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## Nalini Nadkarni: *Roots to Canopy*

Student Presentation Study Guide

November 18 & 19 at 10:15am

Jack Singer Concert Hall at Arts Commons





## Nalini Nadkarni

Throughout human history, trees have provided our most important sources of sustenance, protection, and wonder. Nalini Nadkarni, a tree canopy ecologist, has spent four decades dangling among the branches to study the ways that forests inform our daily lives. Climb into the clouds to experience the magnificent wildlife and incredible science happening in the vast, hidden worlds suspended above our heads.

With expertise honed through years of studying these treetop realms, Nadkarni is one of the world's foremost experts on the vital role canopy ecosystems play in our planet's health. Discover the fascinating interconnections between canopy flora and fauna and the urgent importance of conserving these biodiverse habitats. Join Arts Commons Presents and National Geographic Live for an immersive journey into the heart of the forest canopy, where science, conservation, and wonder converge.

### Nalini Nadkarni Resources:



[TED Talk with Nalini Nadkarni](#)

### Follow the Explorer!

[nalininadkarni.com](http://nalininadkarni.com)

X: [@nalininadkarni](https://twitter.com/nalininadkarni)



What do trees tell us?

What value do trees add to our life?

What memories of trees do you have?

What is the story of a tree?

Who has access to trees?

Who needs trees?

How do different cultures value trees?

How do forests inform our daily life?

# LET'S BRANCH OUT

## QUESTIONS TO START CONNECTION

How are trees connected to the world around them throughout the different stages of their life cycle?



# Urban Forestry in Calgary

Why is a tree canopy coverage important? There are many benefits to urban trees and forests, from providing cooler shade on hot summer days to attracting birds and pollinators. Trees combat the urban heat island effect by absorbing sunlight and releasing moisture to make the air feel cooler. The tree leaves slow rainfall to reduce surge flooding during heavy rains and tree roots make the surrounding soil spongier, which absorbs and stores more rainwater.

Source: [Calgary Tree Equity calgaryclimatehub.ca](http://Calgary Tree Equity calgaryclimatehub.ca)

## Tree Canopy in Calgary

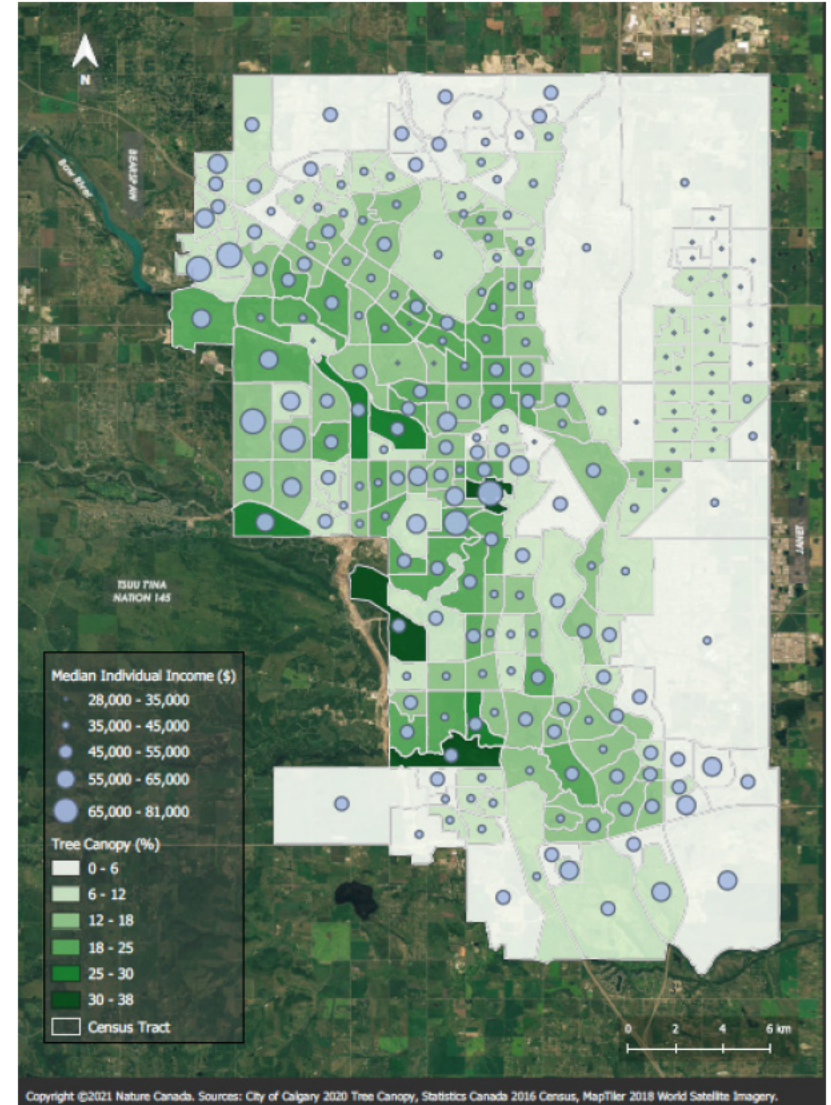
Currently Calgary has a tree canopy cover of 8.25%. This includes trees growing on both private and public property. Calgary is currently not on track on its target of expanding the tree canopy to nine per cent by 2026 due to annual tree losses and new tree planting going towards replacements versus canopy growth.

