

HOW TO WATER A BIG TREE

watering large/mature/established trees

by Martin Tušer
from TREEIB - LEDASCO



OBJECTIVES

SCIENCE

METHOD

EXAMPLES

What to do next?

Your expectations

70%

OBJECTIVES

SCIENCE

METHOD

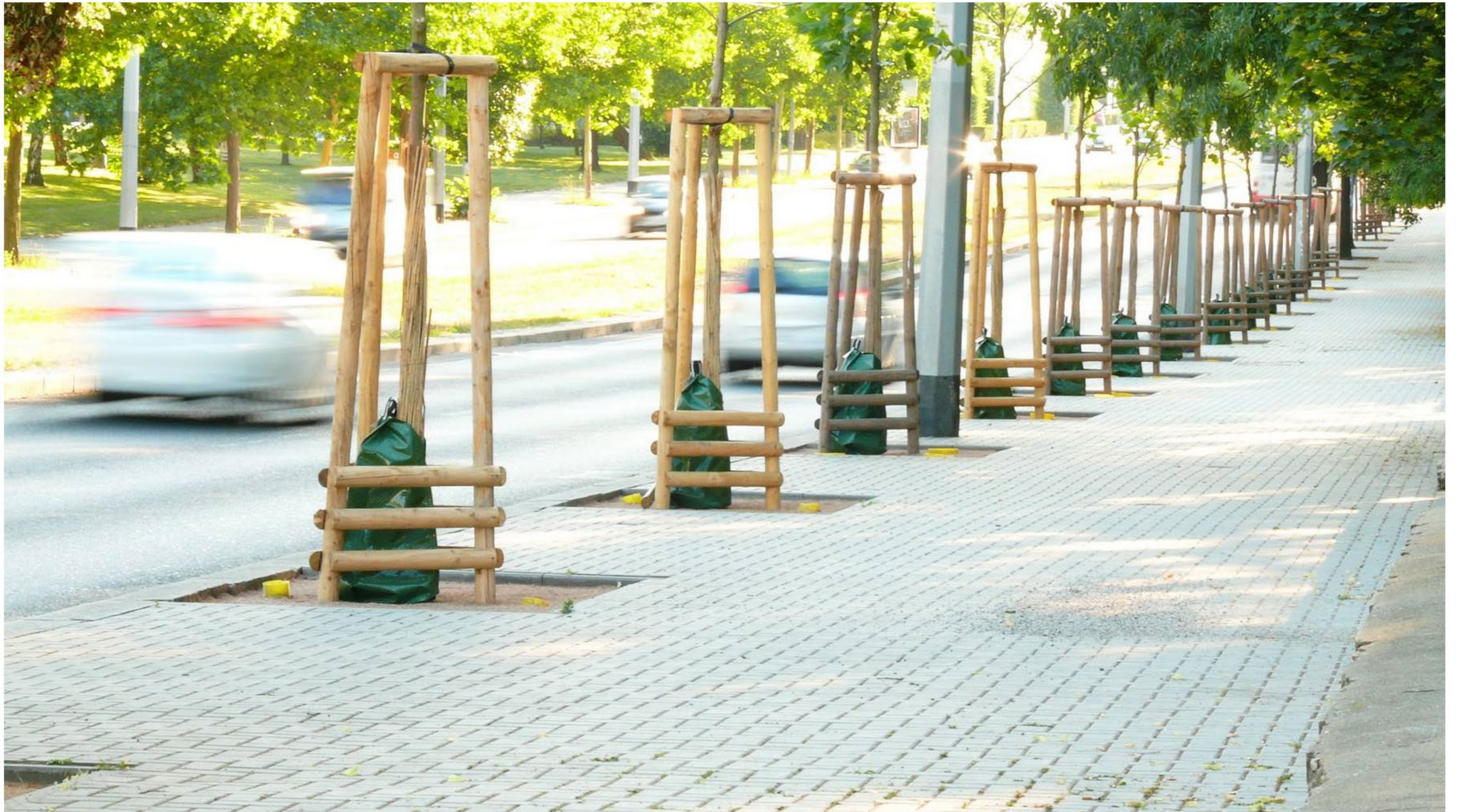
EXAMPLES

What to do next?

WHO I AM









WE DEVELOPED

TREIB®

**THE CORRECT
IN THE WAY**

TREEIB[®]

makes watering big trees feasible

TREEIB[®]

**WATERS BIG
TREES CORRECTLY**

THE METHOD

THE PRODUCT

TREEIB[®]

- IMPROVES SAFETY
- SUPPORTS GROWTH
- INCREASES VITALITY
- IMPROVES HEALTH
- PROMOTES RESISTANCE TO PESTS
- APPLIES SOIL AMENDMENTS
- PROTECTS ON CONSTRUCTION SITES
- REMOVES SALT CONTAMINATION

TREEIB®

- MITIGATES CLIMATE CHANGE
- COOLS CITIES
- BRINGS RAIN
- MANAGES STORM WATER

TREEIB[®]

**WATERS BIG
TREES CORRECTLY**

THE METHOD

THE PRODUCT

THE SET OF TOOLS

for watering large/mature/established trees

TREEIB[®]

THE SET OF TOOLS

for watering large/mature/established trees

TREEIB[®] is:

The only portable **non-invasive** watering system and method for mature trees in the world, which is usable **SAFELY** in large scale in the urban landscape.

