

A colorful but often overlooked organism shows the power of two.

By Todd Whitesel

# Lichens two lives in one

Young  
Naturalists

Seven species of lichens are crowded into this sandy spot along the shore of Lake Superior. Lichens thrive in Minnesota because there's a lot of water on the ground and in the air. Photograph by Stephen and Sylvia Sharnoff.

**T**hey can change the color of a forest or a lakeshore. They can break apart a rock, crumbling it into new soil. They can feed snails and squirrels and birds and deer.

You might have seen them on rocks, tree trunks, fence posts, iron gates, or even tombstones. They look lacy or crusty or scraggly. They come in shades of green, red, orange, yellow, blue, black, and white.

They are alive, but they are neither plants nor animals.

What are they? They are lichens—a partnership of a fungus and an alga.



# Fungus + Algae

For many years scientists believed lichens were single organisms. Then in 1867, a Swiss botanist named Simon Schwendener discovered that lichens are two organisms—an alga and a fungus—living together as one.

**Fungus: the house.** Members of their own kingdom, fungi take many forms. Mushrooms are perhaps the most familiar.

Molds, mildews, and rusts are also fungi. Only certain species of fungi combine with algae to form lichens.

The fungus acts as the house for the alga, giving it shelter from the weather. The fungus makes up 90 percent of the whole lichen.

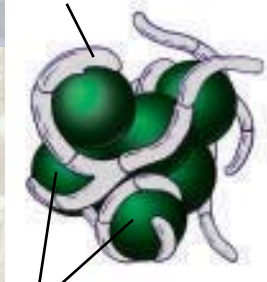
**Alga: the cook.** Water-loving organisms, algae range in size from a single cell to multicelled giant kelp in the ocean. Like a plant, the alga contains

chlorophyll and captures energy from the sun in a process called *photosynthesis*.

In lichens, the alga makes food energy (carbohydrates). Because the fungus cannot make its own food, it harvests energy from the alga.

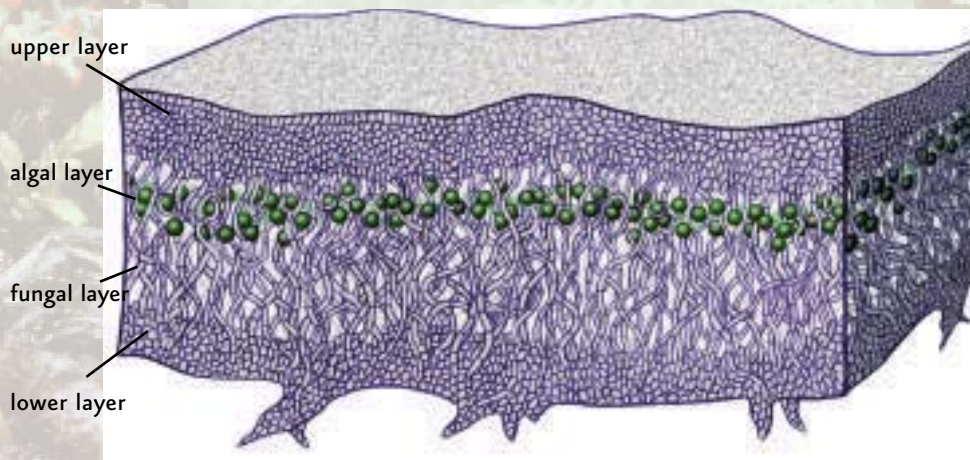
*Symbiosis* occurs when two organisms benefit by living together. The symbiotic relationship of fungus and alga helps lichens adapt to life in all kinds of places.

FUNGUS



ALGAE

LICHEN CROSS SECTION



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Some lichens grow on dead wood, on tree bark, or on the ground, such as reindeer lichen (left). And some grow on rocks (below, unidentified). All lichens need some water to grow, but they can exist in a dry state for a long time.

## How Lichens Grow

Lichens need water and sunlight to grow.

As the sun rises and dewdrops form on the ground, lichens “wake up” and grow. Like a sponge, a lichen soaks up a lot of moisture. Some species can absorb 20 times their weight in water.

By 10 o'clock the dew usually disappears, and lichens begin to lose moisture. When lichens dry out, they stop growing for the day.

Different lichens dry out at different rates, so some grow faster and some grow slower than others.

Lichens do most of their growing in spring and fall when rainfall adds moisture to the air. When the weather is dry, lichens may go dormant.