Source: [Tree Cover calgary.ca](http://Tree Cover calgary.ca)

## What is Tree Equity?

Tree equity refers to tree distribution in urban areas in relation to income and diversity of neighbourhoods. An analysis by Nature Canada in 2022 confirmed previous research that neighbourhoods with lower household incomes and larger BIPOC communities don't have as much access to trees and urban forests as wealthier and less culturally diverse communities. As the following map indicates, communities in northeast Calgary have less tree canopy than similarly aged communities in other parts of Calgary.

Source: [Calgary Tree Equity calgaryclimatehub.ca](http://Calgary Tree Equity calgaryclimatehub.ca)



## Canopy Coverage

- Richmond: 15%
- Mount Royal: 32%
- Shawnessy: 8%
- Saddleridge: 2%





# Alberta Tree Canopy

Around 61 percent of Alberta is forested.

The majority of this forested land is in the vast Boreal Forest Natural Region, with an additional strip of forested land running down the Eastern Slopes of the Rocky Mountains, in the Rocky Mountain and Foothills Natural Regions.

The Boreal Forest Natural Region is 378,046km<sup>2</sup> in size, containing a total of eight distinct Natural Subregions, with all of which combines to total over 58% of Alberta's land base.

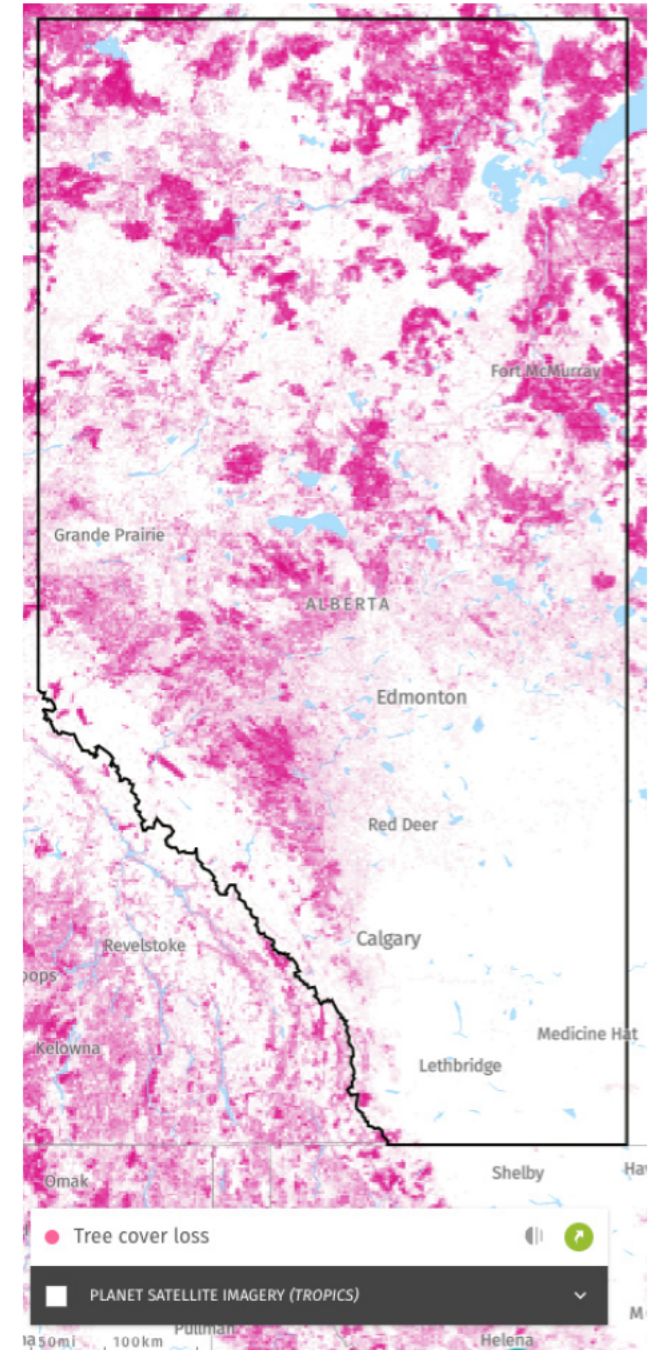
Boreal forest, or taiga, is the largest land-based biome on Earth. This is the type of forest that covers more than 60% of Alberta's land. Boreal forests are tough, cold-weather forests with a relatively short growing season.

Many of Canada's most iconic animals can be found in Alberta's boreal forests. Moose, bears, deer, wolves, woodland caribou, Canada lynx, and elk all make homes there, along with smaller animals like snowshoe hares, lemmings and beavers. There are about 85 mammal species that live in the boreal forest. Thousands of insect species are part of our forests too, playing important roles as pollinators and food sources within the forest ecosystem.