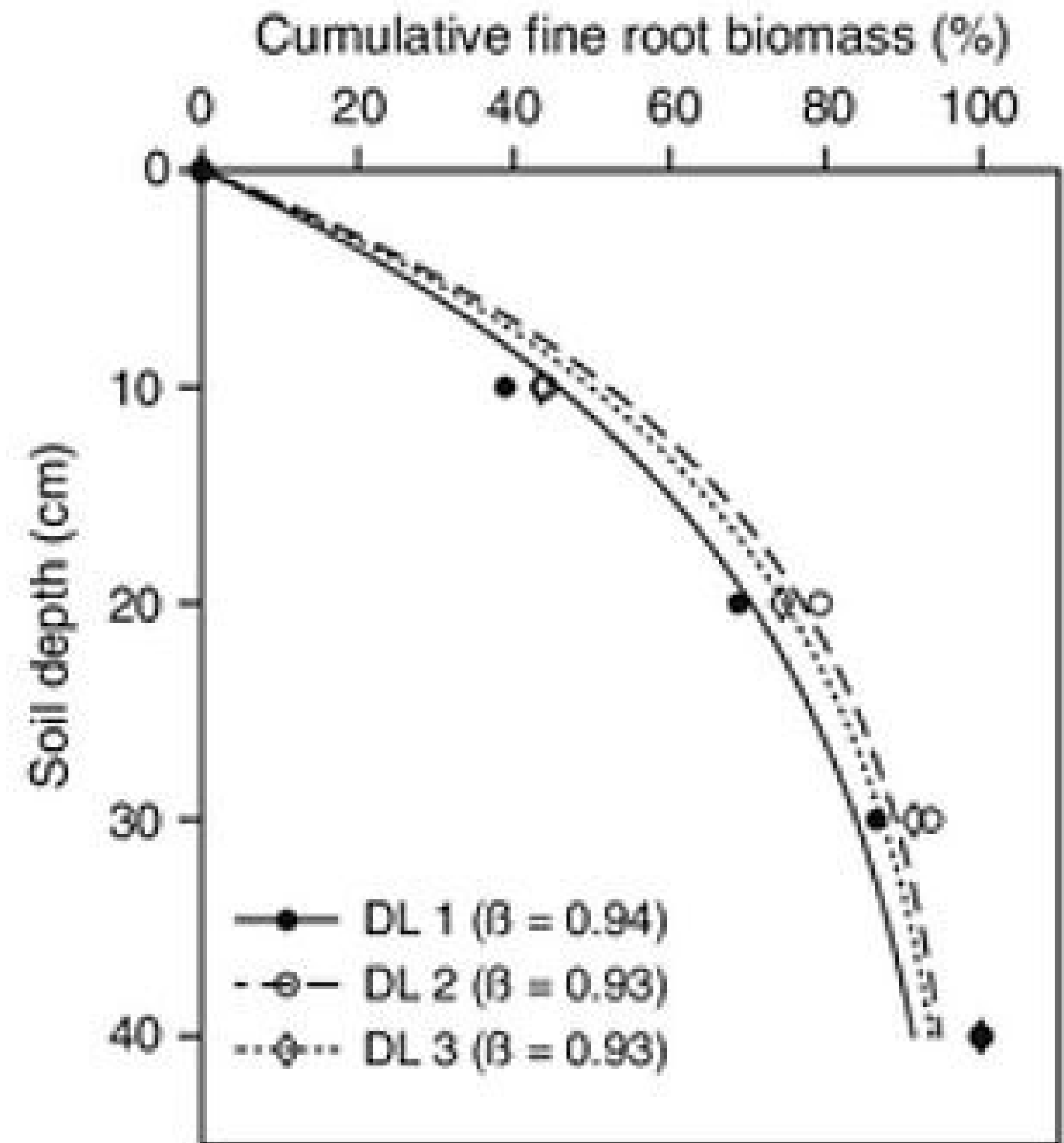
The method and the product, which maximizes tree survival rate and, above that, **maximizes ecosystem services** provided by trees, based on science.

U.S. Patent No. 11,991,960

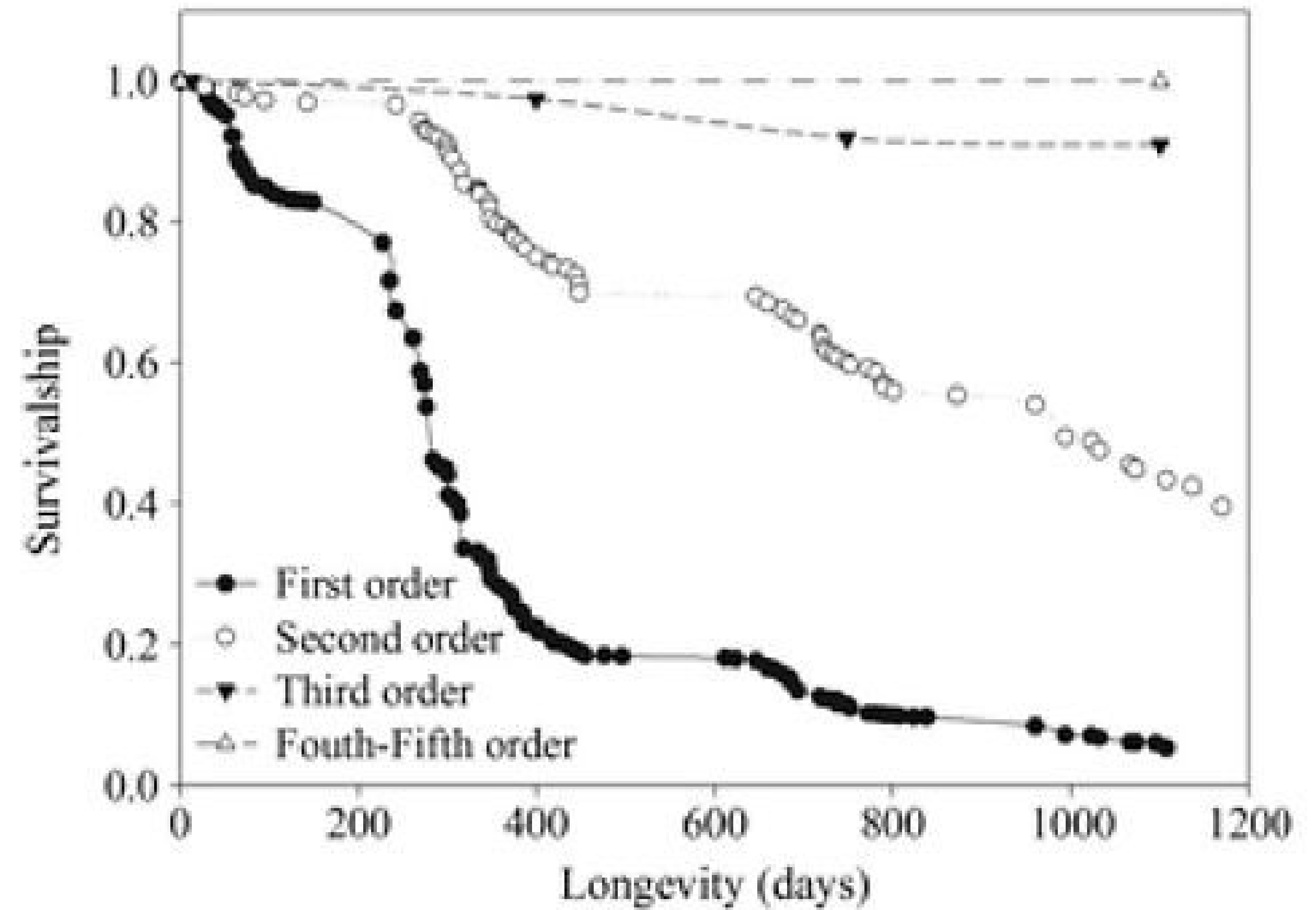
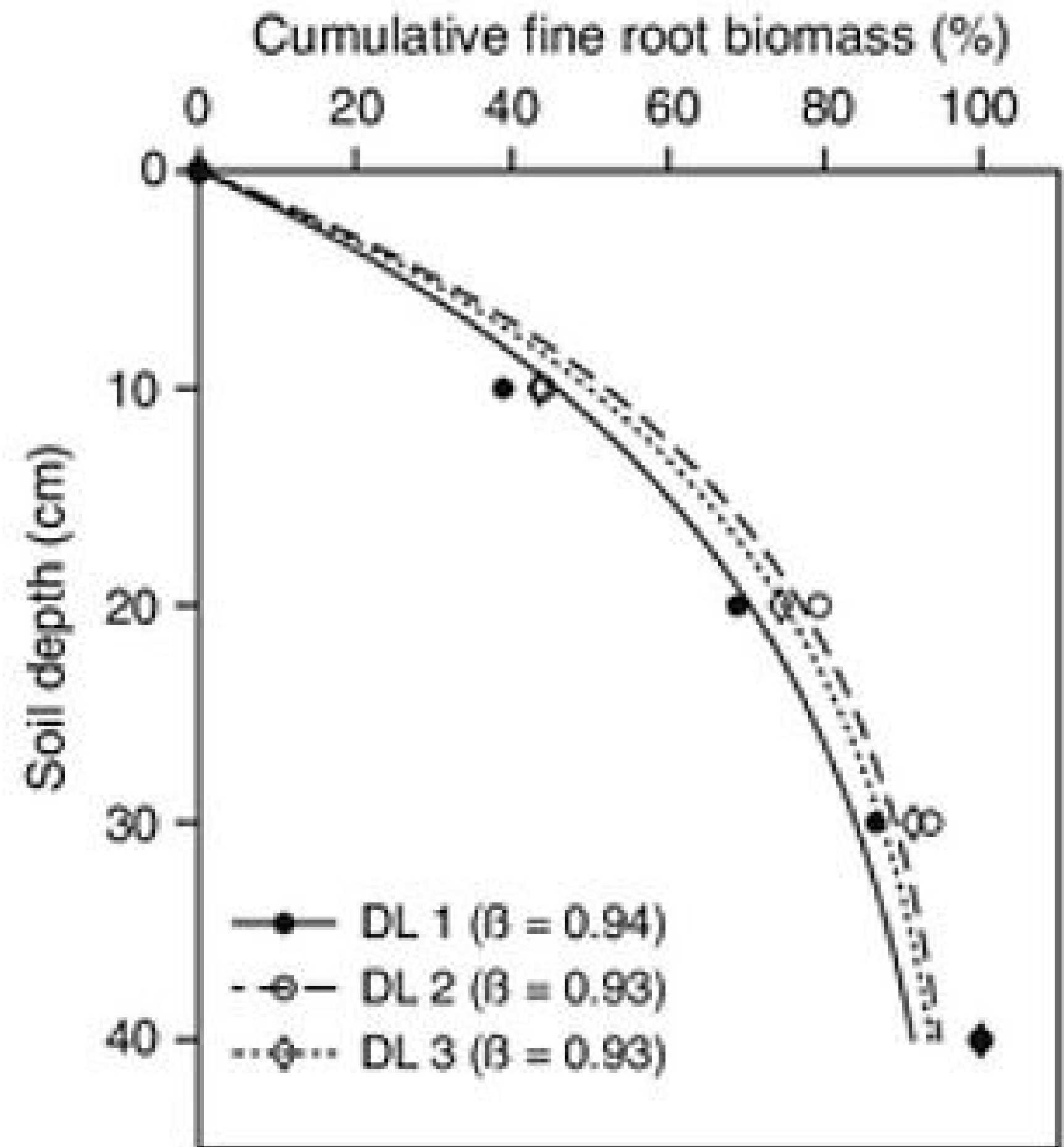


