

## Station 4: LICHENS ARE NOT PARASITIC

Lichen photobionts make their own food during the photosynthesis process, which is also shared with the mycobiont. Therefore, all nourishment necessary to maintain the lichen thallus is produced internally.

Lichens are not parasitic organisms and do not harm the trees they grow on! The substrate is simply a habitat or platform to grow on.

Some people remove lichens from trees to help them grow better, but this is not necessary. In the tropics, lichens also grow on leaves and this can affect plant growth over time. However, plants constantly make fresh new leaves to replace the ones covered by lichens or other organisms.

The tree at this site supports the growth of many different types of lichens on the twigs, stems and leaves.

**Objective:** To observe lichens and reflect whether the presence of lichens is in any way harmful to the trees.

**Activity:** Look at the lichens covering this tree and others in the area. Do you see any evidence of harm to the tree caused by the lichens? If we removed all the lichens, do you think the tree could grow better? Try to find a tree without lichens.



*Cosmibuena grandiflora* (Rubiaceae) with several lichens

## OTHER LICHENS YOU MAY FIND:

Many other lichens can be seen in the botanical garden and we encourage you to find as many as possible. See if you can find these and keep track of your total score:



*Graphis mexicana*



*Heterodermia* sp.



*Pertusaria* sp.



*Coccocarpia pellita*



*Tylophoron* sp.



*Sticta weigelii*



*Rimelia cetrata*



## TOUR LENGTH: 1 HOUR

**Maximum number of people:** 15

If your group has more than 15, we encourage you to split up in smaller groups so everybody can participate and observe better.

### Safety:

An adult should be present at all times.

All natural areas present danger. Please walk on trails only and stay with your group. Be watchful for spines, stinging insects, and snakes, among others.

Before you start make sure you, your classmates and your chaperone have: ✓ This brochure ✓ Hand lenses ✓ Evaluation form (2 parts)

We kindly ask you to fill out a quick evaluation form before and after the tour to help us to improve this activity. Suggestions and constructive criticism are highly appreciated.

Please return all materials used in this tour.

**PLEASE, DO NOT COLLECT ANY LICHENS OR OTHER ORGANISMS DURING THE TOUR. THANK YOU FOR YOUR UNDERSTANDING.**

**Map of Las Cruces Biological Station with the lichen tour:**



✓ Please remember to return to your leader all materials used in this tour, so other people can also learn about lichens!

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## ENCHANTED GARDEN Lichen Day Tour at Las Cruces Biological Station. Costa Rica



Organization for  
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## WHAT ARE LICHENS?



<http://www.anbg.gov.au/lichen/index.html>

Lichens are symbiotic associations of fungi (mycobiont) and algae or cyanobacteria (photobiont), making a distinctive structure called a thallus. Lichens are among the most successful types of symbiosis known, having around 18,000 described species. The nature of the lichen symbiosis is largely mutualistic with each partner contributing to the success of the other. The lichen fungus receives food from

the algae produced during photosynthesis and the alga is protected by the fungus from environmental extremes. The partners can be separated and resynthesized in the laboratory and some lichen algae can live independently, but most natural lichens are known only in a symbiotic state.

### Ecology

Lichens inhabit all continents and many can tolerate environmental extremes other organisms cannot, such as arctic and desert habitats. They colonize a variety of surfaces, and typically grow very slowly, sometimes showing no perceptible growth for decades.

### Importance of lichens

Many species are sensitive to air pollution and are used as indicators of air quality around the world. They are eaten by some cultures around the world, but most lichens contain organic acids that make them too bitter for consumption. They serve as food and shelter for insects, gastropods and other invertebrates, and are important source of nutrition for animals in arctic regions. They are economically important as dyes, antibiotics and in the perfume industry.

### Lichen chemistry

Lichens are known to produce over a 1000 secondary compounds, including colorful pigments and some that fluoresce in UV light. They are all produced by the lichen fungus and may function as antibiotic, defensive or light-screen compounds. They are taxonomically valuable and have been used for over 100 years to identify lichen species.

## Station 1: RECOGNIZING LICHENS

Lichens share habitats with a variety of other organisms, such as algae, mosses, ferns, and seed plants. At this station you can learn how to recognize lichens and tell them apart.

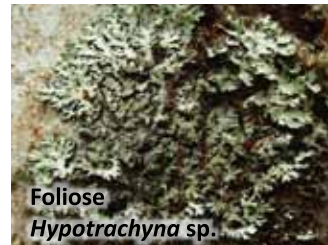
**There are four main lichen growth forms. They are:**

- ✓ **Crustose:** flat crust-like thallus adhering tightly to the surface.
- ✓ **Foliose:** flat leaf-like thallus more loosely attached to the surface.
- ✓ **Fruticose:** shrub-like thallus that grows off the surface.
- ✓ **Dimorphic:** thallus composed of a horizontal portion that forms small scales and vertical portion that grows upright.

**Objective:** how to recognize lichens and identify their growth form.

**Activity:** find one lichen that represent each of these forms.

### LICHENS AND THEIR GROWTH FORMS



Foliose  
*Hypotrachyna sp.*



Crustose  
*Herpothallon rubrocinctum*



Fruticose  
*Usnea sp.*



Dimorphic  
*Cladonia sp.*

### EXAMPLES OF OTHER ORGANISMS YOU MAY SEE



Moss



Liverwort

## Station 2: HOW DO LICHENS GET AROUND?

Lichens are able to move to new habitats by producing a variety of small structures, some of which are found only in lichens. Large numbers of these tiny structures are produced by the parent lichen to disperse “babies” great distances away.

Lichens can produce spores in fungal fruiting bodies that only carry the fungal partner, which means the spore still needs to find a photobiont partner to develop a thallus. **Some you can see here include:**

- ✓ **Apothecium:** a disk- or cup-shaped structure.
- ✓ **Lirella:** a linear, elongated structure that reminds writing.
- ✓ **Perithecium:** a flask- or drop-shaped structure.



Lirellae  
*Graphis sp.*

Lichens can also produce dispersal structures that contain both the lichen fungus and alga so that the babies are dispersed from parents already lichenized. **There are two types you can see here:**

- ✓ **Soredia:** small powdery-looking clusters of algal cells wrapped by fungal hyphae that are massed together on thallus margins or openings on the thallus surface.
- ✓ **Isidia:** small finger-like projections off the surface of the thallus that contain fungal hyphae surrounding an algal layer.



Soredia  
*Herpothallon sp.*



Isidia  
*Sticta beauvoisii*

**Objective:** To learn to recognize the variety of dispersal structures in lichens and distinguish only fungal from lichenized structures.

**Activity:** How many different lichens can you find with these dispersal structures? Can you find baby lichens?

## Station 3: WHERE DO LICHENS LIVE?

Lichens grow in several things, we call these different surfaces substrates. The natural substrates include tree barks, rocks, soil, leaves, fern stumps and mosses. Lichens can also grow in artificial (man-made) substrates, such as monuments, headstones, plastic objects, and glass.

When one is a lichenologist, a person who studies lichens, it is very important to record on which substrate the lichen was found. Some lichens require a specific substrate and will grow only there, while some can grow on anything.

Here you can see a fern stump full of a very popular lichen genus called Cladonia among other organisms.

**Objective:** to learn about the different substrates lichens can grow.

**Activity:** find one lichen growing on a leaf, a rock and soil. Also see if you can find a different Cladonia!



Fern stump



Leaves



Rocks



Tree bark



Concrete