



# Urban Biodiversity

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# Monoculture

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The main goal is to increase diversity. The one thing that is bad for society is low diversity. This is true for culture or evolution, for species and also for whole societies. If you become a monoculture, you are at great risk of perishing.

- George M. Church



Keep in mind:



Genetics



Soil Health



Ecosystem Function

# Components of urban biodiversity

1. **Genetic diversity** – the genetic variation in and between organisms and the genetic link to resilience and species adaptation.
2. **Species diversity** – number of species within an ecosystem.
3. **Ecosystem diversity** – variety of habitats, biotic communities, and ecological processes.
4. **Age class and size diversity** - mixed forest concept.
5. **Humans are ecosystem engineers** – urban environments are not natural.



- In 2020, the World Economic Forum launched **One Trillion Trees**, an initiative aimed at adding a third to the world's current estimated inventory of around 3 trillion trees.
- Even **Donald Trump** got behind the push, promising to plant a billion trees across the U.S.



## **Why tree planting programs fail:**

- Lack of community engagement and support
- Poor planning and design
- Inadequate maintenance
- Lack of funding
- Climate change and other environmental factors



### **Considerations for planting local genetical diverse trees:**

- Genetic diversity = resilience
- Environmental adaptation
- Ecological interactions
- Cultural significance

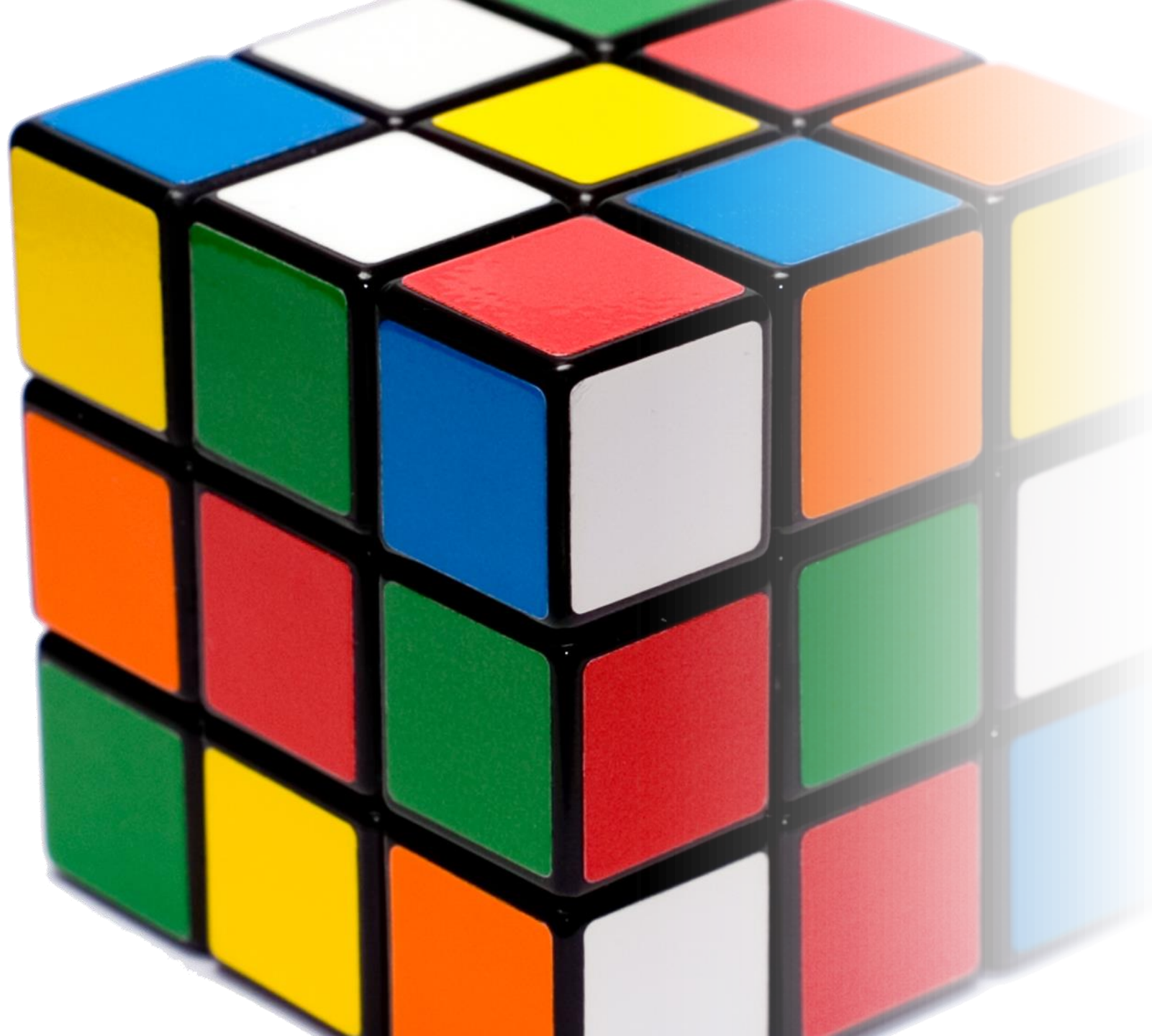
**Flip-side:** Cultivars of trees can also have benefits, such as consistency in growth and appearance. Often are more 'budget friendly'.