New lichens form in three basic ways: 1) Small pieces of lichen may break off and grow. When a bit of old man's beard breaks off, it drifts in the wind until it catches on a tree branch. With enough moisture in the air, it begins to grow there. 2) The lichen may shoot out little packets of alga cells surrounded by fungal threads. Each packet can grow into a lichen. 3) The fungus in a lichen may release dustlike spores. If spores land on an alga, a new fungus develops and lives with the alga, forming a new lichen.



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# Forms of Lichens

To find lichens in Minnesota, look high and low—on trees, rocks, and soil. Most lichens look brittle when dry and rubbery when wet. You'll find lichens of three main types: crustose, foliose, and fruticose.

## CRUSTOSE

These lichens form a crust on rocks or in tiny spaces between rock crystals. Their bright colors—red, orange, yellow—prevent damage from too much sunlight. Like sunscreen, the colors help keep ultraviolet rays from penetrating the surface of the organism.

Slow-growing and long-lived, some crustose lichens take 25 years to grow 1 inch. Some found in glaciers are several thousand years old.



**Sidewalk firedot lichen (*Caloplaca feracissima*)** is tiny, but it spreads easily and can color a whole sidewalk if no one walks there.

## FOLIOSE

These leafy-looking lichens have rootlike threads that anchor them to tree trunks, rocks, and soil. Foliose lichens can grow as much as 1 inch per year. Minnesota's two most common foliose lichens are rock tripe and hammered shield.

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**Lemon lichen (*Candelaria concolor*)** is one of the most common foliose lichens in North America. Look for large groups, or colonies, of these tiny bright yellow lichens growing along rain tracks on tree trunks.

## FRUTICOSE

These bushy lichens often look like miniature shrubs or trees.



**Pitted beard lichen (*Usnea cavernosa*)**, commonly called old man's beard, hangs in long yellowish green strands from tree branches in northern forests, especially on spruce trees. Usnea lichens contain an acid useful in making certain medicines and cosmetics, such as deodorant.

## CRUSTOSE



**Surprise lichen (*Bacidia schweinitzii*)** has a greenish body with pitch-black spots, which look like upside-down cups. The surprises inside the cups are spores. Look for this lichen on tree bark in shaded forests.



**Sulphur-firedot lichen (*Caloplaca flavovirescens*)** grows on limestone, sandstone, and concrete. Its warty-looking body is sulphur-yellow. The orange dots contain spores for reproducing.

## FOLIOSE



**Northern camouflage lichen (*Melanelia septentrionalis*)** is among the most common brown-to-olive foliose lichens. It grows on the bark of coniferous and deciduous trees in northeastern Minnesota.



**Hammered shield lichen (*Parmelia sulcata*)** grows in sun or shade on bark, wood, mossy rocks, and soil all around the state. You might see it growing on the picnic bench in your back yard.

## FRUTICOSE



**Gray reindeer lichen (*Cladonia rangiferina*)** grows in clumps in sandy or rocky places. Caribou in Canada and reindeer in Norway eat it in winter. Ojibwes have boiled it in water to make a liquid for bathing newborn babies.



**British soldier lichen (*Cladonia cristatella*)** grows in dry, sunny places on sandy ground, rocks, and pieces of old wood. Its red stem tips resemble the red coats of British soldiers who fought for King George in the Revolutionary War.

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## Rugged Pioneers

Some lichens live within a couple hundred miles of the South Pole. Some live on desert floors or near hot springs where temperatures can soar to 300 F.

Because they can survive almost anywhere, lichens are one of the first *colonizers*, or pioneers, to move in after a fire, volcano, or glacier has cleared the land.

Some lichens excrete acids, which help break apart rock, separating minerals that eventually form new soil. Some lichens have rootlike threads that grow into tiny rock crevices, breaking off bits of rock and making openings where soil and seeds can settle and grow.

Scientists have identified about 15,000 lichen species around the world. About 750 species live in Minnesota. Voyageurs National Park near the Canadian border has about 400 species.

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Lichens live in the hot, dry desert of Arches National Park in Utah.



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Lichens live in the cold, wet climate along the shore of Lake Superior.

## Clean-Air Lovers

Lichens thrive in clean, moist air. Fewer lichens live in cities because they have trouble surviving in polluted air.

Because lichens take in water and air, they also absorb pollutants such as sulfur dioxide. This gas is released into the air by burning coal and oil. By measuring the amount of sulfur in lichens, scientists can determine how much sulfur dioxide has entered the air. In heavily polluted places, lichens cannot grow because sulfur dioxide harms the algae's chlorophyll, the essential ingredient for producing the lichen's food energy (carbohydrates).

