

## **Teacher's Guide to Lichen Lessons 1-4**

These four lessons were developed for use with high school students in a biology or ecology class. They can stand alone, but work best when taught in sequence. The lessons are differentiated so that they can be used by students with general or accelerated levels of ability. Time needed will vary depending on the ability of the students.

### Resources provided for teachers include:

- Teacher's Guide to Lichen Lessons 1-4
- Lesson Summary Table
- Student worksheets for the 4 lessons
- How to establish a belt transect protocol
- **Learning Lichens with Students** PowerPoint, tutorial for teachers
- **How to Conduct a Lichen Inventory (lesson 3)** PowerPoint
- Resource list

### Lesson 1: Introduction to Lichens

This lesson is designed to be conducted indoors. Students can research the answers to the questions using the websites suggested, or using printouts from the websites. Students may work individually or in groups of 2.

### Lesson 2: Lichen Structure Lab

This lesson is an indoor lab. Provide students with samples of crustose, foliose, and fruticose lichen at each lab station. Students should work in groups not larger than 2 if possible to maximize exposure to the samples. Students will need computer access to the websites listed, or printouts of these pages (this works just as well).

### Lesson 3: Lichen Field Transect and Research

This is an outdoor activity that is best conducted in the forest. However, it may be adapted to a more urban setting, using buildings, paved or concrete surfaces, or fences (all substrates for lichen). It will probably require two class periods.

- Before going outside, research questions can be assigned or developed by student teams, depending on available time and ability. For example, students could examine relationships between lichen occurrence and tree height, diameter, species, distance from forest edge, or compass direction.
- If you have a suitable location, locate the belt transects so that one end is along a roadway (pollution source) and the other end is in the middle of the forest. These transects can be laid out by the students, if you have an extra class period. Or, they can be laid out and flagged by the teacher ahead of time. You will need a compass, a surveyor's tape, and surveyor's flagging. Ideally, the same transects can be used each year, so that data can be compared over time.
- Inventorying lichen with tree transects can be demonstrated indoors, using a log or slides, before going outside.

- Common mosses and liverworts can be included in the inventory so that students are aware that these types of organisms occupy similar substrates and niches.

#### Lesson 4: Lichens and Air Quality Monitoring Essay

This essay assignment will challenge students to apply what they have learned about lichen ecology and biomonitoring to the problem of air pollution. The essay's length and number of references used can be adjusted depending on the abilities of the students. There are two versions of this assignment, one for honors and one for general students.

Lessons developed and field tested by:

Sarah Thorne, Science Teacher, Prospect Mountain High School, Alton, NH

Funded by:

White Mountain Interpretive Association, Kiwanis International,

Cooperating organizations:

White Mountain National Forest, Hubbard Brook Experimental Forest

Thanks to consulting lichenologist, Natalie Cleavitt and

US Forest Service Air Quality Specialist, Ralph Perron.