
HOW TREES BRACE FOR FREEZING IMPACT

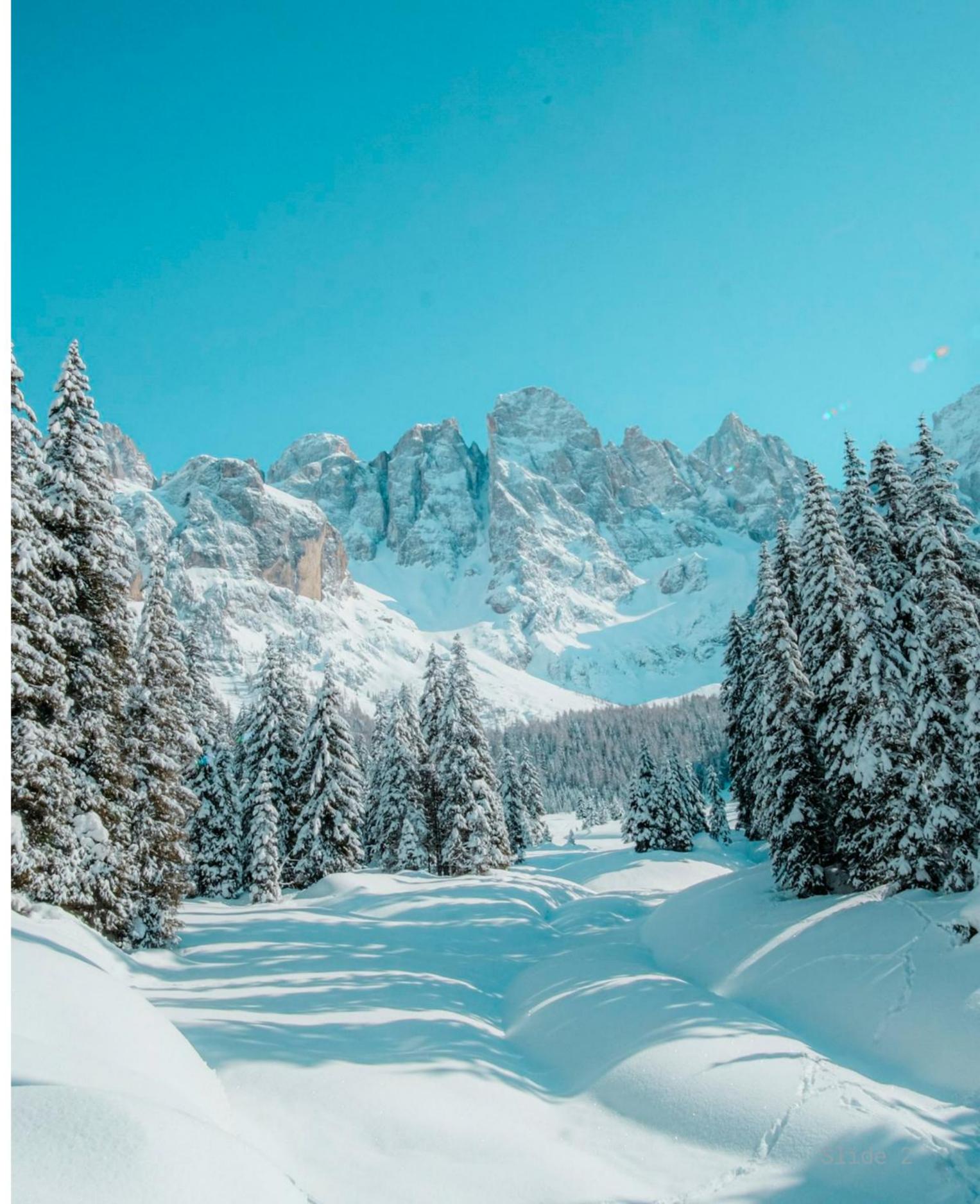
Understanding Glycol Peptides & Restoring Trees After
the Freeze

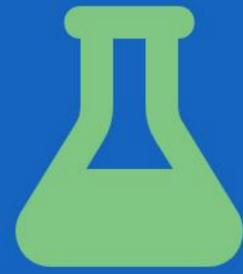
The Dual Challenge

Winter brings a formidable enemy to our landscapes: freezing temperatures. But trees are not defenseless.

This guide explores:

- ✓ **The Science:** How trees produce natural "antifreeze."
- ✓ **Preparation:** How homeowners can boost this defense.
- ✓ **Restoration:** How to heal damage after the storm passes.





PART 1: THE SCIENCE

Understanding Glycol-Like Peptides

What Are Glycol-Like Peptides?

Definition: Specialized proteins produced by trees to mitigate freezing damage. Often called *Antifreeze Proteins (AFPs)* or cryoprotective compounds.

