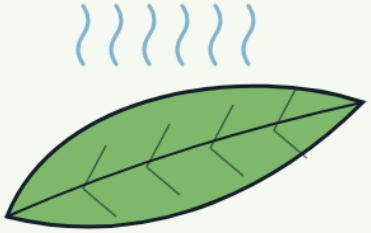
That is why

Why do some trees have needles instead of leaves?

A needle is a leaf rolled up to save water: less surface, a thick wax coat and pores hidden in pits.

A Same leaf, different shape



Broad leaf (maple, oak)

Big flat surface: catches lots of sun but loses water fast in dry air.



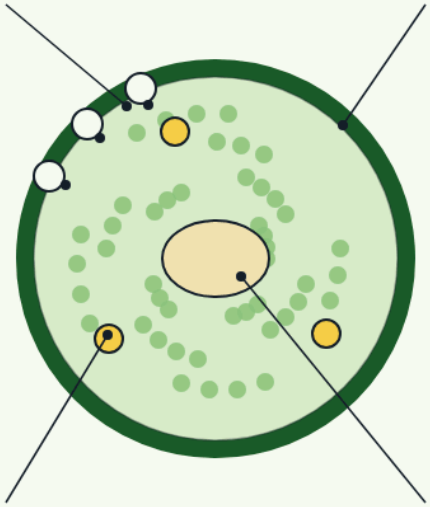
Needle (pine, spruce, fir)

Thin and narrow: catches less sun but loses far less water.

The rule: surface-to-volume ratio

Less surface for the same volume means less water lost to the air.

B Inside a needle (cross-section)



The needle is still a real leaf: it photosynthesises.

It is just built for dry, freezing air.

C Built for winter

1 Saves water

Winter is a desert: frozen soil means roots cannot drink, and cold air is dry. Needles lose very little.

2 Sheds snow

Snow falls between narrow needles or slides off the wax, so branches carry less weight.

3 Works all year

Evergreen: it can photosynthesise on any mild winter day. Old needles fall a few at a time, over several years.

Trade-off: needles catch less sun, so conifers often grow more slowly.

Spread out, a leaf catches sun. Rolled up, it keeps its water.

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Diagram: https://thatiswhy.com/diagrams/why-some-trees-have-needles/ · Full guide: https://thatiswhy.com/why-some-trees-have-needles/