Tutorial for Teachers

Learning Lichens with Students

Lessons developed by Sarah Thorne

Funded by: White Mountain Interpretive Association, Kiwanis International,
Cooperating organizations: White Mountain National Forest,
Prospect Mt. High School, Alton, NH

Lichens are a portal to studying ecosystems

Learning Lichens in Lesson 1: online research

- Students will learn that lichens are:
  - symbiotic partnership of a fungus, alga or cyanobacteria and newly discovered 3rd fungi
  - affixed to substrates such as trees and rocks
  - “air plants” without roots or vascular systems, readily absorb pollutants from rain, fog and air
  - used as bioindicators of air pollutants

Learning Lichens
Lesson 2: in the lab

- Students will be able to compare and contrast lichens, moss, fungi, and vascular plants.

- Students will learn to recognize these growth forms of lichens:
  - Fruticose
  - Foliose
  - Crustose

Learning Lichens
Lesson 3: in the field

- Students will develop a research question and inventory lichen in the schoolyard or forest
- Students will analyze and present their results

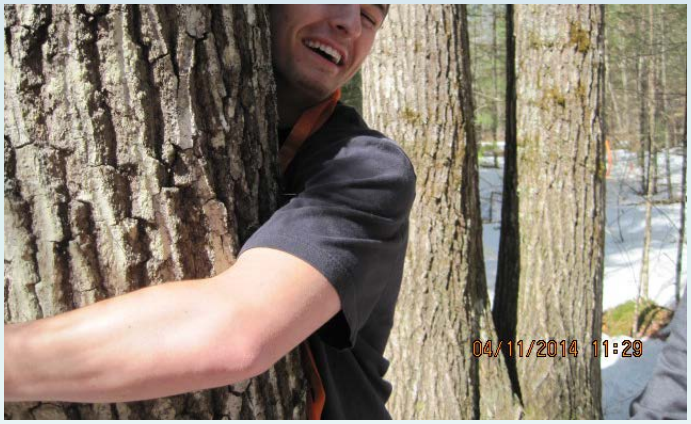
Learning Lichens in Lesson 4:

- Students will research lichen ecology and use in biomonitoring for air pollution

- Students will write an essay to demonstrate what they have learned

Materials available to teachers:

- Lesson Summary Table
- Student worksheets for the 4 lessons
- Belt transect protocol
- **Learning Lichens with Students** PowerPoint, intended for teacher preparation (including photos)
- **How to Conduct a Lichen Inventory (lesson 3)** PowerPoint
- Resource list



Lessons are available online at:

White Mountain National Forest Website

- http://www.fs.usda.gov/detailfull/whitemountain/learning/parents-teacher/?cid=STELPRD3820933&width=full