Structurally, they interact directly with ice crystals to prevent them from growing large enough to puncture cell walls. While they share similarities with automotive glycol in lowering freezing points, these are 100% natural biological defenses.

Mechanism 1: Inhibiting Ice Growth

The biggest threat to a tree isn't the cold itself—it's the **formation of sharp ice crystals** inside the tissue.

Glycol-like peptides bind to "ice nucleation points," effectively capping the crystal. This keeps the ice microscopic and round, rather than large and jagged.



STOPPING ICE GROWTH

Mechanism 2: Osmotic Balance



Freezing temperatures disrupt the water balance within tree cells, leading to severe dehydration.

These peptides help regulate water movement across cell membranes, maintaining **osmotic pressure**. This ensures the cell doesn't collapse or dry out even when water outside the cell is frozen.

Mechanism 3: Cryoprotective Activity

Trees endure constant freeze-thaw cycles throughout winter. This expansion and contraction stresses cell membranes.

Membrane Stabilization

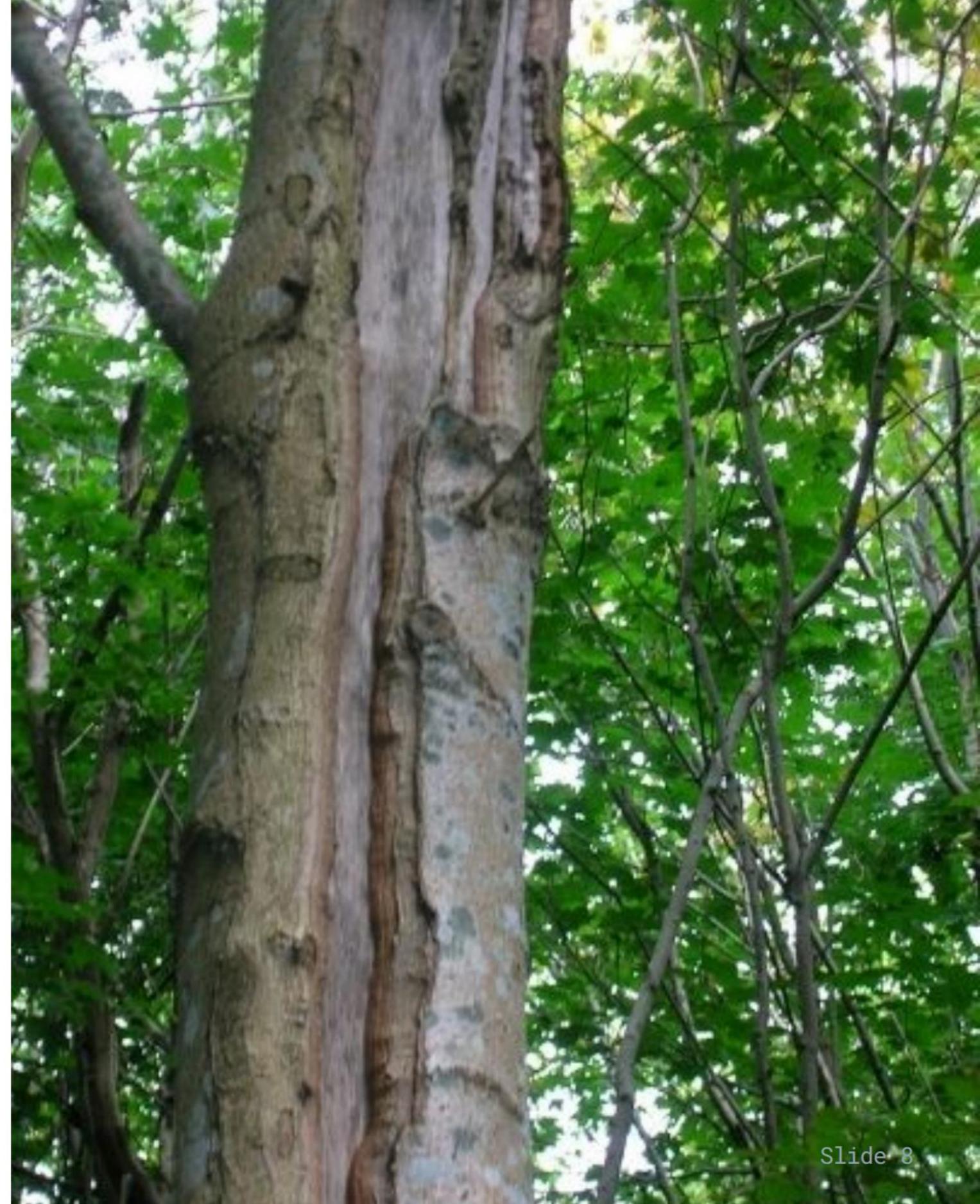
Glycol peptides act as stabilizers for proteins and membranes, ensuring vital functions (like metabolism) continue even in sub-zero conditions.

