



# Protecting and restoring the fungi community of Lane Cove Bushland Park



Department of **Environment & Climate Change** NSW



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## Introduction

As Sydney has developed, much original native vegetation has been cleared or disturbed. As a result, many native plants, animals and fungi have become locally extinct, or there are so few of them living in isolated communities that they are threatened with extinction.

The Department of Environment and Climate Change NSW and Sydney Metropolitan Catchment Management Authority are working with local government and the community to protect endangered remnants of native vegetation in Sydney and the threatened species that live in them.

This brochure explains how you can help preserve the fungi in your local area by, for example, reporting sightings or by joining a bushcare group. It also helps in identifying different fungal species and describes their interesting biology.

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You can obtain other threatened species brochures at [www.environment.nsw.gov.au/threatenedspecies](http://www.environment.nsw.gov.au/threatenedspecies) or contact the Environment Line on 131 555.

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## What are fungi?

Fungi are a very large group of organisms which includes moulds, yeasts, mushrooms and toadstools. None of these organisms contains the green pigment chlorophyll, so they cannot make their own food by photosynthesis. Fungi are neither plants nor animals – they belong to a separate kingdom.

Fungi are very diverse, ranging from microscopic, single-celled organisms to complex, multicellular organisms. The fungi pictured in this brochure are all multicellular and visible to the naked eye.



The threatened  
*Hygrocybe anomala* var.  
*ianthinomarginata*



The stinkhorn fungus  
*Dictyophora multicolour*



The starfish fungus  
*Aseroe rubra*

Photo: Cheyne Ramsay

## Fungi above and below the ground

### Toadstools and mushrooms

The mushrooms and toadstools seen above the soil are only a small part of the whole fungal structure. They are a 'fruiting' structure whose purpose is to produce spores and disperse them into the air. Spores in fungi function in a similar way to seeds in flowering plants. Once the fungal spores disperse and are subject to favourable environmental conditions they are capable of producing new individuals. The term toadstool is commonly applied to the spore-bearing bodies of those fungi that are poisonous if eaten. The term mushroom refers to edible varieties of common mushrooms. The mushrooms available at supermarkets and food stores are grown commercially under controlled conditions. Many endangered species of fungi have not yet been cultured artificially.



*Hygrocybe graminicolor*

### Mycelium

What is seen above the ground is only part of the fungal structure. At the base of the stem it is common to see cotton wool-like material referred to as the mycelium. It is composed of living threads called hypha that grow by lengthening and branching. The mycelium is vital to the fungus and can extend long distances from the mushroom. When the mycelium inhabits grass, it grows outwards from a central point. After rain, the mycelium of some fungi is activated to produce a ring of mushrooms that is commonly called a 'fairy ring'. The grass is greener within the fairy ring because the mycelium provides nutrients to the grass via the roots. One litre of soil taken from around the base of a plant can contain several kilometres of hyphae.



The threatened fungus  
*Hygrocybe collucera*



The macrofungi lifecycle  
Graphic supplied by the Royal Botanic  
Gardens Melbourne.

## The basic categories of fungi

Fungi are divided into three basic categories, depending on their nutrient sources.

### Symbiotic fungi

A number of fungi have a symbiotic relationship with the roots of living plants. Symbiotic fungi provide minerals and nutrients to living plants while the fungi receive sugars and water in return. This relationship of mutual benefit is called a mycorrhizal association. Most plants, including trees, bushes and grasses, could not grow without the symbiotic fungi that inhabit their roots and supply essential nutrients for growth and reproduction.

Some fungi have a close relationship with only one species of tree while others grow next to a variety of trees. If the fungus disappears due to unsuitable conditions, the plant can become ill or die.

### Saprotrophic fungi

The saprotrophic fungi are the major agents in the breakdown and recycling of dead plant and animal matter as well as all types of organic waste materials. These fungi carry out the vital process of decomposition. Saprotrophic fungi can be found on decaying rubbish and old, unhealthy or dead trees. They may grow from soil, dead leaves or dead wood.

Saprotrophic fungi are crucial to the environment and biosphere. The conversion of organic matter into energy eventually leads to the release of carbon dioxide, nitrogen and other nutrients that are used by living plants and algae.

