GLACIER BAY NATIONAL PARK & PRESERVE

Fungus Among-us

Fungi: Friend or Foe of the Forest?

Most forest fungi are neither easy to see nor understand, but with this primer, you will be able to explore the fungi that can be found in the Bartlett Cove area forests!

The temperate rainforest around Bartlett Cove began to develop after the Grand Pacific Glacier retreat in the mid 1700's. Although the trees appear stately and fully mature, they are, in fact, relatively young. Comprised mainly of Sitka spruce and western hemlock trees, these forests continue to develop and mature towards an old growth climax successional stage. In these lush forests, fungi are already important components of the ecosystem, exerting influence on soil building and nutrient recycling processes, woody debris deterioration, forest structure, and wildlife habitat.

Distinctive bark color and patterns help distinguish western hemlock (foreground) and Sitka spruce (background) trees in the Bartlett Cove area.

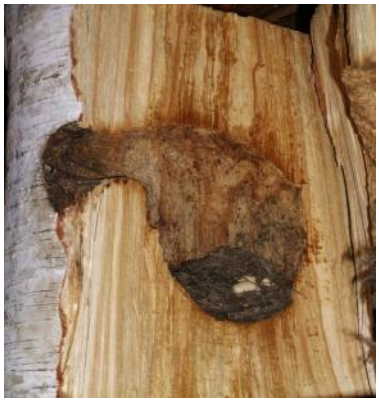
How do Fungi Make Fertilizer?

Soil Processes and Fungi:

- *Forest fungi decompose dead and down woody material and help build the rich humus soil layer by breaking down carbon into very small particles.*
- *Fungal decomposers possess a variety of strategies for extracting and releasing nutrients from wood, and thus play an essential role in soil development and nutrient recycling.*
- *Recent research in the forests of the Pacific Northwest indicates that fungal mats help plant growth by making nitrogen available and increasing the production of organic acids that enhance phosphorus uptake.*
- *Fungal mats may cover up to 40% of the forest floor and may be over 2,000 years old in Pacific Northwest forests.*

Tap, Tap, Tap: How Birds use Fungi to find Homes!

Cavity nesting birds, such as the hairy woodpecker, red-bellied sapsucker, chestnut backed chickadee, and the red breasted nuthatch, seek live and dead forest trees with heartwood that has been "softened" by fungi. These trees make the process of home building much easier! Woodpeckers and other primary cavity nesters can be seen tapping on many different trees in the forest, essentially testing the tree for a "hollow" sound. Once a suitable tree is found, holes are excavated and chambers are drilled out for nesting. Secondary cavity-nesters, including the Hammond's, olive-sided, and Pacific-slope flycatchers, as well as many owl species, take advantage of abandoned cavities.



Common fungi that decay the heart-wood of trees in Bartlett Cove include the red belt fungus, Fomitopsis pinicola *(A), and the red ring rot conk,* Phellinus pini *(B).*

A.

B.

Is there a Witches' Broom in that Tree?

Characteristic large broom of the spruce broom rust fungus. It is too early in the spring to know whether this broom is dead. Can you also find the porcupine?

Have you seen what looks like a large nest or witches' broom in Bartlett Cove spruce trees? Look around to see if you can spot one or smell one in early summer. Spruce broom rust, *Chrysomyxa arctostaphyli,* is one of the most easily seen and smelled forest fungus. Infected trees develop dense clusters of branches with a yellow or orange needle appearance in summer. These branch clusters are sometimes referred to as "witches'-brooms" or "brooms". Brooms can occur on branches or the main tree trunk.

For about two weeks in mid- to late June, a distinctively sweet but earthy odor emanates from live brooms that are releasing fungal spores. Needles are shed in the fall, giving brooms a bare, dead appearance, but the twigs in the broom only die occasionally. The following spring, brooms produce new yellowish-colored needles to start the process again.

The broom-like growth structure is important habitat for red and flying squirrels as well as other mammals. Brooms have been found hollowed out for nesting or winter hibernation.

Spruce broom rust broom releasing spores and likely smelling fragrant!

Lions and Tigers and Bears, oh my: Forest Change from Diseases and Insects

Significant signs of change are found across Alaska's National Parks. While change is not new, the accelerated pace of change has become particularly noticeable.

The forests of Bartlett Cove are experiencing change due to two important insect and disease outbreaks that have recently been investigated and monitored by USDA Forest Service Entomologists and Plant Pathologists. A third forest issue, decline of Alaska yellow-cedar, has been investigated across Southeast Alaska as a climate change story since the mid-1980s.

A spruce beetle, *Dendroctonus rufipennis*, epidemic that began in the mid-1970s and persisted to the 1990s, caused significant death of Sitka spruce trees in Bartlett Cove forests and the neighboring areas of lower Glacier Bay. Fungi are now decomposing standing and downed bark beetle-killed trees, contributing to significant tree fall and in some places, creating challenging hazard tree issues. A shifting climate may alter spruce growth rates and may accelerate the potential for intense outbreaks of bark beetles in Glacier Bay National Park in the near future.

"When we study Park resources, we can't point to any single event and say it is caused by changing climate. Long term trends tell the story."

-State of Change, Climate Change in Alaska's National Park Areas, 2014

Since 2010, a needle disease outbreak, caused by *Dothistroma septosporum*, is responsible for significant death of shore pine, *Pinus contorta* var. *contorta,* in theBartlett Cove area, adjacent lands near Gustavus, and lower Glacier Bay.

Fatal needle disease outbreaks such as this, have recently been associated with climate change in the Pacific Northwest, Rocky Mountain Region, and Canada.

Contrary to expectations, the *Dothistroma* outbreak continued to cause significant shore pine death in 2014 and shows few signs of abating any time soon.

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