The Acclimation Process

Trees don't produce these peptides all year. It is a gradual process triggered by:

- ✓ Shortening daylight hours (Photoperiodism).
- ✓ Gradually dropping temperatures.

Note: Sudden freezes in early fall are dangerous because the tree hasn't finished synthesizing these protective compounds yet.





PART 2: HOMEOWNER PREP

Boosting Natural Defenses

Health = Resilience

A stressed tree cannot produce glycol peptides efficiently.

Hydration

Regular watering during dry spells in fall is critical. Dehydrated trees enter winter with a "fuel deficit."

Nutrition

Apply balanced fertilizer during the growing season to support the cellular machinery that builds antifreeze proteins.

Insulation: The Mulch Barrier

Adding a 2-4 inch layer of organic mulch provides a thermal blanket for the roots.

- ✓ Stabilizes soil temperature.
- ✓ Retains essential moisture.
- ✓ Promotes beneficial soil biology.

Tip: Keep mulch off the trunk flare to prevent rot.



Watering Before the Freeze

The Thermal Battery

Moist soil retains heat better than dry soil.

Watering your trees deeply 24-48 hours before a hard freeze fills the soil pores with water, which releases heat slowly as it cools, creating a warm buffer zone around the roots.

Avoid Late-Season Pruning



Pruning stimulates the tree to heal and often triggers **new growth**.

This new growth is tender, lacking the glycol peptides and hardened bark needed to survive. A freeze will kill this new tissue immediately, wasting the tree's energy reserves.

Frost Blankets & Covers

For younger or smaller trees, biological defenses might not be enough.

- ✓ Use frost blankets or burlap.
- ✓ Cover the canopy completely.
- ✓ Anchor the cover to the ground to trap soil heat (The "Heat Tent" effect).



**Wrap
in the tree**



**Cover directly
on the land**



**Cover on
greenhouse ho**

Plant Cold-Hardy Species

The best defense is genetics. Native or adapted species are naturally better at synthesizing glycol-like peptides.

Pro Tip: Always check the USDA Hardiness Zone rating before planting. A tree adapted for Florida cannot produce enough antifreeze for a Chicago winter.



PART 3: RESTORATION

After the Freeze

Post-Freeze Reality

The storm has passed. Your trees look brown and drooping. **Do not panic.**

Visual damage to leaves does not mean the tree is dead. The glycol peptides may have protected the cambium and buds even if the foliage was sacrificed.

Recognizing Damage

- ✓ **Discolored Foliage:** Brown, black, or transparent leaves.
- ✓ **Bark Splitting:** Vertical cracks caused by rapid expansion (Frost Cracks).
- ✓ **Broken Branches:** Weight load from ice accumulation.



The Scratch Test

Before you cut, check for life.

Use your fingernail or a knife to gently scratch the outer bark of a small twig.

Green/Moist: Alive. Be patient.

Brown/Brittle: Dead tissue.



Hydration Recovery

Freeze-dried trees are thirsty trees.

-  **Check Soil Moisture:** If the ground is dry after the thaw, water deeply.
-  **Do Not Overwater:** If the ground is soggy from melting snow/ice, let it drain. Roots need oxygen to recover.
-  Proper hydration helps re-pressurize the cells and supports the transport of nutrients.

Restoration Pruning

The Golden Rule: WAIT.

Wait until spring growth emerges to see the true extent of the dieback. Pruning too early can remove live wood that simply looked dead.

Once new growth appears, prune back to live tissue using proper cuts.



Soil Health & Fertilization

After a freeze stress event, the tree needs easy access to resources.

Gentle Nutrition

Avoid heavy nitrogen immediately after the freeze. Wait for active growth. Instead, focus on biostimulants, compost tea, or soil conditioners that support root health without forcing rapid canopy growth.

Long-Term Monitoring

Freeze damage can manifest months later.

- ✓ **Pests:** Stressed trees emit chemical signals that attract borers and beetles.
- ✓ **Disease:** Open frost cracks are entry points for fungal pathogens.
- ✓ **Structure:** Watch for decay in limbs that may have cracked internally.

When to Call a Professional

Structural Risk

Large leaning trees or split trunks near structures.

Hangers

Large broken branches suspended in the canopy ("Widowmakers").

Large Scale

Trees requiring climbing or heavy equipment for restoration.