### Parasitic fungi

Parasitic fungi grow in the living tissue of both plants and animals. In this relationship the fungi benefit and the host species is disadvantaged. Some of the large fungi are plant parasites causing disease and death of native plants. Specialised fungi also parasitise insects and other arthropods including spiders.



The symbiotic fungus  
*Cortinarius radicans*



The saprotrophic fungus  
*Pleurotus djamor*



The parasitic fungus  
*Gymnopilus junonius*

## Endangered fungi

Enthusiasts and scientists working together led to the protection of the Fungi (Hygrocybeae) Community at Lane Cove Bushland Park in 2000. This was the first fungal community to be listed as endangered under the *Threatened Species Conservation Act 1995*. This listing set a precedent as it pushed the boundaries of the legislation beyond the realm of plants, animals and invertebrates into a new kingdom.

The endangered species in the Hygrophoraceae family are all saprotrophs, and include examples of gilled fungi. Many species are brightly coloured and their shapes are unusually symmetrical. Most bushland areas support one or more species of Hygrophoraceae, but at Lane Cove Bushland Park there are over 20 species, which is the highest concentration of Hygrophoraceae fungal species in Australia.

Subsequent nominations to list fungi species under the Threatened Species Conservation Act resulted in five individual fungi species being listed as endangered and four individual species being listed as vulnerable.

Fungal communities are threatened by the removal of native vegetation, intrusion of weeds, increased stormwater runoff, fertilisers, arson, domestic pets, rubbish dumping and clearing.

## The endangered fungi of Lane Cove Bushland Park

### Getting there

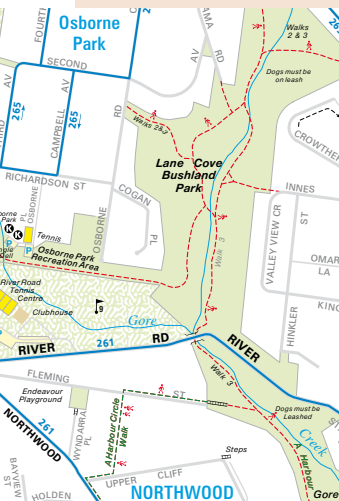
The main entrance to the park is via Osborne Road, Lane Cove, and may be reached by public transport. Sydney Buses routes 265 and 261 stop within walking distance of the park.



The threatened *Hygrocybe anomala* var. *ianthinomarginata*



*Hygrocybe irrigata*



Sydney Buses routes to Lane Cove Bushland Park

## Why is the community so important?

The endangered fungal community of Lane Cove Bushland Park:

- is a unique assemblage of over 20 fungal species in the Hygrophoraceae family
- contains decomposing fungi that are a crucial component of the ecosystem; the breaking down of organic matter eventually leads to the release of carbon dioxide, nitrogen and other nutrients that are used by living plants and algae thereby resupplying the ecosystem
- is part of a community relied on by most plants, including trees, bushes and grasses, that could not grow without the symbiotic fungi that inhabit their roots and supply the essential growth factors
- provides food for a range of native animals that are resistant to their toxins.

## The fungus, the orchid and the gnat

As in most ecosystems, the ground layer of vegetation in Lane Cove Bushland Park contains strong relationships between species. Several species of ground orchids depend on fungi for survival. Some of these orchids, such as greenhoods, emit pheromones that mimic the odour of mushrooms to attract fungi gnats. Normally the fungi gnats lay eggs in the flesh of fungi as part of their breeding cycle. The gnats locate the fungi by the pheromones they excrete. However, the gnats can be deceived by pheromones emitted by species of greenhoods, and act as pollinators for the orchids. The strong interdependence of different species with fungal communities highlights the importance of maintaining fungi and native vegetation throughout bushland.



The saprotrophic fungus *Pycnoporus coccineus*

Photo: Cheyne Ramsay



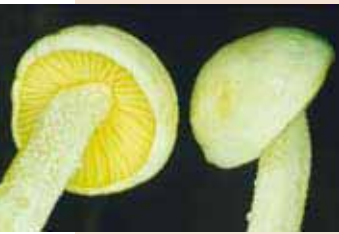
The egg of fungi gnat laid between gills of

*Humidicutis helicoides*

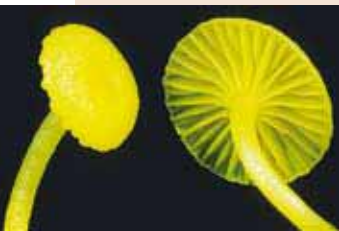


A greenhood orchid (*Pterostylis*)