Source: [Anatomy of a Boreal Forest](https://www.albertaforestproducts.ca)  
[albertaforestproducts.ca](https://www.albertaforestproducts.ca)

From 2001 to 2023, Alberta lost 7.34 Mha of tree cover, equivalent to a 19% decrease in tree cover since 2000.

Source: [Alberta globalforestwatch.org](https://www.alberta.globalforestwatch.org)





# Famous Trees in Alberta



## Burmis Tree

The Burmis tree is a limber pine located in south western Alberta in the community of Burmis, Alberta, along the Crowsnest Highway and east of municipality of Crowsnest Pass. The tree died in the late 1970s after losing its needles.

The Burmis tree was estimated to be between 600 and 750 years old. In 1998, it was toppled by wind, however members of local community refused to leave it lying. The tree was stabilized by Alberta Culture, Historic Sites staff using stainless steel rods and brackets.

In 2004, vandals cut one of the tree's main branches. Locals fixed it again with glue and a prop pole. The community rallied to have the new Highway 3 built around the tree rather than destroy the heritage symbol it has become. The tree remains as the sole point of interest in the once prosperous town of Burmis.



## The Grandfather Tree

The Grandfather is a white spruce, nestled amongst many other trees a few metres southwest of Bighill Creek, which flows near the Historic Cochrane Ranche and past the Cochrane Ranche House. The tree's expansive and exposed roots both fascinate and inspire its many visitors.

The Grandfather Tree is estimated to be over 300 years old however, that has never been tested.

## Pine That was Napi

The Pine That Was Napi is said to be still standing, somewhere along the banks of the Highwood River.