SCIENCE

SCIENCE



SCIENCE



METHOD

So that soil gas exchange is possible and shallow rooting of the tree is prevented.

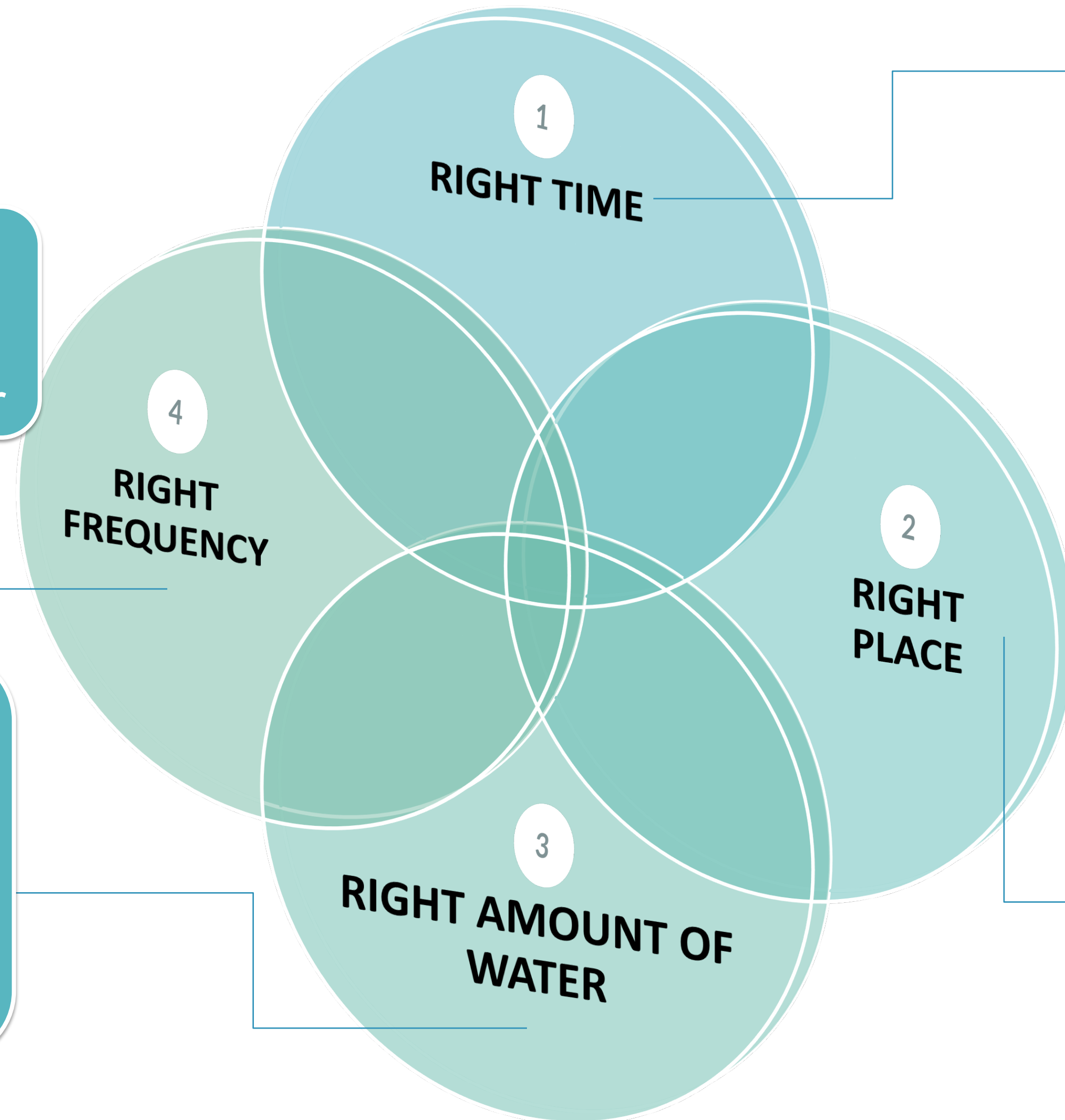
4-5 times per year

The soil must dry out so that the root system does not become lazy. Vertical soil hydraulics is restored, as we cannot replace all the water the tree needs.