Photo: Natalie Izquierdo



*Hygrophorus involutus*



*Hygrocybe chromolimonea*

## Identifying species

Learning to identify fungi can be a fascinating hobby. Keep a record of fungi encountered when working in the garden or bushwalking; if possible, photograph unfamiliar species. Record the top view, the under-surface of the cap and the comparative size of the fungi. Also include the date, and recent climatic conditions as well as a description of the substrate, such as soil, moss, root, decaying wood or leaf litter from which the specimen is growing. Contact a mycologist or visit the website of the Sydney Fungal Studies Group Inc. for assistance in the identification if you think it may be a new species.

The FungiMap project encourages fungi enthusiasts to help locate fungal species in their local area. Without the support of community volunteers our knowledge of fungi would be very limited.

Threatened fungi must not be disturbed in any way. Unlicensed collection or harm of endangered or vulnerable fungi can result in criminal penalties under the Threatened Species Conservation Act, *Environmental Protection and Biodiversity Conservation Act 1999* and the *National Parks and Wildlife Act 1974*. If you see such activities you can report them on Environment Line on 131 555.



Northern section of Lane Cove Bushland Park in warm-temperate sclerophyll forest



## Common fungal species

### *Auricularia auricular-judae*

This common thin, rubbery, ear-shaped fungus grows in clusters on decaying logs and stumps of deciduous trees; it can also colonise dead mangrove trees. The fungus is characterised by a smooth, almost waxy upper surface that is reddish-brown in colour and a hairy undersurface. It has medicinal properties and is claimed to lower blood cholesterol.

### *Nidula emodensis*

This unusual fungus, also known as bird's nest fungus, grows on decaying wood and organic matter. The egg-like spore bodies (peridioles) are splashed out by falling drops of water.

### *Trametes versicolor*

This 'bracket' fungus forms flexible shelves and is active in decaying wood. The colourful rings arise from spurts of growth during rainy periods, and the new fungal growth appears white. The species is sometimes referred to as the rainbow fungus. It often forms extensive tiers on dead logs and stumps, and can also parasitise living trees. The underside is cream in colour, with a layer of pores.



The poisonous fungus *Omphalotus nidiformis*



*Auricularia auricular-judae*



*Nidula emodensis*



*Trametes versicolor*



*Mycena viscidocruenta*



A witch's stool fungus  
Photo: Cheyne Ramsay

### *Mycena clarkeana*

This widespread fungus has a distinctive shape and colour. It forms small to large colonies on stumps, decaying logs and dead upright tree trunks.

### *Mycena viscidocruenta*

Always found on rotting wood, twigs or leaves, this fungus is quite tiny with the cap only up to 15 mm across. It is usually quite slimy, and is normally found where it is very damp. Sometimes it is mistaken for a species of red *Hygrocybe*.



*Mycena clarkeana*

## Threatened fungal species

### *Hygrocybe lanecovens* (endangered)

This red capped species has cathedral-like buttressed gills and is found only in Lane Cove Bushland Park. Rarely are there more than eight or 10 fruiting bodies per season. Sometimes the fruiting bodies may be found attached to each other at the base. Drought conditions threaten the regular fruiting of this species.

### *Hygrocybe collucera* (endangered)

Found only in Lane Cove Bushland Park, this scarlet species has bright yellow gills, though the spores are white. It is especially affected by drought conditions and may not appear for more than two or three seasons after poor rainfall. Some grow in clumps of two or three attached at the base.

### *Hygrocybe griseoramosa* (endangered)

The cap of this species is a sepia colour in the centre and grey towards the outer margin. The gills are branching at the outer margins. This species occurs in Lane Cove Bushland Park. In one season only four to eight fruiting bodies may appear, and they are difficult to see in shaded leaf litter.



*Hygrocybe collucera* (endangered)



*Hygrocybe lanecovens*  
(endangered)



*Hygrocybe griseoramosa*  
(endangered)



*Hygrocybe rubronivea*  
(vulnerable)

### ***Hygrocybe reesia* (vulnerable)**

This attractive species is a deep mauve colour and is found on creek banks. When it dries the colour may change from mauve to off-white. It is occasionally found in the Blue Mountains.