The Blackfoot People tell the story of Napi, known as Old Man, the cultural hero of the Blackfoot tribe. Napi is often portrayed as a trickster, a troublemaker, and a foolish being. But he is a well-intentioned demigod responsible for shaping the world the Blackfoot People live in. When all the others found husbands and wives, Napi was left alone. Realizing that he had no wife, he stomped his feet and turned into a lone pine tree. To this day, if a man is not asked to dance by a woman, he is called a lone pine.

Source: [Kitaowahsinnoon.galileo.org](http://Kitaowahsinnoon.galileo.org)



## The Medicine Tree

Growing on the north bank of the Highwood River, just a few kilometers west of High River, the Medicine Tree was two cottonwoods growing side by side and joined by a branch of one tree which had grafted to the trunk of the other about ten feet off the ground.

This tree was sacred to the local Blackfoot people.

When the tree blew down in 1958, residents of the town salvaged part of its great trunk and main branch. This remnant can be seen attached to the archway of George Lane Memorial Park in High River. The Town of High River uses a depiction of this tree in its official logo.

Medicine Tree Mural: [Kitaowahsinnoon.galileo.org](http://Kitaowahsinnoon.galileo.org)



WOOD YOU BELIEVE IT?

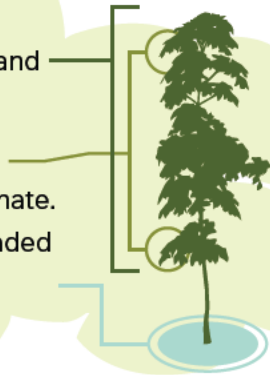
# TREETOPS ARE FULL OF SOIL, WORMS, AND ROOTS

## WHERE ARE WE?

**Tree Canopy:** the layer of leaves, branches, and stems of trees.

**Microclimate:** the climate of a very small or restricted area. e.g. The Tree Canopy microclimate differs from the forest floor climate.

**Tree Canopy Coverage:** the ground area shaded by the leaves, branches, and stems of trees when viewed from above.



**Epiphytes:** Plants that grow on other plants without connecting their roots to the vascular system of the tree. This diverse group includes orchids, mosses, and ferns. They capture nutrients from outside the ecosystem and then make them available to plants and animals that are inside it.

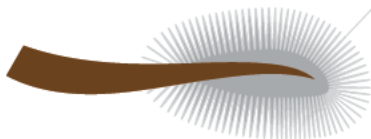
**CANOPY SOIL CAN BE 1M DEEP!**

**Canopy Soil:** Soil in the tree canopy created by decomposed epiphytes. Rich in nutrients, it's populated by invertebrates and microbes, even earthworms. Some trees can put out roots from their own branches and trunks into these mats of canopy soils and take up nutrients and water from them.



Nalini Nadkarni on a branch 35 metres above the ground, near the top of a strangler fig in Costa Rica's Monteverde forest. Photo: Christian Sinibaldi

## DOWN AT THE ROOTS



Filaments of fungi intertwine with the tips of tree roots to form underground networks that seem to benefit both organisms: the filaments, called hyphae, break down minerals in the soil that trees can then take into their roots, and the fungi get a steady supply of sugar from the trees.

The associations between roots and fungi are called **mycorrhizae**. These mycorrhizal fungi, a specific fungus that forms mutually beneficial partnerships with plant roots, is a prime example of this incredible natural phenomenon. Mycorrhizal fungi have existed for over 400 million years, and affected plant evolution.