Enough to replace evapotranspiration volume for a minimum of 10 days

800-9,000 liters/
211-2,400 US gal.

A sufficient volume of water must reach a minimum depth of 60 cm / 2 ft.



Whenever the substrate temperature is above

6°C/42°F

an adequate amount of water must be accessible to the tree with possible irregularity to prevent die off the feeder roots.

Where we want the roots to be
On and beyond the canopy dripline

The extent and shape of the root system should be close to the natural shape of the root system of the taxon.

THE RIGHT TIME





Where we want the roots to be

6°C/42°F

OBJECTIVE:

The tree has the largest root system as possible, including feeding roots. **Do not disrupt the growth cycle by root dieback and maximizing the tree growth.**

The biomass of the leaves corresponds approximately to that of the fine roots. If we want to generate enough nutrients over the growing season, we need to have as much fine root biomass as possible.

-  It is widely acknowledged that soil temperature is one of the primary factors affecting plant growth. In fact, soil temperature could be even more important than air temperature, because it usually lags behind (although it tracks) air temperature in spring (1). On the other hand it supports incorporate autumn mature tree irrigation into yearly tree management routine because vice versa soil temperature in autumn mornings is usually higher than air temperature.
-  The roots, unlike the leaves and other parts of the tree, grow all year round, especially in spring and in autumn (3). If the soil temperature drops below 41-42°F (1),(2), growth stops. The main condition of the tree roots grow in this period is water availability in the soil. If there is not enough water in the soil, the already grown fine roots die. The growth potential of the tree is lost, as well as the nutrients stored in the fine roots.
-  The root grow during spring has different function against root grow in autumn. When in spring the root system grows to secure enough nutrients and water for developing the tree foliage and blossoming, in autumn the root grow secure depositing of metabolites (like starches) to their tissue. This energy is saved for the spring grow spurt of tree in the next season.
-  Therefore, in general, we recommend watering in the following scheme:
 - very early spring, before the leaves appear
 - during the rapid growth phase in spring, at flowering period
 - in summer to overcome dry periods (maximum once a month)
 - in autumn to keep the feeding roots alive until the temperature drops

(1) Pregitzer, Kurt & King, John & Burton, Andrew & Brown, Shannon. (2000). Responses of tree fine roots to temperature. *New Phytologist*. 147. 105-115. [10.1046/j.1469-8137.2000.00689.x](https://doi.org/10.1046/j.1469-8137.2000.00689.x).

(2) ALVAREZ-URIA, P. and KÖRNER, C. (2007), Low temperature limits of root growth in deciduous and evergreen temperate tree species. *Functional Ecology*, 21: 211-218. <https://doi.org/10.1111/j.1365-2435.2007.01231.x>

(3) Montagnoli, Antonio & Dumroese, R. Kasten & Terzaghi, Mattia & Onelli, Elisabetta & Scippa, Gabriella & Chiatante, Donato. (2018). Seasonality of fine root dynamics and activity of root and shoot vascular cambium in a *Quercus ilex* L. forest (Italy). *Forest Ecology and Management*. 10.1016/j.foreco.2018.06.044

THE RIGHT PLACE

When the soil temperature is higher than
**On and beyond the canopy
dripline**

OBJECTIVE:

The tree has the largest a root system as possible, including stabilization roots. **Safety and stability of the tree.**

The tree root system is a dynamic system, which can move quite rapidly. That's why we recommend watering trees on / beyond the canopy dripline.

- ✓ Longevity of the roots of the first order is relatively short (about 90% less than 1 year⁽¹⁾) and the FO roots grow, where water and nutrients are available. It means that FO roots can move to the source of water or nutrients within one year. We have a documented observations of the fact.
- ✓ If the tree is watered near the trunk, within a short time the roots of the first order form close to the trunk and the others gradually disappear. As the FO roots form higher order roots that stabilise the whole tree, in the medium term the higher order roots further away from the trunk die and the stability of the tree is threatened.
- ✓ Deformation of the root system also occurs when the lawn and trees are watered together. This was well demonstrated, for example, in Salt Lake City during the September 2020 windstorm. The city lost tens of thousands of large trees in a matter of hours. According to a written statement from the local ISA-ARBOR chapter that we have access to, this was a direct result of lawn irrigation where trees rooted shallowly and became
- ✓ Watering close to the trunk or under the crown, as well as applying / injecting fertilizers to the same area, cause tree instability.
- ✓ This can be avoided if the tree is watered beyond the crown, where we naturally maintain/expand the root system similar to the natural environment. Even trees that are in a paved sidewalk should be watered beyond the canopy dripline.

(1) Huo, C., and Cheng, W.. 2019. Improved root turnover assessment using field scanning rhizotrons with branch order analysis. *Ecosphere* 10(8):e02793. 10.1002/ecs2.2793

Enough to replace evapotranspiration volume for a minimum of 10 days

211-2,400 US gal.

OBJECTIVE:

Deep rooting. **Safety and stability of the tree.** Restoring vertical soil hydraulics.

Depending on their size, trees can evapotranspire up to 200 gallons of water per day. We recommend an irrigation rate of at least ten times the daily evapotranspiration volume.

- ✓ Although values may vary between taxons, as well as between individuals of the same species in different locations, it can generally be said that 90% of feeding roots are found at depths of up to 40 cm/16 inch (1).
- ✓ The soil must be moistened to at least this depth to prevent shallow rooting. There are not many ways to get water to such a depth, even in the dry season.
- ✓ The only way that is practically applicable is large irrigation doses applied by drip irrigation.

(1) Meinen, Catharina & Leuschner, Christoph & Ryan, Nicholas & Hertel, Dietrich. (2009). No evidence of spatial root system segregation and elevated fine root biomass in multi-species temperate broad-leaved forests. *Trees*. 23. 10.1007/s00468-009-0336-x.

So that soil gas exchange is possible and shallow rooting of the tree is prevented.

4-5 TIMES a year

OBJECTIVE:

Maintaining the soil gases exchange. Making watering of trees economically accessible. Avoiding tree collapse in case of watering interruption.

- ✓ The presence of oxygen in the soil and the overall exchange of gases between the soil and the atmosphere is a factor that influences the growth and health of the tree. If the soil water content increases, the soil gas content decreases and vice versa. Overall, we should aim to keep the soil gas/moisture ratio as close to 'normal' as possible. This means that the soil substrate needs to dry out from time to time to allow the exchange of gases (1).
- ✓ We consider it completely pointless and dangerous for established trees to be watered every day or even once a week. This is appropriate for newly planted trees, not for the established ones.
- ✓ We have set an initial test frequency of 4-5 times per year for irrigation dose of mature trees in our test plot with minimum volume of 10x estimated evapotranspiration volume. After four years, we can say that this frequency has proven to be sufficient and very beneficial. We have verified experimentally that water applied with our product in heavy soil penetrates to a depth of 2-3 feet and moistens the entire soil profile.
- ✓ The above mentioned frequency minimizes the risk we lose the tree if the watering is not possible from any reason. The root system of the tree is still robust enough to get supply water and nutrients to the tree.

