WHAT IS A LICHEN AND WHAT IS IT WORTH?
Lichens are symbiotic organisms consisting of a fungus and a green alga (or cyanobacterium—or both!) growing together. Lichen lovers are not afraid to admit that they simply enjoy seeing the variety of forms and colors growing on the trees, rocks, and soils wherever they go. Many also know that lichens are indicators of air pollution and that both lichens and humans depend on clean air and a healthy environment. Less well known is that lichens play integral roles in keeping our natural world working. They provide food, cover, and nesting materials for a variety of birds, mammals, and insects, and contribute to forest and fensided water and mineral cycles. Lichens also have many traditional human uses as food, medicines, and textiles and produce unique compounds with promising pharmaceutical potential as antioxidants, anti-cancer drugs, and antibiotics.

CONTRIBUTIONS TO FOOD AND NESTING MATERIALS FOR WILDLIFE
Lichens are ecologically important as food, shelter, and nesting material for wildlife. Deer, elk, mouse, caribou, mountain goats, big horn sheep, pronghorn antelope, and various squirrels, chipmunks, voles, pikas, mice, and bats eat lichens or use them for insulation or in nest building.

WHAT DOES A LICHEN SYMBIOSIS WORK?
Algae and cyanobacteria produce food for the fungus, converting carbon dioxide gas into sugars via photosynthesis. Cyanobacteria also convert nitrogen gases into forms useful to build proteins, nucleic acids, and other essential molecules. The fungus, in turn, serves as a house for the food-producing partner(s) and provides water, minerals, and other nutrients absorbed from the air, rain, and substrates.

WHY LICHENS MATTER
Lichens contribute to the Earth’s biological diversity. There are more than 20,000 species of lichens and lichen-dependent fungi in North America. Lichen diversity is promoted by good air-quality, habitat diversity, availability of preferred substrates, and favorable climate.

A lichen’s variety of habitats can be found on soil, rocks, trees, moss, human-made materials, rebar, and even underwater.

LICHENS AND MICROBES
Distributions of soil, leaf, and aquatic microbes and invertebrates can be shaped by lichen-dominated habitats and thus the unique chemical compounds.

A variety of fungi, algae, and bacteria grow on or parasitize lichens; none are very specific to particular species.

HUMANS USE THEM
Throughout history, people have used lichens for food, clothing, dyes, perfumes, additives, medicines, panes, tanning agents, handmade, and absorbent materials. Compounds unique to lichens are used in perfumes, fiber dyes, and in medicines for their antibacterial and antifungal properties. Ornate lichens are harvested around the world for use in floral displays, decorations, and models.

LEFT: Many North American birds, like this Anna’s hummingbird, use leafy and hairlike lichens for nesting material. RIGHT: A deer grazes on tree beard lichens plucked from the ground after a wind storm. Shifts in lichen species indicate that forests are moving forests in Oregon’s high Cascades and that humidity is increasing along the Pacific Coast.

FOOD AND HABITAT FOR INVERTEBRATES
Birds, bats, butterflies, spiders, beetles, ladyflies, mites, ants, bees, butterflies, beetles, ladyflies, mites, ants, flies, and many beetles live on, camouflage themselves as, or eat lichens.

VARIOUS INSECTS, LIKE THE MOSQUITO, HIDE FROM PREDATORS BY CAMOUFLAGING THEMSELVES AS OR EAT LICHENS.

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ON THE TREES, LATE SUMMER TO EARLY FALL, LICHENS PROVIDE FOOD AND NESTING MATERIAL FOR A DIVERSITY OF ANIMALS.

The Oregon lung lichen dominates the lichen biomass of old-growth, temperate forest ecosystems in certain lichens. Climate change and biodiversity can be tracked and biodiversity can be tracked by monitoring certain lichens. Climate change and biodiversity can be tracked and biodiversity can be tracked by monitoring certain lichens.

CLIMATE INDICATORS
Climate strongly influences lichen community composition, i.e., which lichens are present. A few lichens tolerate large fluctuations in climate, but more require specific temperature regimes. Even a ‘C’ shift in mean annual temperature can drastically increase or decrease the probability of finding certain lichens. Climate change and biodiversity can be tracked and indexed by monitoring lichen community composition.

SHIFTS IN LICHEN SPECIES INDICATE THAT CLIMATE IS WARMING IN ORANGE LICHENS.

