# The Outside Story

# Liverworts

## By: Susan Shea

I followed a stream downhill through the woods as it coursed through a small ravine. At the base of the hill, just before the brook entered a wetland, a patch of unusual-looking plants was growing amongst moss on a decaying tree root that spanned the stream. They were round and flat with lobed edges, and only the size of a dime. A couple of other patches grew nearby. Here the plants had branched out from their round bases, extending flat green ribbons across the damp soil.

These odd plants are liverworts, named for the resemblance of lobed species to the human liver. Liverworts are often confused with mosses and both are bryophytes, though recent evidence indicates that they may not be closely related. Liverworts have no roots, tubes, or veins to transport water and nutrients, but they anchor their bodies to soil or rock with threadlike filaments called rhizoids. They rely on diffusion (movement from an area of higher to one of lower concentration) to move water in and out.

Like mosses, liverworts reproduce from spores, not seeds, and can reproduce asexually (without a combination of egg and sperm) as well as sexually. Thallose liverworts (ones that have lobes) have goblet-like structures for asexual reproduction. Inside each tiny cup are green, egg-shaped discs of tissue called gemmae. When raindrops knock gemmae out of the cups, another liverwort plant with the same genetic make-up as the parent will grow.

For sexual reproduction, liverworts develop miniature umbrella-shaped structures, both male and female. Sperm released from a male “umbrella” swim along the plant’s moist surface and fertilize the egg. An embryo grows and develops into a capsule, which releases spores. The spores may be blown to a different location by the wind.

Leafy liverworts are the largest group of liverworts. Sometimes known as scale mosses, they grow as mats on rotten logs and damp soil, and on tree trunks and branches in temperate and tropical rain forests, where they live as epiphytes (obtaining moisture and nutrients from the air). According to ecologist Jerry Jenkins of the Northern Forest Atlas, northeastern liverworts, along with mosses, perform vital functions in forest ecosystems by retaining water and slowly releasing it to the soil, reducing erosion along streambanks, helping maintain humidity, and facilitating the decay of logs and disintegration of rock into soil by holding moisture.

The Northeast has a high diversity of liverwort species because of its varied topography and bedrock types. In our region, liverworts can be found in alpine areas (72 species have been

documented on Maine's Mount Katahdin), spruce-fir forests, bogs, cedar swamps, red maple swamps, maple-beech-birch forests, oak-hickory-white pine forests, and along the coast.

While liverworts aren't are the most spectacular plants, they're well worth inspecting as a way of looking into the distant past of life on our planet. They are among the earliest land plants, a link in the transition from marine algae to land. Fossilized spores from five different types of liverworts dating from about 472 million years ago were found in rocks in Argentina in 2010. Or to put that in perspective, they existed before flowering plants or even ferns, and well before the dinosaurs.

By studying liverwort genetics, scientists can determine the purpose of related genes in more complex plants. For example, researchers recently identified a pathway in a common liverwort for synthesizing auxin, a hormone critical for regulating plant growth, and genes to synthesize lignin for plant cell wall development (important for living on land). They also found genes for a hormone that makes a plant dormant when water is scarce. As Jeremy Schmutz of the US Department of Energy JGI Plant Program explained, in a recent article in *Science Daily,* "early plants like the liverwort are what set the world up for land plants. Without them, we wouldn't have plants more than two feet from the ocean and freshwater."

Look for liverworts along streambanks, on rotting logs, tree bark, rocks, and soil in cool, moist, shady, or foggy places. With a hand lens, you will see more detail and perhaps gemmae cups, or embryonic capsules.

*Susan Shea is a naturalist, conservationist, and freelance writer who lives in Brookfield, Vermont. The illustration for this column was drawn by Adelaide Tyrol. The Outside Story is assigned and edited by Northern Woodlands magazine, www.northernwoodlands.org, and sponsored by the Wellborn Ecology Fund of New Hampshire Charitable Foundation: wellborn@nhcf.org.*

Northern Woodlands
**PO Box 471, Corinth, Vermont 05039**
**Tel. 802.439.6292 Fax 802.439.6296**
**www. northernwoodlands.org**

This article is reprinted with the permission of the Center For Northern Woodlands Education. A not for profit organization, Northern Woodlands seeks to advance a culture of forest stewardship in the northeast by increasing understanding of and appreciation for the natural wonders, economic productivity and ecological integrity of the region's forests. Subscribe or donate at www.northernwoodlands.org.