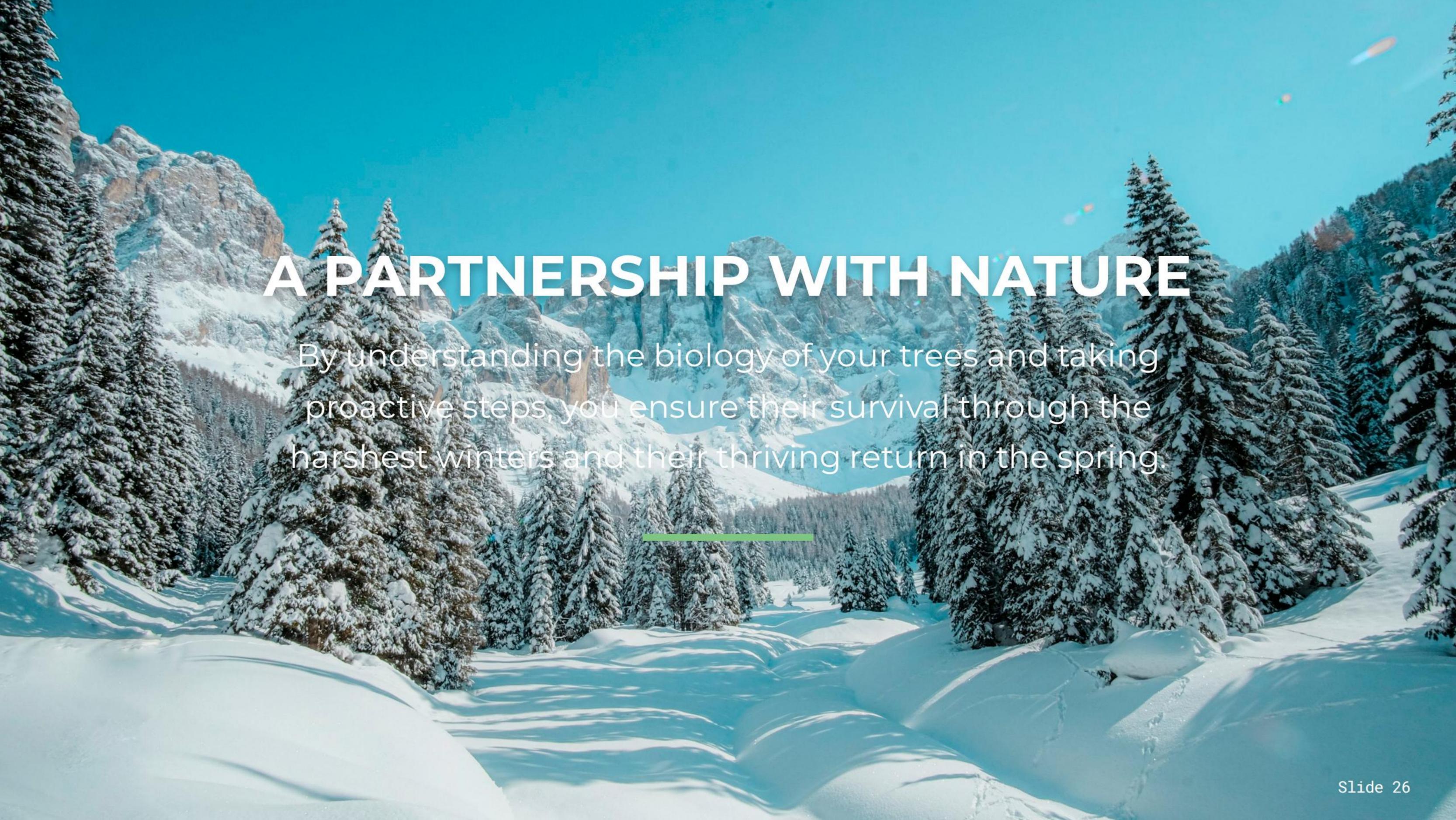
High Value

Heritage trees that need advanced health care regimens.

Summary of Resilience

Trees are incredible survivors.

-  **Adaptation:** They produce Glycol-like peptides to stop ice.
-  **Preparation:** You help by watering, mulching, and covering.
-  **Restoration:** Patience, hydration, and careful pruning bring them back.

A winter landscape with snow-covered evergreen trees and mountains under a clear blue sky. The scene is a valley filled with snow, with several large evergreen trees in the foreground and middle ground. In the background, there are snow-capped mountains and a clear blue sky with a few small, colorful light artifacts. The overall tone is bright and crisp.

A PARTNERSHIP WITH NATURE

By understanding the biology of your trees and taking proactive steps, you ensure their survival through the harshest winters and their thriving return in the spring.

Arborist On Demand

For professional tree risk assessment, winter prep, and restoration guidance.

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Image Sources



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