LICHENS, INSECTS, AND SONGBIRDS
As a forest matures, canopy lichens increase in number and support larger, more diverse insect populations. Most song birds are insectivorous, and a rich supply of insects helps ensure their breeding success. Songbirds consume copious quantities of insect pests across their migratory ranges, providing a valuable ecosystem service that enhances the production of wood, fruit, and other crops.

SONGBIRDS CONSUME COPIOUS QUANTITIES OF INSECT pests ACROSS THEIR MIGRATORY RANGES, PROVIDING A VALUABLE ECOSYSTEM SERVICE THAT ENHANCES THE PRODUCTION OF WOOD, FRUIT, AND OTHER CROPS.

LICHENS, FLYING SQUIRRELS, AND ENDANGERED TREES
Northern flying squirrels rely on air pollution sensitive, lowland forest for shelter and nesting material. These squirrels are a primary prey of the northern spotted owl, an endangered species whose protection has helped reduce forest management in the Northwest. Owls are very valuable to ground-fruiting fungi. Scampering through the forest, the squirrels disperse fungal spores in their droppings. The spores germinate and form mycorrhizal associations with trees rooted for tree growth. The trees, in turn, provide habitat for lichens, flying squirrels, spotted owls, and other organisms and provide wood products for people.

SHOVEL-MOUTHED FLYING SQUIRRELS EAT LICHENS, FEED ON SEEDS, AND FLIGHT IN WINTER AND UNDERGROUND FUSIONS IN SUMMER.

LICHENS PROVIDE GREAT HABITAT FOR A VARIETY OF WILDLIFE, WANTED AND WANTED, OPPORTUNITY PROVIDER, EMPLOYER, AND LENDER.

CONTRIBUTIONS TO NUTRIENT AND WATER CYCLING
Lichens play significant roles in mineral and hydrological cycles, notably nitrogen fixation. Cyanobacterial lichens fix atmospheric nitrogen into forms usable by the lichen and to other plants and animals. Where abundant, lichens and cyanobacterial growing on trees intercept and hold moisture, moderating humidity and temperature within the canopy. They also capture and slowly release nutrients from rain, dew, fog, air-borne fine particles, and gases, which might otherwise be lost or unusable. Desert crags of lichens, fungi, cyanobacteria, and moss reduce soil erosion by intercepting surface run-off and regulating infiltration of water into dry soils.

THE OREGON LUNG LICHEN DOMINATES THE LICHEN BIOMASS OF OLD-GROWTH, TEMPERATE FOREST Ecosystems IN NORTH AMERICA, WHERE IT CONTRIBUTES SIGNIFICANT AMOUNTS OF NITROGEN TO NITROGEN-LIMITED FOREST Ecosystems.

AIR QUALITY INDICATORS
Two properties make lichens useful air quality indicators. They are especially sensitive to some important pollutants, and they concentrate more pollutants in proportion to environmental availability. The first property can be used to demonstrate that air pollution is causing environmental harm and warn of incipient broader ecological effects; both properties are useful for assessing relative pollution levels over geographic space and time. When lichens are wetted, pollutants deposited to their surfaces as gases, vapors, or fine particles dissolve and are absorbed. Lichens and cyanobacterial partners are especially vulnerable to air pollutants like sulfur dioxide, ammonia, fluorine, and sulfite acids. These highly reactive gases and acids interrupt essential processes like photosynthesis and respiration. Lichens are also sensitive to excessive nutrients, especially nitrogen, which favor smaller, fast-growing weeds over the larger more ecologically valuable species. Air quality can be tracked using changes in lichen community composition, indicator species distribution, phylogeny, or appearance.

LINKS BETWEEN LICHENS, ECOSYSTEMS AND ENVIRONMENTAL CHANGE
As nitrogen- and sulfur-containing air pollutants increase, the ecological impacts increase too. Sensitive lichens, diatoms, bryophytes, cyanobacterial fungi, and alpine plants are more vulnerable. Because these air pollution-sensitive organisms are completely known to the ecosystem, lichens can therefore impact more tolerant or economically valuable species that need the protective species for food, habitat, or cover.

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LICHENS PROVIDE GREAT HABITAT FOR A VARIETY OF WILDLIFE, WANTED AND WANTED, OPPORTUNITY PROVIDER, EMPLOYER, AND LENDER.
Lichens are widespread, evolutionarily ancient, composite organisms comprised by members of two, and sometimes three, biological kingdoms.

CELEBRATING LICHENS

They provide food and habitat for wildlife and are important environmental quality indicators. Turn over this poster to learn more about these amazing organisms and why they matter.