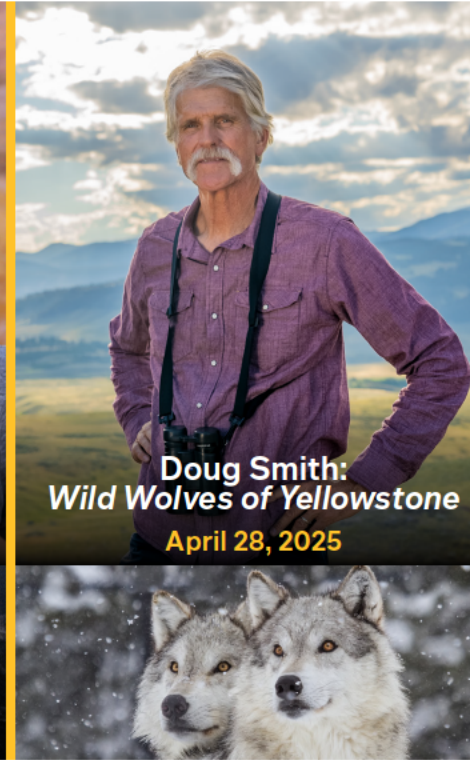
# Tree-tastic Terms

Bark	The outermost layer of stems and roots of woody plants, designed to protect the tree from diseases, growths, and other threats. Plants with bark include trees, woody vines, and shrubs.
Bough	A main branch of a tree.
Branch	A stem that grows off another stem, or when structures like veins in leaves are divided into smaller veins.
Bud	An undeveloped shoot that normally occurs in the axil of a leaf or at the top of a stem.
Cambium	The layer of the tree trunk that is living and growing. Every year, the cambium layer of a tree trunk grows, which expands the tree's diameter.
Chlorophyll	A green pigment, present in all green plants, responsible for the absorption of light to provide energy for photosynthesis.
Conifer	A tree that bears cones and needle-like or scale-like leaves that are typically evergreen.
Deciduous Trees	Trees that lose their leaves for part of the year through a process called abscission. Often leaf loss coincides with winter—namely in temperate or polar climates. The leaves of a deciduous tree will change colours, typically to yellow, orange, or red before falling off.
Fine Roots	All the root types (tap, lateral, oblique, and sinker) can give rise to fine roots. Water and nutrients are directly absorbed by fine roots. They also house mycorrhizae, which are fungal partnerships that increase root absorption capacity.
Fruit	The sweet and fleshy product of a tree or other plant that contains seeds and can be eaten as food.
Growth Ring	A layer of wood formed in a plant during a single period of growth. Most growth rings reflect a full year's growth and are called annual rings. Growth rings are visible when the trunk of a tree is cut horizontally.
Heartwood	The section of a tree trunk composed of layers of sapwood that has died. Heartwood is the oldest part of the trunk and the darkest in colour. Though dead it remains strong to support the entire framework of the tree.

Lateral Roots	Roots that grow outwards right under the soil surface. They absorb a lot of water and nutrients as well as anchoring the tree.
Leaf	The principal appendage of the stem of a vascular plant, usually borne above ground and specialized for photosynthesis.
Oblique/Heart Roots	Roots that grow at a diagonal and have the same function as lateral roots.
Photosynthesis	The process by which green plants and some other organisms use sunlight to synthesize food from carbon dioxide and water
Root	The part of the tree that is normally underground, which anchors the tree in the soil. Tree roots take nutrients and chemicals out of the soil and use them to produce what they need for the tree's growth, development, and repair.
Sapwood / Xylem	The inner layer of a tree which is responsible for moving water up the trunk and out to the leaves.
Sinker Roots	Roots that grow downwards from the lateral roots to a depth of several feet. There, lateral roots take advantage of any water and nutrients deeper in the soil in addition to increasing tree stability.
Stem	One of two main structural axes of a vascular plant, the other being the root. It supports leaves, flowers, and fruits.
Tap Roots	The central, large root that a tree starts with that provides stability and absorption.
Tree	A perennial plant with elongated stem, or trunk, usually supporting branches and leaves
Trunk	The thick main stem of a tree, from which its branches grow.
Twig	A thin, often short, branch of a tree or bush
Vein	The vessels inside a plant's leaves that carry water and food to and from the leaves. Veins also provide the strong support that gives a leaf its shape.



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