(1) Poorter, H., Niklas, K.J., Reich, P.B., Oleksyn, J., Poot, P. and Mommer, L. (2012), Biomass allocation to leaves, stems and roots: meta-analyses of interspecific variation and environmental control. *New Phytologist*, 193: 30-50. doi:10.1111/j.1469-8137.2011.03952.x

PRODUCT

TREEIB[®]



CAPACITY: 1500 l / 396 US gal

LENGTH: 600 cm / 19.7 ft

WIDTH: 110 cm / 3.6 ft

HEIGHT WHEN FULL: 30 cm / 11.8 in

WATER RELEASE TIME: 8-12 hours

SHAPE: 1/4 circle 7 m in diameter

FILLING OPENING: 15 cm / 6 in

USE: on a plane, on a slope

**PARKS
GARDENS
PUBLIC SPACE
CONSTRUCTION SITES
LARGE TREE
TRANSPLANTS**



TREEIB® CITY

VARIABLE SOLUTION FOR WATERING TREES IN PAVED AREAS

CAPACITY: 430 l / 114 US gal

LENGTH: 204 cm / 6.7 ft

WIDTH: 105 cm / 3.4 ft

HEIGHT WHEN FULL: 30 cm / 11.8 in

WATER RELEASE TIME:

GRASS SURFACE: 8-9 hours

PAVED SURFACE: 20-22 hours

SHAPE: rectangle

FILLING OPENING: 15 cm / 6 in

- STREETS
- PAVEMENTS
- PAVED AREAS
- PARKING LOTS
- CONSTRUCTION SITES



TREEIB[®]

VERGE

CAPACITY: 1500 l / 396 US gall

LENGTH: 600 cm / 19.7 feet

WIDTH: 102 cm / 3.6 feet

HEIGHT WHEN FULL: 30 cm / 1 feet

WATER RELEASE TIME:

