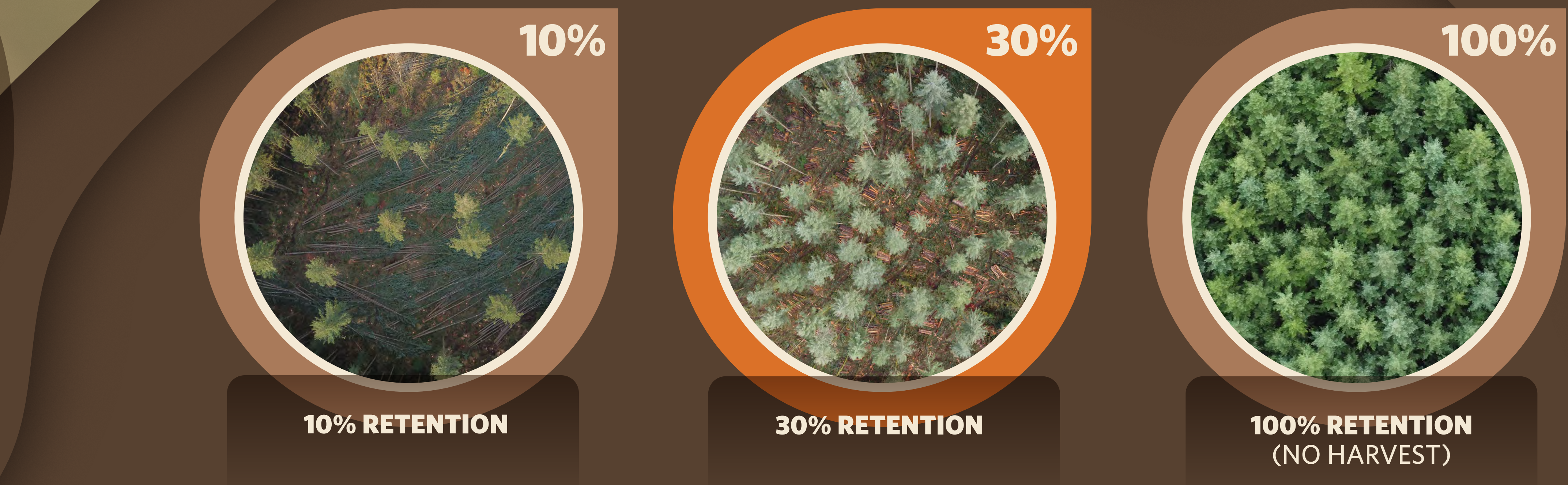


HARVESTING WITH THE FUTURE IN MIND

This UBC research project explores **retention harvesting** in coastal Douglas-fir forests planted in the 1960s and 1970s. At that time, seed choices were limited, and Douglas-fir was widely planted because it grows quickly and was highly valued by the forest industry. However, over time this approach created large areas dominated by a single species.

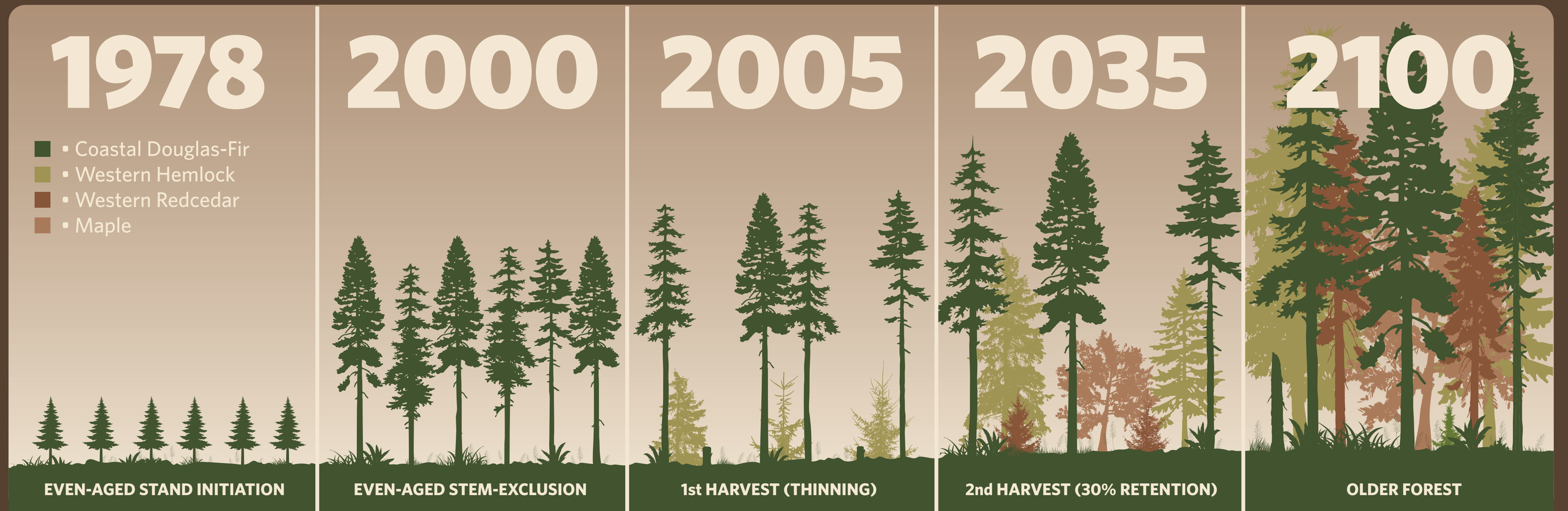
A new question is shaping forest research today: Can alternatives to clear-cut harvesting help create more resilient forests for the future? This project explores retention harvesting—an approach that leaves some trees standing—to support more diverse forest development over time, while still producing usable wood.