### ***Hygrocybe rubronivea* (vulnerable)**

This red-capped species with white gills is found in Lane Cove Bushland Park, south-east Queensland and in the Blue Mountains. Found in soil and leaf litter it can be easily distinguished from *Hygrocybe lanecovens* by its shallow and short gills.

### ***Camarophyllopsis kearneyi* (endangered)**

This pale brown species is found growing under ferns and on creek banks. In one season no more than five to eight fruiting bodies have been recorded. This species has been named after its discoverers, Ray and Elma Kearney.



*Camarophyllopsis kearneyi*  
(endangered)



*Hygrocybe reesia* (vulnerable)

## Conserving fungi

Neighbours and visitors can protect fungal communities from threats by:

- **staying on the walking tracks** – short cuts and new tracks cause fragmentation of fungal communities
- **keeping dogs on leads** – ensure your pets are kept under control in native bushland and out of waterholes and creeks, and *always* pick up your dog's faeces
- **weeding the garden** – removing weeds from local gardens will prevent them spreading into native bushland; birds can transport weed seeds large distances, so it is important to keep a weed-free garden even if you live a long way from the bush
- **keeping stormwater out of the bush** – ensure chemicals such as pesticides, herbicides and fertilisers do not escape from your property through rainwater or wind drift into native bushland or down the drain
- **not dumping rubbish** – never dump garden refuse into bushland as, apart from being illegal it helps weeds to spread into the bush; use the green waste service provided by your local council to dispose of garden waste
- **not cutting down or planting trees in bushland** – cutting down or poisoning trees and removing soils can destroy ecosystems; these actions alter the microclimatic conditions and impact on the relationships that fungi have with plants and soil
- **joining a bushcare group** – visit your local council or its website; if you live in Lane Cove you can email [bushcare@lanecove.nsw.gov.au](mailto:bushcare@lanecove.nsw.gov.au)
- **joining the Sydney Fungal Studies Group Inc.** – if you want to learn more about how to identify fungi visit the website at <http://sydneyfungalstudies.org.au/>.



A constructed track in Lane Cove Bushland Park



Fungi surveys in Lane Cove Bushland Park



*Hygrocybe cheelii*

## Further reading

### Websites

Australian National Botanic Gardens: <http://www.anbg.gov.au/fungi/>

Department of Environment and Climate Change NSW:

<http://www.threatenedspecies.nsw.gov.au/tsprofile/>

Department of Environment, Water, Heritage and the Arts:

<http://www.environment.gov.au/biodiversity/threatened/publications/action/cryptogams/10.html>

Fun facts about fungi:

[www.herb.lsa.umich.edu/kidpage/factindx.htm](http://www.herb.lsa.umich.edu/kidpage/factindx.htm)

FungiMap

[http://www.rbg.vic.gov.au/fungimap\\_/](http://www.rbg.vic.gov.au/fungimap_/)

Introduction to fungi:

<http://www.ucmp.berkeley.edu/fungi/fungi.html>

Royal Botanic Gardens Melbourne:

[http://www.rbg.vic.gov.au/research\\_and\\_conservation/fungi](http://www.rbg.vic.gov.au/research_and_conservation/fungi)

Sydney Fungal Studies Group Inc.:

<http://sydneyfungalstudies.org.au>

The University of Sydney:

<http://bugs.bio.usyd.edu.au/Mycology/Ecology/conservation.shtml>

Tom Volk's fungi:

[http://botit.botany.wisc.edu/toms\\_fungi/](http://botit.botany.wisc.edu/toms_fungi/)

WWW Virtual Library – Mycology:

[biodiversity.uno.edu/~fungi/](http://biodiversity.uno.edu/~fungi/)

### Books

Fuhrer, B. (2005) *A Field Guide to Australian Fungi*, Bloomings Books, Melbourne.

Kendrick, B. (2001) *The Fifth Kingdom* (3rd edn), Mycologue Publications, Sidney, British Columbia, Canada.

Suzuki, D. and Grady, W. (2004) *Tree: a biography*, Allen & Unwin, Sydney.

Young, A.M. (2005) *Fungi of Australia: Hygrophoraceae*, CSIRO Publishing, Melbourne.



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Lane Cove Bushland Park and *Hygrocybe collucera*

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