Contact information for Sarah Thorne Prospect Mt. High School

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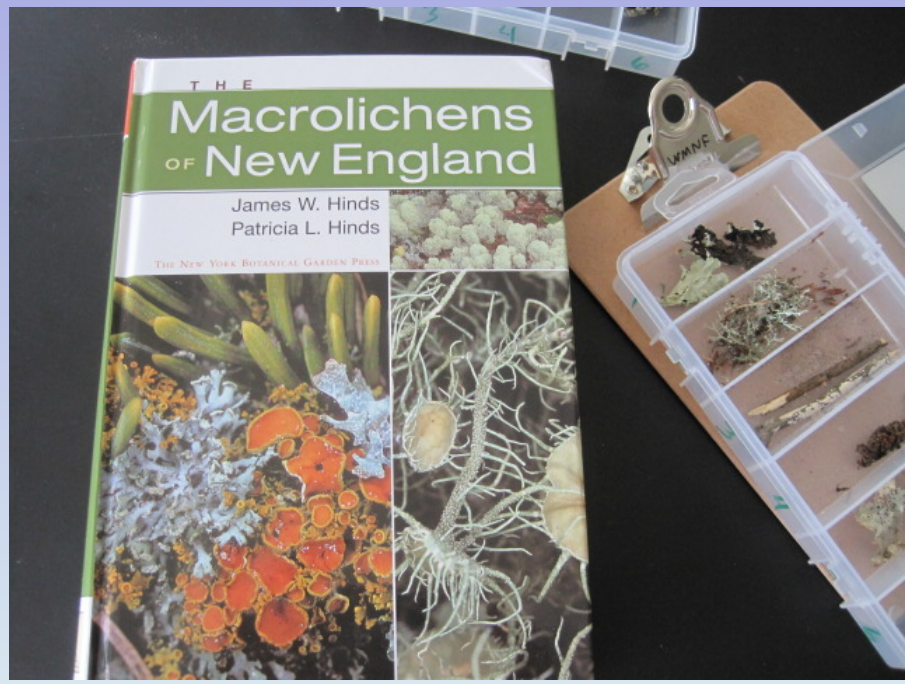
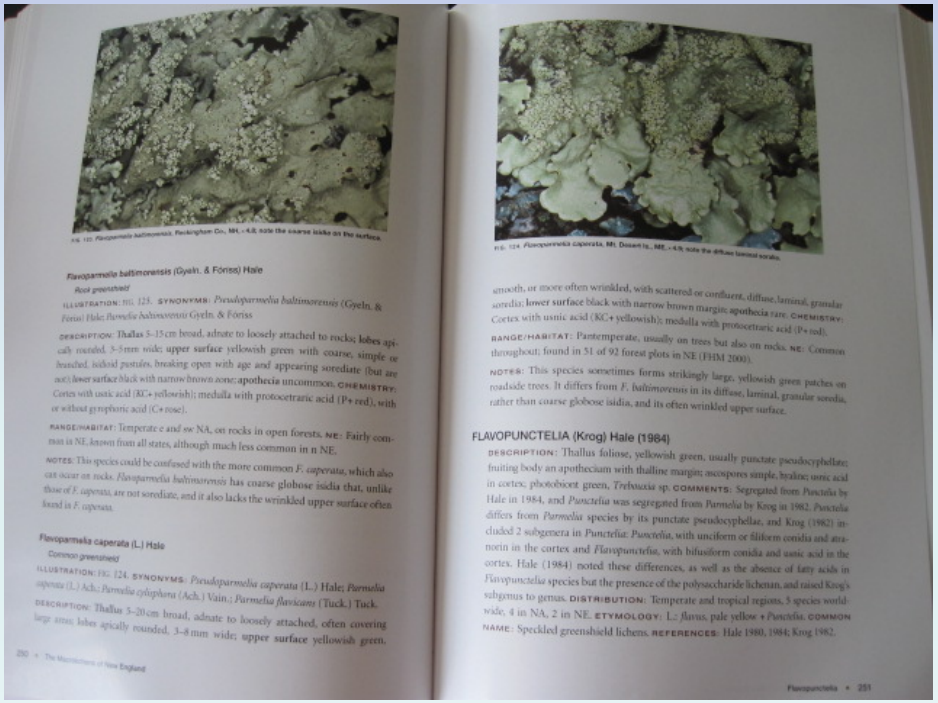
Lichen ID

- A challenge, but you don't have to learn hundreds of species!
- Photograph the common lichens in your sampling area
- Find a local lichen expert to confirm your identifications
- Make photo ID cards for field use by students

Your best ID friend

- James and Patricia Hinds' **The Macrolichens of New England** from The New York Botanical Garden Press, 2007





Flavoparmelia baltimorensis (Gyeln. & Fóriss) Hale

Rock greenshield

ILLUSTRATION: FIG. 123. SYNONYMS: *Pseudoparmelia baltimorensis* (Gyeln. & Fóriss) Hale; *Parmelia baltimorensis* Gyeln. & Fóriss

DESCRIPTION: Thallus 5–15 cm broad, adnate to loosely attached to rocks; lobes apically rounded, 3–5 mm wide; upper surface yellowish green with coarse, simple or branched, isidioid pustules, breaking open with age and appearing sorediate (but are not); lower surface black with narrow brown zone; apothecia uncommon. CHEMISTRY: Cortex with usnic acid (KC+ yellowish); medulla with protocetraric acid (P+ red), with or without gyrophoric acid (C+ rose).

RANGE/HABITAT: Temperate e and sw NA, on rocks in open forests. NE: Fairly common in NE, known from all states, although much less common in n NE.

NOTES: This species could be confused with the more common *F. caperata*, which also can occur on rocks. *Flavoparmelia baltimorensis* has coarse globose isidia that, unlike those of *F. caperata*, are not sorediate, and it also lacks the wrinkled upper surface often found in *F. caperata*.