WHAT IS RETENTION HARVESTING?
It's a forest management approach where only some trees are removed from an area, while others are deliberately left standing.



MALCOLM KNAPP RESEARCH FOREST

Using **30% retention** to increase forest diversity over time:



- 6 yrs after clear-cut logging
- Only Douglas-fir planted

- Trees approx 30 yrs old
- Some trees are winning over others, some are suppressed

- **Thinning harvest** of suppressed or less dominant trees
- 40% of trees harvested
- Natural regeneration of western hemlock

- 12 yrs after **retention harvest**
- 30% of trees retained
- Western red cedar planted in spring 2025

- New opportunity for retention harvesting?

 **As you hike, discover how thoughtful tree harvesting can help forests thrive—while still providing the wood we rely on every day.**

We are grateful for the funding support of Jill Kantelberg, the McCain family, and the Silviculture Innovation Program for this research.



NOT SO CLEAR CUT

TWO TOOLS IN ONE
The **harvester** works as both a feller buncher and a processor—two jobs in one machine.



METHODS, TOOLS AND TRADEOFFS

This UBC research project looks beyond clear-cutting to explore **retention harvesting**—a forest management approach that leaves some of the trees standing. We compared two harvest methods: one requiring three machines (whole-tree harvesting) and another requiring two (cut-to-length). Each involves different trade-offs. Cut-to-length harvesting may offer unique advantages when retaining more than 30% of trees.

METHOD 1 3 MACHINES

X3

WHOLE-TREE HARVESTING

This is the most common type of harvesting done in British Columbia. It involves cutting trees then moving the **whole-tree** to the side of the road for cutting into individual logs. It is efficient and thought to be more cost-effective.

METHOD 2 2 MACHINES

X2

CUT-TO-LENGTH HARVESTING

This type of harvesting is more common in Europe, where trees are **cut-to-length** right where they fall, and branches are left on the forest floor. Typically machines are smaller and better at weaving around trees that are meant to stay in the forest.