8-12 HOURS

SHAPE: RECTANGLE

FILLING OPENING: 15 cm / 6 in

USE: ON A PLANE

PARKING LOTS
TREE AVENUES
VERGES
LIMITED SPACES
PARKS
ON TURF



2 metal eyelets
for anchoring







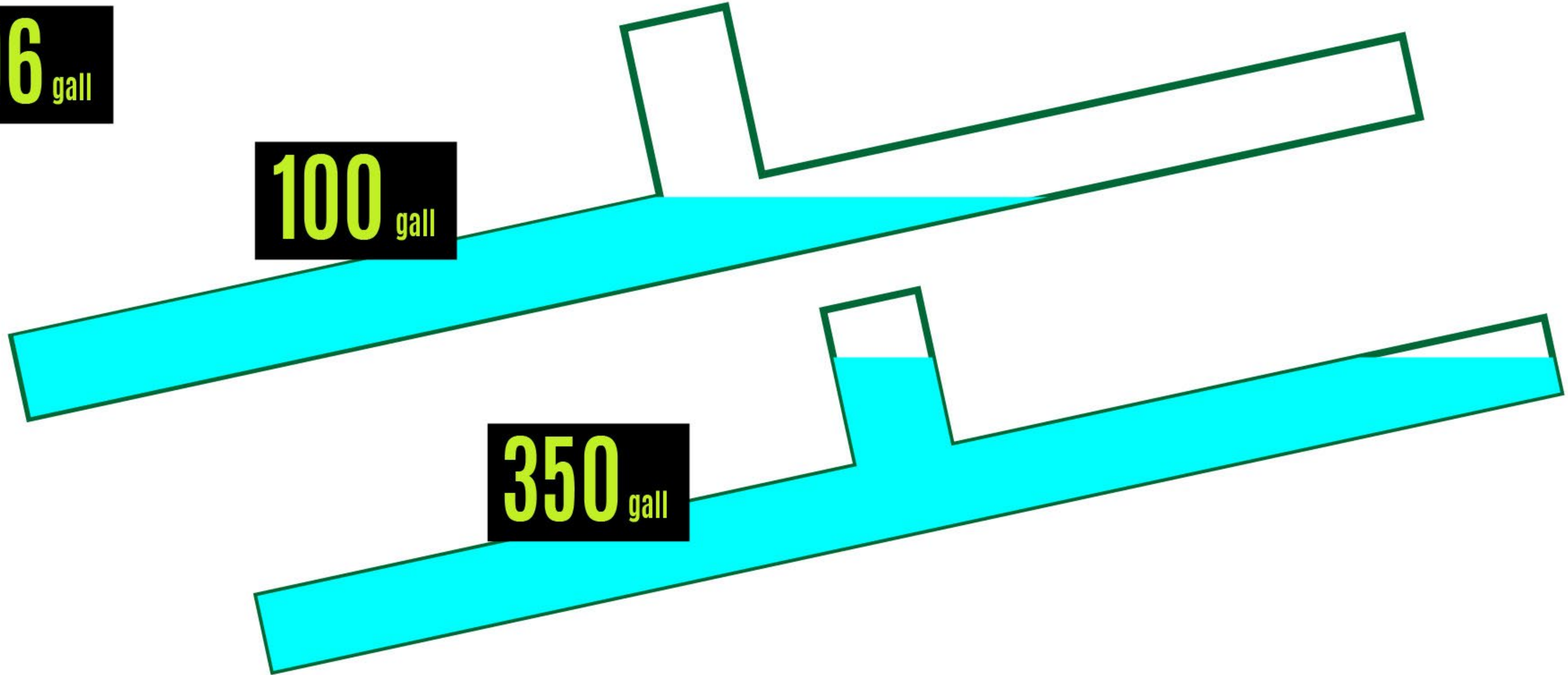
ALFIB
700001




396 gall

100 gall

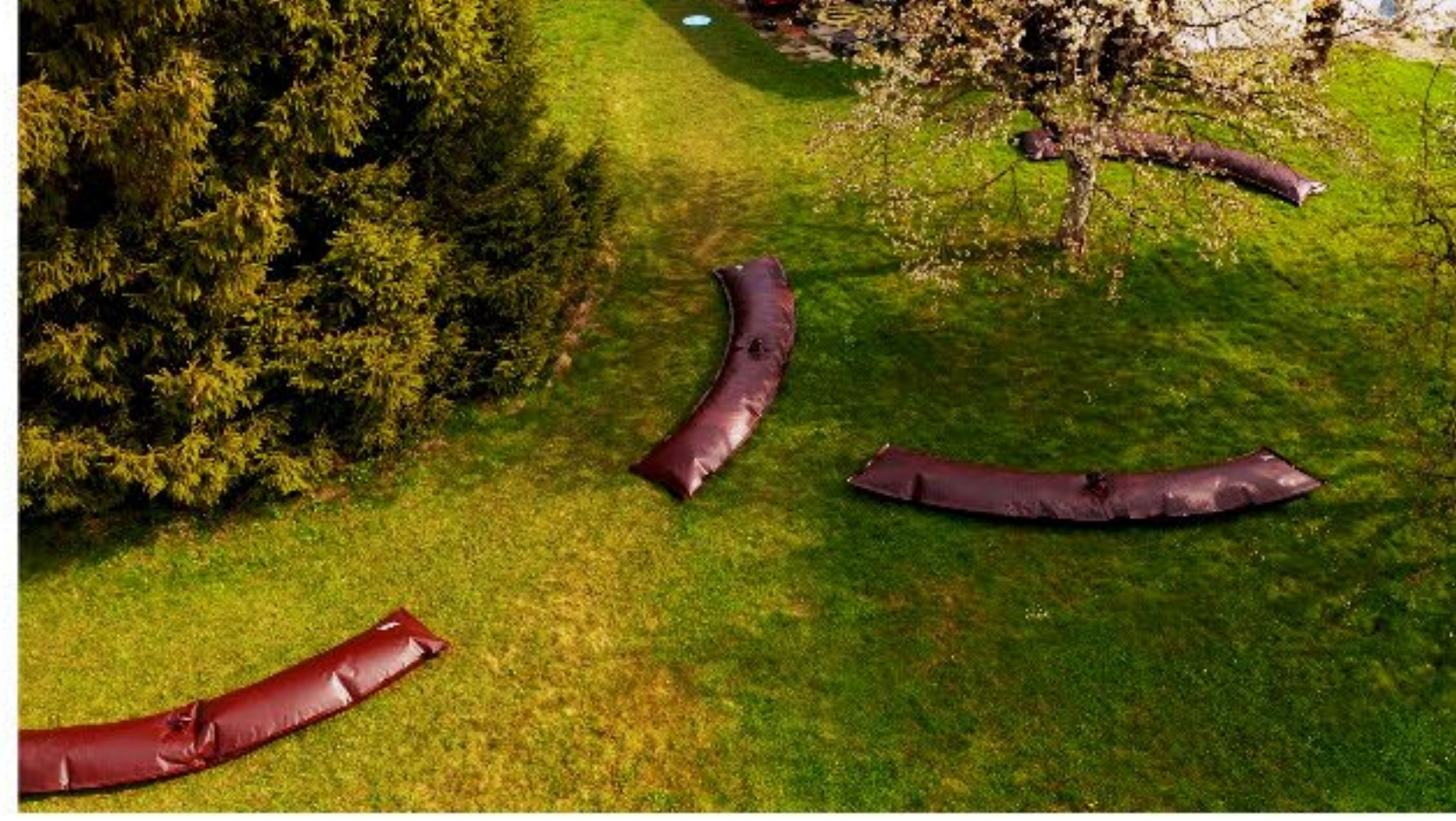
350 gall





**Open
hose
end**

**Always
close
filling
opening**





App. watering doses