University of Minnesota *lichenologist* Clifford Wetmore studies lichens in national parks to see if the air is clean or polluted and to see how the air quality might have changed over time. In Voyageurs National Park, he found lichens sensitive to sulfur dioxide, so he concluded the air is clean.



## Many Uses

American Indians found many uses for lichens. They used lichens to dye fabric—such as yarn to weave rugs—brew medicinal teas, and to make poultices to soothe skin irritations. They discovered that super-absorbent lichens also made fine baby diapers.

Lichen-dyed wool blankets



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Certain species of lichens contain a blue coloring matter called *litmus*. Litmus can show when a chemical is acid or base. School chemistry classes use litmus paper to test for acids and bases. If the paper turns red, the substance is acid. Blue indicates base.

## For Animals Too

Rich in carbohydrates, lichens provide energy for animals that eat them.

Squirrels, chipmunks,

deer, and spruce grouse all nibble on lichens. A century ago, before logging of old-growth pines, caribou feasted on old man's beard lichens in Minnesota's northern forests.

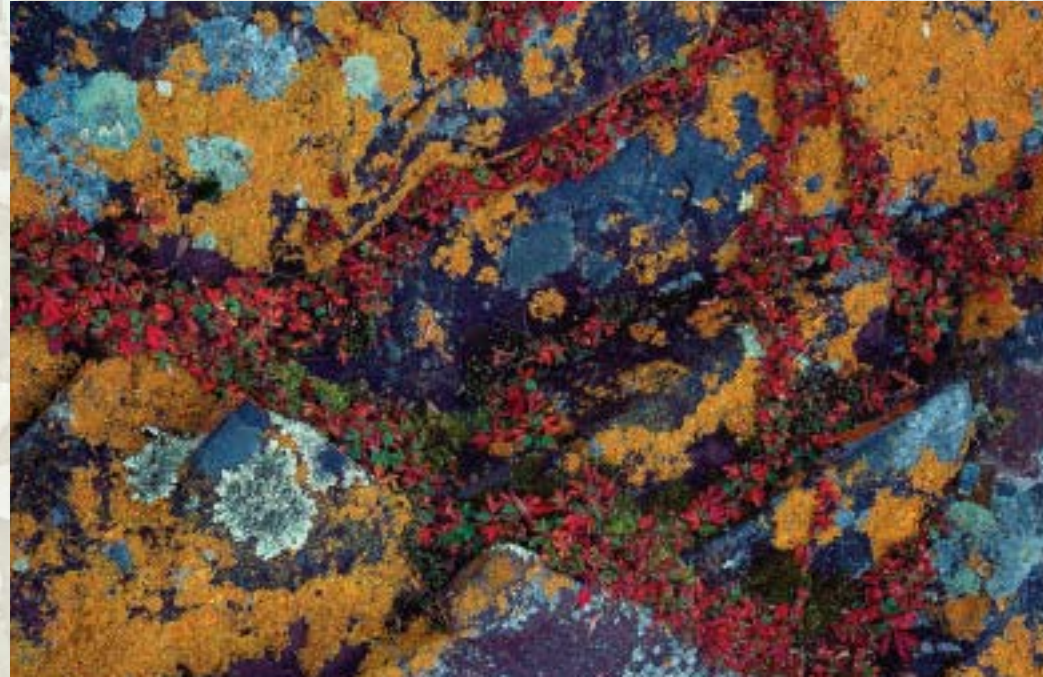
Northern parula warbler and its lichen nest



Common mergansers, ruby-throated hummingbirds, boreal chickadees, American redstarts, and white-winged crossbills all pad their nests with lichens. The northern parula warbler builds its nest in old man's beard.

*Todd Whitesel is an editor at Deer & Deer Hunting magazine in Iola, Wis.*

Lichens splash color on these granite rocks in northern Minnesota.



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## Look Again

Without lichens, Minnesota would be a different place. Rocks and trees would be less colorful. Forest animals would have less to eat. And birds would have less material for nest building.

The next time you see lichens, take a few minutes to get up close. Look through a magnifying glass at the fungus and the alga living as one. And remember that this often unnoticed life form is proof that teamwork works. 🌱

### ATTENTION TEACHERS!

To find an online teachers guide for this story, visit [www.dnr.state.mn.us/young\\_naturalists/lichens](http://www.dnr.state.mn.us/young_naturalists/lichens). To learn more about using *Minnesota Conservation Volunteer* as a teaching tool, contact Meredith McNab, [meredith.mcnab@dnr.state.mn.us](mailto:meredith.mcnab@dnr.state.mn.us) or 651-259-5348.