TOOLS

X3 **WHOLE-TREE HARVESTING**

1
Feller Buncher: fells trees and accumulates them in bunches.

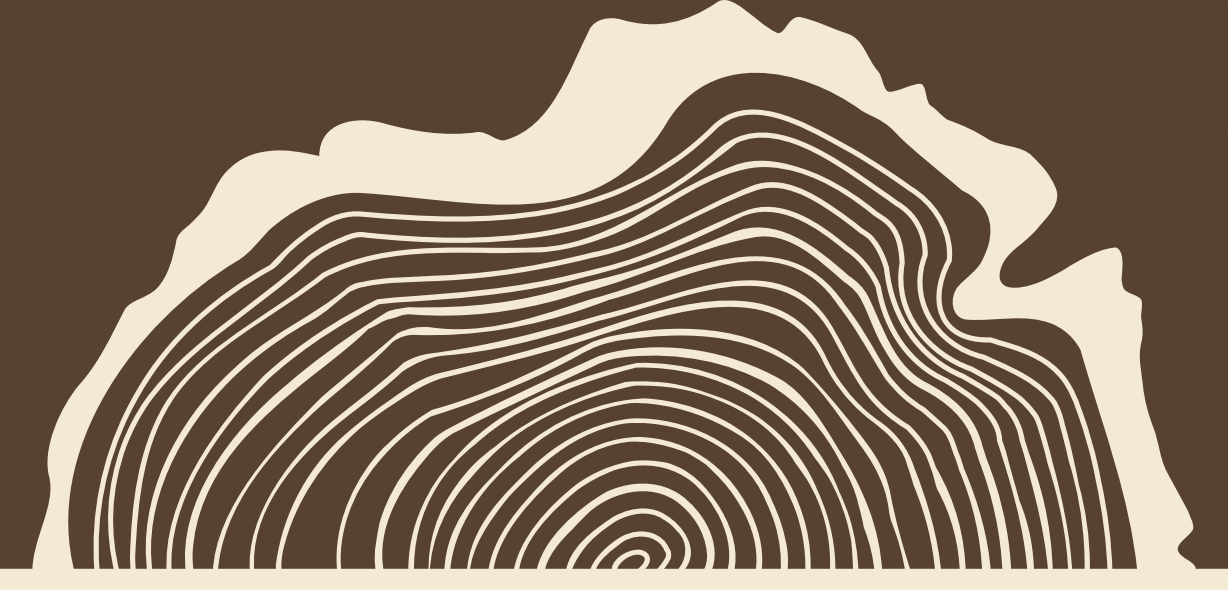
2
Hoe-Chucker: moves whole-trees to the road side.

3
Processor: cuts each whole-tree into multiple logs of different lengths, while removing the branches.

X2 **CUT-TO-LENGTH HARVESTING**

1
Harvester: fells trees, removes branches then cuts them to length at the stump.

2
Forwarder: transports cut-to-length logs from the stump to the road side landing.



TRADEOFFS

WHOLE-TREE HARVESTING

VS

CUT-TO-LENGTH HARVESTING

	Whole-Tree		Cut-to-Length
Maneuvering around standing trees	HARDER ❌		EASIER ✅
Likelihood of damaging standing trees	GREATER ❌		LOWER ✅
Logging efficiency	SIMILAR ✅		SIMILAR ✅
Cost to purchase logging machines	MORE ❌		LESS ✅
Compatible with coastal sawmills	YES (Long logs) ✅		NO (Short logs) ❌

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**NOT
SO
CLEAR
CUT**

DID YOU KNOW?

Research from UBC shows that, depending on the ecosystem, **retaining 10-60% of trees** during harvest can help protect below-ground life and keep essential soil processes functioning.

HOW TREES FEED THE FOREST

What you see above ground is closely connected to what's happening below your feet. A forest rich in plants, fungi, and animals depends on an equally vibrant underground network—roots and microbes working together to move carbon, water, and nutrients. They all support each other.

This project explores what happens when mature trees are left standing during a harvest, and how they continue to support this hidden underground network. How does retention harvesting shape forest diversity and the carbon balance?