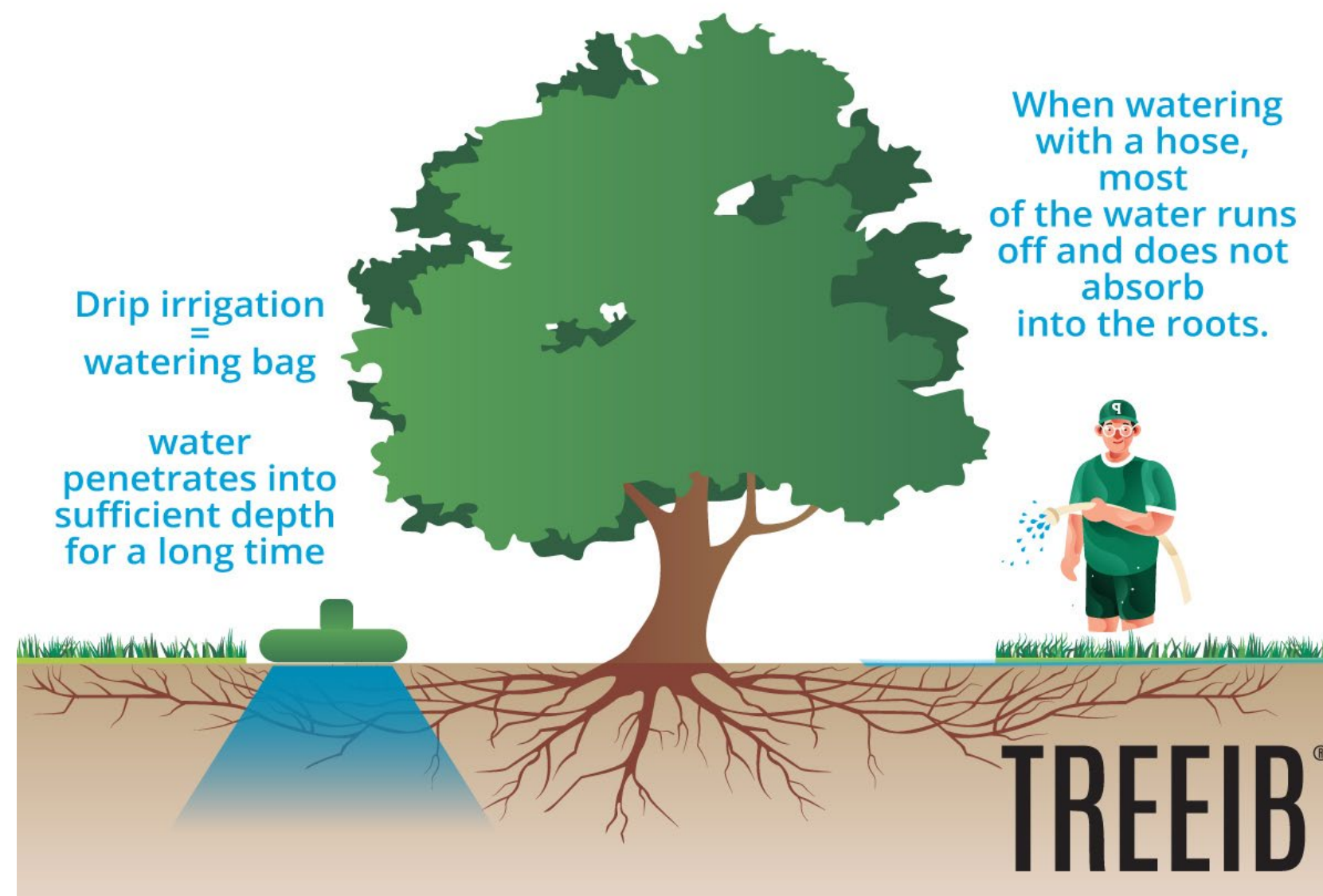
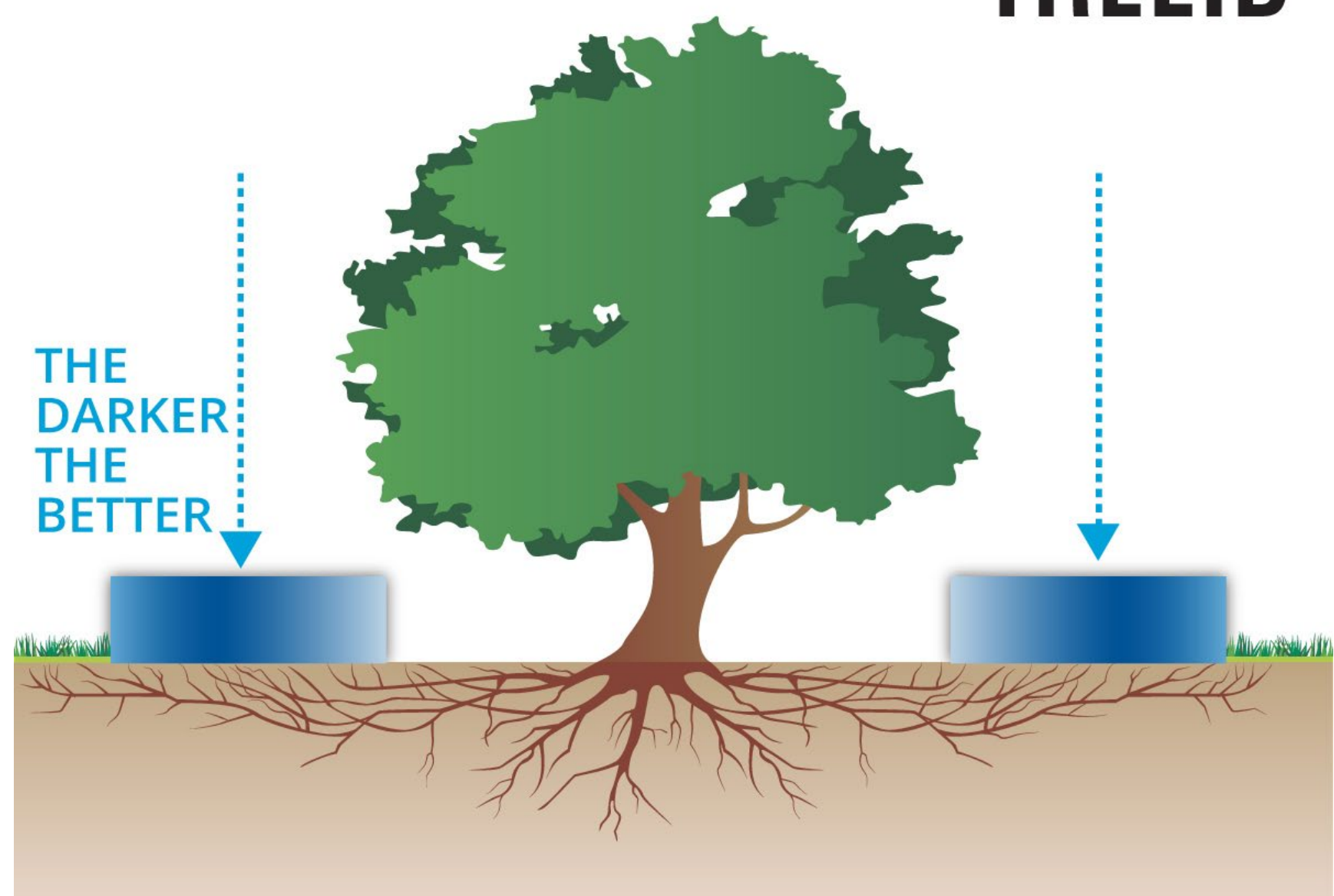
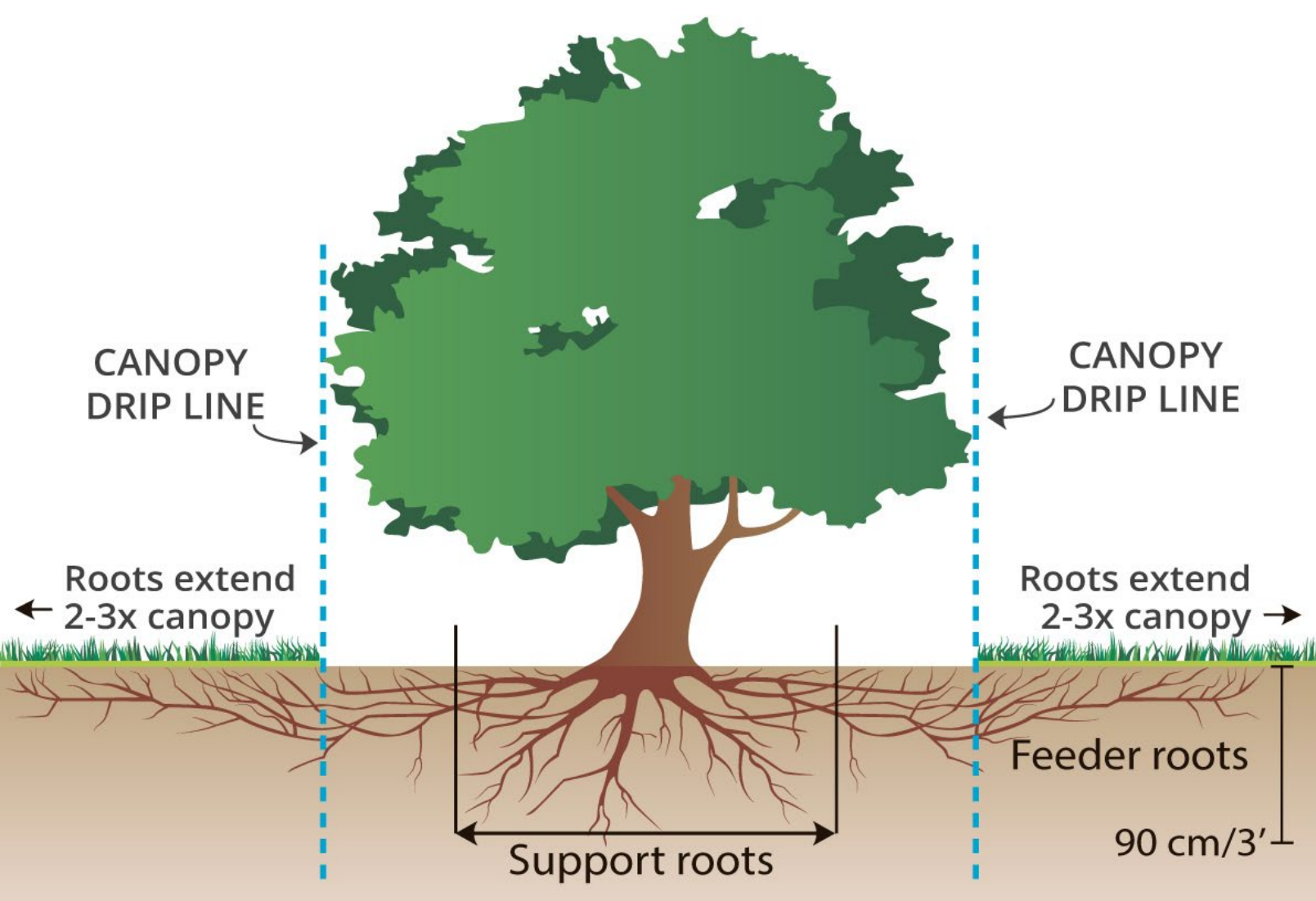
DBH INCH	TREEIB® City	Volume gallons	TREEIB® 1500	Volume gallons
4	2	227		
8	4	454	1	396
12	6	682	2	793
16	8	909	3	1 189
20			3	1 189
24			4	1 585
28			4	1 585
31			4	1 585
35			4	1 585
39			5	1 981
43			5	1 981
47			5	1 981
51			6	2 378
55			6	2 378
59			6	2 378