Flavoparmelia caperata (L.) Hale

Common greenshield

ILLUSTRATION: FIG. 124. SYNONYMS: *Pseudoparmelia caperata* (L.) Hale; *Parmelia caperata* (L.) Ach.; *Parmelia cylisphora* (Ach.) Vain.; *Parmelia flavicans* (Tuck.) Tuck.

DESCRIPTION: Thallus 5–20 cm broad, adnate to loosely attached, often covering large areas; lobes apically rounded, 3–8 mm wide; upper surface yellowish green, smooth, or more often wrinkled, with scattered or confluent, diffuse, laminal, granular soredia; lower surface black with narrow brown margin; apothecia rare. CHEMISTRY: Cortex with usnic acid (KC+ yellowish); medulla with protocetraric acid (P+ red).

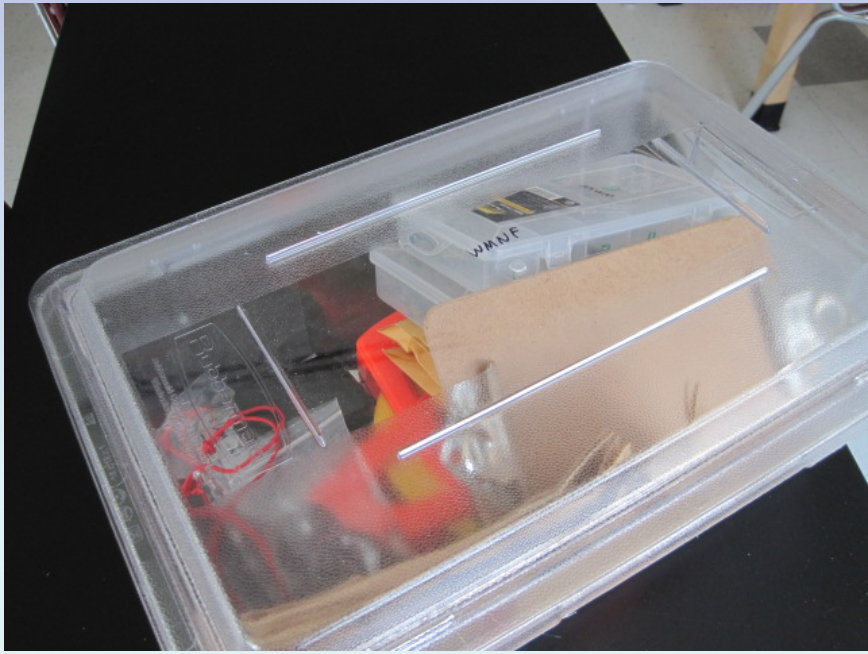
RANGE/HABITAT: Pantemperate, usually on trees but also on rocks. NE: Common throughout; found in 51 of 92 forest plots in NE (FHM 2000).

NOTES: This species sometimes forms strikingly large, yellowish green patches on roadside trees. It differs from *F. baltimorensis* in its diffuse, laminal, granular soredia, rather than coarse globose isidia, and its often wrinkled upper surface.

FLAVOPUNCTELIA (Krog) Hale (1984)

DESCRIPTION: Thallus foliose, yellowish green, usually punctate pseudocyphellate; fruiting body an apothecium with thalline margin; ascospores simple, hyaline; usnic acid in cortex; photobiont green, *Trebouxia* sp. COMMENTS: Segregated from *Punctelia* by Hale in 1984, and *Punctelia* was segregated from *Parmelia* by Krog in 1982. *Punctelia* differs from *Parmelia* species by its punctate pseudocyphellae, and Krog (1982) included 2 subgenera in *Punctelia*: *Punctelia*, with unciform or filiform conidia and atranorin in the cortex and *Flavopunctelia*, with bifusiform conidia and usnic acid in the cortex. Hale (1984) noted these differences, as well as the absence of fatty acids in *Flavopunctelia* species but the presence of the polysaccharide lichenan, and raised Krog's subgenus to genus. DISTRIBUTION: Temperate and tropical regions, 5 species worldwide, 4 in NA, 2 in NE. ETYMOLOGY: L: *flavus*, pale yellow + *Punctelia*. COMMON NAME: Speckled greenshield lichens. REFERENCES: Hale 1980, 1984; Krog 1982.

Equipment Needs?
Kit available on loan from WMNF



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