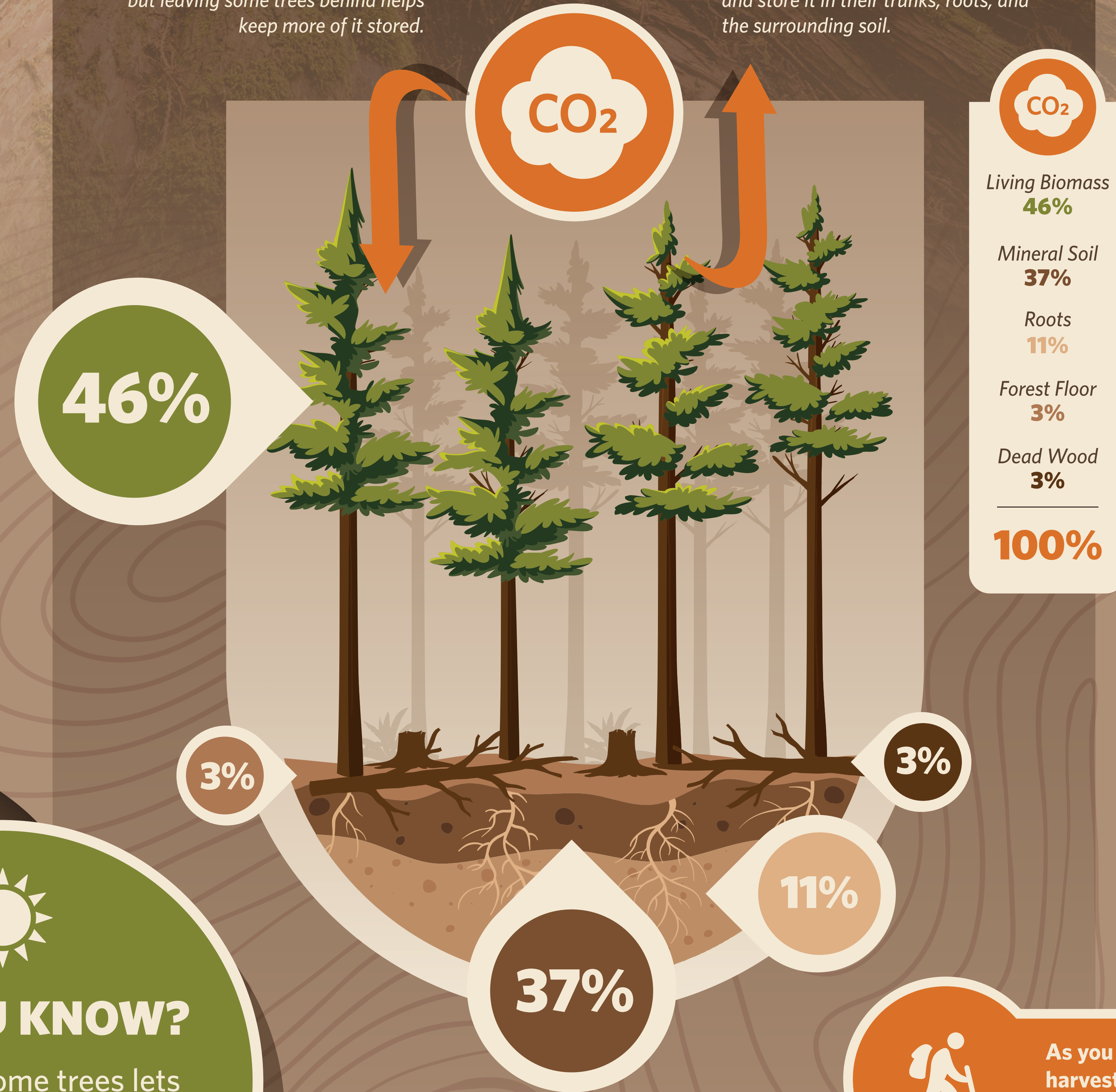
DID YOU KNOW?

Harvesting some trees lets sunlight reach the forest floor, encouraging shrubs, herbs, and berries to grow.

Where is the carbon stored in the Malcolm Knapp Research Forest?

Harvesting can release carbon—but leaving some trees behind helps keep more of it stored.

Trees pull carbon from the atmosphere and store it in their trunks, roots, and the surrounding soil.



(Photo credit: Liam Irwin)

AN UNCOMMON VISITOR

In January 2025, a **Great Grey Owl** was spotted in the 30% retention forest—a powerful reminder that leaving some trees standing creates real habitat for wildlife.

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NOT SO CLEAR CUT

NOT A SIMPLE CUT

Retention harvesting leaves some trees standing—but it changes their world. Trees that once grew sheltered by their neighbours are suddenly exposed to stronger winds and driving rain, and some may topple. Harvesting equipment and falling trees can also damage the trees that remain.

Even before harvesting, many Douglas-fir trees in this forest were already stressed by root disease, drought, and bark beetles. Protecting the trees that are left behind is critical—damage during harvesting can make them more vulnerable to beetle attack.

DID YOU KNOW?
Some tree species handle wind better than others. Douglas-fir grows a deep taproot that anchors it firmly in the soil, making it highly wind-resistant. Western hemlock, by contrast, has shallower roots and is more easily blown over, making it a riskier tree to retain during harvesting.



2024
WINDTHROW: Even wind-tolerant Douglas-fir can fall. December 2024 storms toppled over 15 trees in the 30% retention area.



2024
MACHINE DAMAGE: Watch out! Stem damage from retention harvesting can make these trees more susceptible to insects or disease.

What challenges can trees face with retention harvesting?

2021-2024
DROUGHT: Drought and the 2021 heat dome severely stressed the trees in this forest.



ARMILLARIA ROOT DISEASE: A widespread and destructive fungus found around the world. In some Douglas-fir forests, it acts as an unseen stressor, weakening trees from below ground.



2023-2025
DOUGLAS-FIR BARK BEETLE: Outbreaks of this destructive species of beetle increased, targeting trees already stressed by drought and disease. **See how the beetles' tracks lead them to stressed trees.**

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