TREEIB®

IDEAL WATERING ZONE

TREEIB®

THE DIFFERENCE BETWEEN DRIP AND HOSE WATERING



DANGEROUS! Watering a large tree too often with a small amount of water, as when watering a lawn, e.g. with a sprinkler.

TODAY Tree with naturally shaped root system.

1-3 YEARS LATER: A tree with a deformed root system, that roots just below the surface and not firmly anchored in the ground. It is susceptible to drought.



TREEIB®

DANGEROUS! Watering the tree near the trunk or under the canopy, unless there is a legitimate reason to do so.

TODAY Tree with naturally shaped root system.

1-3 YEARS LATER: A tree with a deformed root system, that roots just below the surface and not solidly anchored in the ground. It is susceptible to drought.



3-5 YEARS LATER: The tree loses its stability and is susceptible to uprooting by wind. It is not at all drought-resistant, if we stop watering.



RESULTS

2018



2021



RE-GROWING NEEDLES



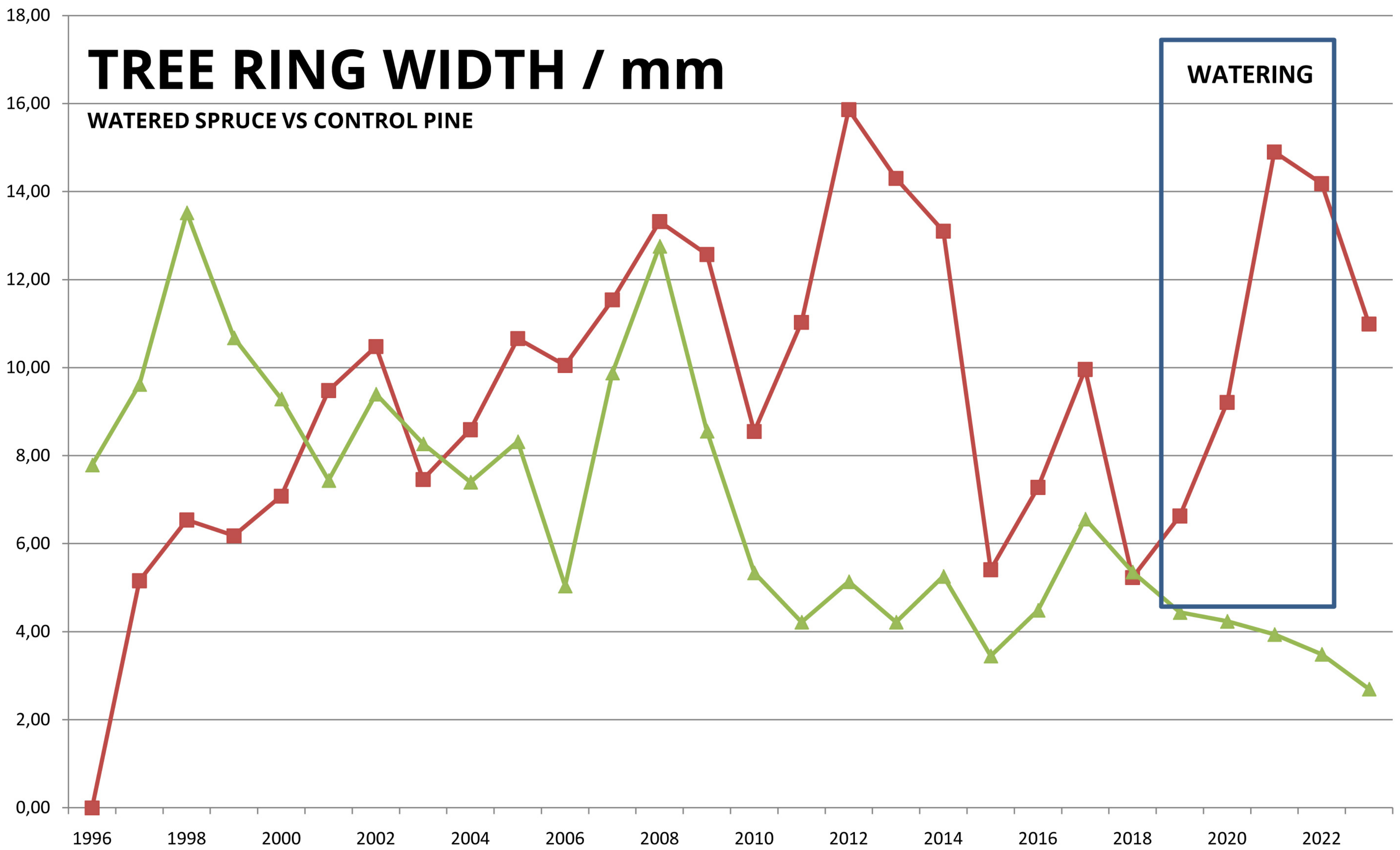
RAPID SAFE GROWTH



TREE RING WIDTH / mm

WATERED SPRUCE VS CONTROL PINE

WATERING



■ Picea Abies ▲ Pinus sylvestris (CONTROL)

ITALY



← August 2023

CINNAMOMUM GLANDULIFERUM

September 2023 →



BUSINESS

**ADD A NEW SERVICE
TO YOUR PORTFOLIO**

**STRATEGIC
WATERING
BIG TREES**

YOU

- GENERATE ADDITIONAL PROFIT
- BRING ADDED VALUE TO YOUR CUSTOMERS
- GROW VALUE OF YOUR COMPANY
- HELP THE ENVIRONMENT

WITH

- LOW INVESTMENT
- NO COMPETITION
- NO SKILLED WORKFORCE NEEDED

BUSINESS MODEL

WATER

FILL

LEASE

SELL ADVERTISING SPACE TO COVER INITIAL COSTS

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Schedule a meeting with me on [Calendly](#)

