan, New Zealand, North and South America and the U.S.S.R. have supported this view.

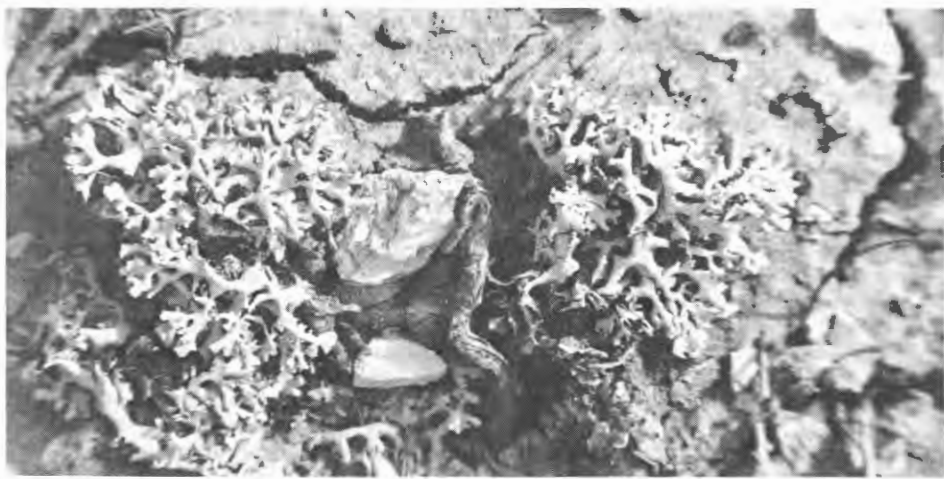
As a result of increasing energy development, the air quality of many of our national parks is threatened with deterioration. Surrounded by oil and gas fields, adjacent to proposed federal coal leases and proposed gasification plants, Theodore Roosevelt National Park (North Dakota) is no exception. Many fruticose (hair-like, shrubby or finger-like) and some foliose (leaty and flattened) lichens are killed by low levels of sulfur dioxide, and so the disappearance of sensitive lichen species in an area can indicate deteriorating air quality. For national parks not to proceed with the orderly acquisition of baseline data on lichens is much the same as not installing a battery in your smoke alarm.

Lichens are composed of two quite different organisms, a fungus and an alga, in a symbiotic (living-together) relationship. Lichens are an outstandingly successful group of symbiotic organisms; perhaps more than 18,000 species exploit habitats throughout the world. An enigmatic group of plants in many ways, lichens often receive only scant attention in national parks.

While lichens are one of the easiest groups of plants to collect and preserve and most lichens are no more difficult to identify than the majority of flowering plants, many genera are poorly known with highly variable and confusing species requiring the assistance of specialists to identify them. *Usnea* (the "goat's beard" lichens) and *Cladonia* ("British soldiers," for example) are two commonly collected genera with many "hybrids." The serious naturalist or resource manager can often obtain assistance in identification or verification from lichenologists at universities or museums. Professional etiquette demands that only good, well labeled specimens be sent.

For the park library, few reference works exist for lichen collection and identification. The best on the market at this time is the second edition (1979) of *How To Know the Lichens* by Mason E. Hale of the Smithsonian Institution. This is a Pictured Key Nature Series book published by Wm. C. Brown Company. Price \$5.95. Out of date and out of print, B. Fink's (1935) *The Lichen Flora of the United States* (University of Michigan Press) is the only overall reference for the crustose (crust-like) genera. The second edition (1974) of *The Biology of Lichens*, authored by Mason E. Hale, Jr., provides one of the few concise and contemporary surveys of lichenology. A well illustrated paperback, this college-level text is published by Edward Arnold (Publishers) Ltd., 25 Hill Street, London W1X 8LL, England. Price \$11.95.

Another reference is the Institute of Biology's Studies in Biology no. 66, *Lichens as Pollution Monitors* (1976) by David L. Hawksworth and Francis Rose. This small (60pp.) and practical work assumes



Lichen xanthoparmelia is shown here, growing on the ground at Theodore Roosevelt NP.

no previous knowledge and includes an account of the biology of lichens as well as a discussion of their relationship to environmental pollution and their value in monitoring it. The work describes a series of simple experiments and suggested air pollution survey methodologies – including investigations appropriate for schoolchildren. It is clear from this book that the survey of lichen flora is appropriate for rural, urban, natural, and cultural units of the National Park System. The book is available from University Park Press, 233 East Redwood Street, Baltimore, Maryland 21202, for \$7.95. A more advanced treatment of the subject can be found in the college-level text edited by B.W. Ferry, M.S. Baddeley and D.L. Hawksworth (1973). Entitled *Air Pollution and Lichens*, this book is published by Athlone Press of the University of London.

The Bryologist, the official journal of the American Bryological and Lichenological Society, is responsible for publishing much of the research on North American lichens. It is published by the Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166. *The Lichenologist*, the official journal of the British Lichen Society, routinely summarizes the current literature on air pollution and lichens. It is published by Academic Press Inc. (London) Ltd., 24-28 Oval Road, London NW1 7DX, England. Articles from both journals, as well as the books mentioned above, are available through interlibrary loan services.

The assessment of a national park's lichen flora is responsive to more than one of the conclusions reached by the recent U.S. National Parks' service-wide survey entitled "State of the Parks – 1980: A Report to Congress." Specifically, the collection and identification of lichens addresses the report's conclusive remark, to "establish accurate baseline data on park resources and conduct comprehensive monitoring programs designated to detect and measure changes . . ." By studying the lichens of an area, baseline lists can be prepared for use later in comparing the lichen flora over a period of time.

Personnel at Theodore Roosevelt NP have ne-

gotiated a proposal with lichenologist Clifford M. Wetmore of the University of Minnesota, whose publications include articles on the lichens of Big Bend and Voyageurs National Parks (see *The Bryologist* (1981) 84(3), in press and 84(4) in press, respectively).

Dr. Wetmore will provide Theodore Roosevelt NP with (1) a set of identified and labeled specimens for the park herbarium, (2) a list of localities where collections were made, (3) a list of species found within the park indicating localities where each was found, (4) a list of lichens that might be useful in monitoring air quality changes, (5) suggestions concerning critical areas for lichens in the park, and (6) suggestions for future research. He will also provide willing park personnel with training in collection and identification of common lichens, as well as their interpretation.

The work will take approximately 18 months and cost \$2000. Funding for transportation, supplies, and materials has been made available from a research fund established and administered by the Theodore Roosevelt Nature and History Association. The Association is a non-profit organization, established to serve the interpretive, educational, scientific, and research programs of the park. Membership in the Association is open to the public.

While Theodore Roosevelt NP continues to be involved in the recording of instrument readings for air chemistry, visibility, and atmospheric deposition, these can only determine whether or not air quality meets legislated standards. Lichens can provide a more direct biological test. Many lichens are far more intolerant of pollutants than are higher plants, animals, and people. Thus, careful surveys of lichens in national parks can be an important adjunct of air pollution monitoring – a kind of early warning system like miners' canaries and smoke alarms.

The staff at Theodore Roosevelt National Park is interested in hearing from other parks which are conducting or proposing similar investigations.

Snow is district naturalist at the North Unit of Theodore Roosevelt NP.