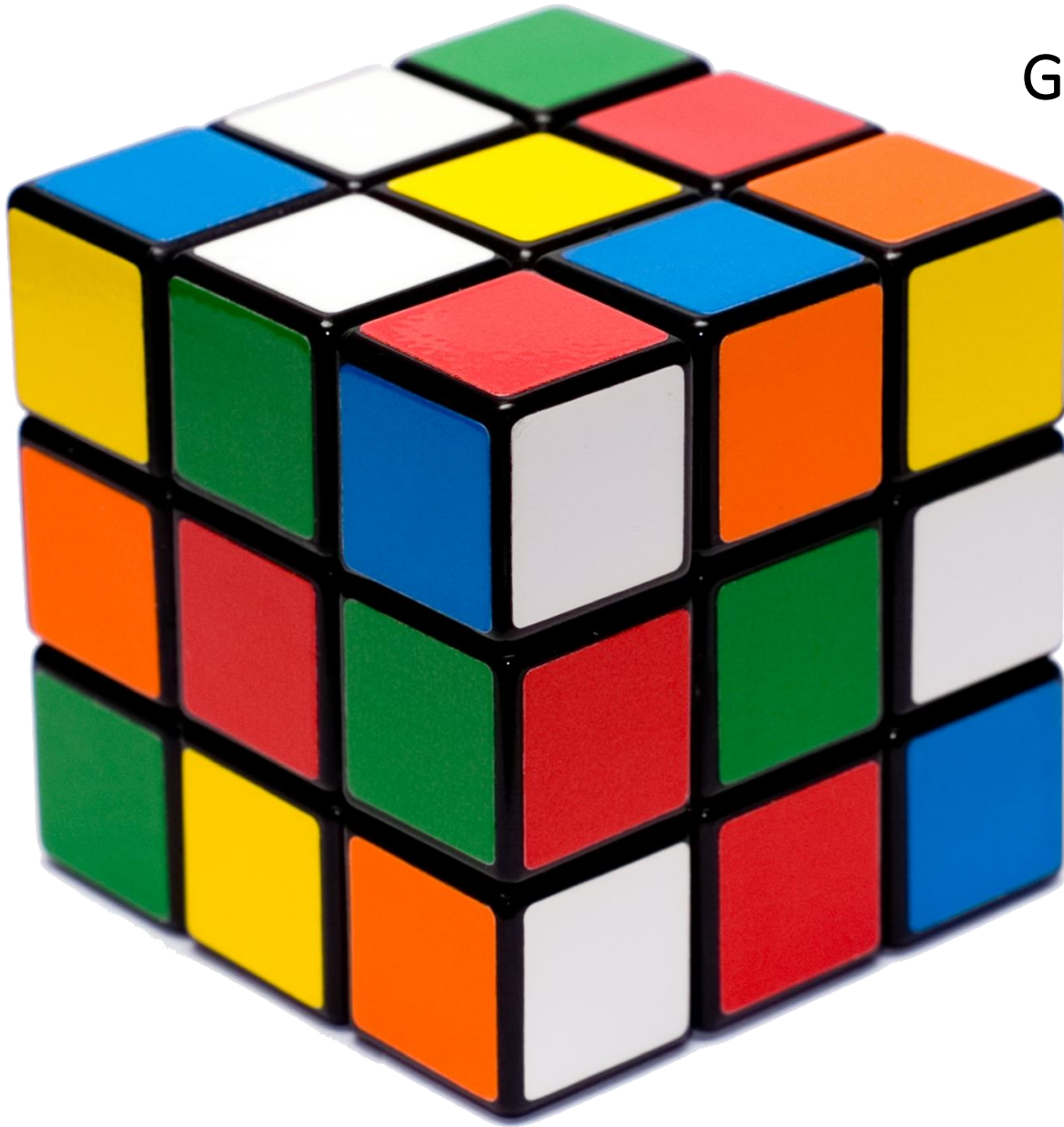


# **The National Tree Seed Centre presents the Scaling Up Seed Supply webinar series**

Feb. 21<sup>st</sup> 2023 (2:00pm Atlantic Time)  
Register Online

Canada 





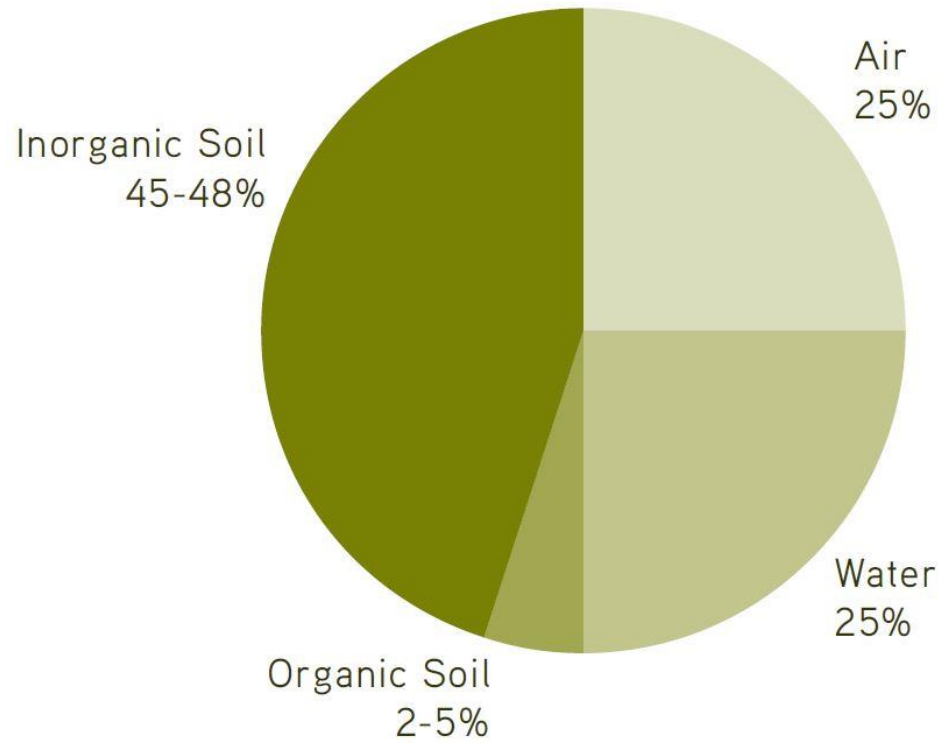
## Genetics = urban forest resilience

### What we know:

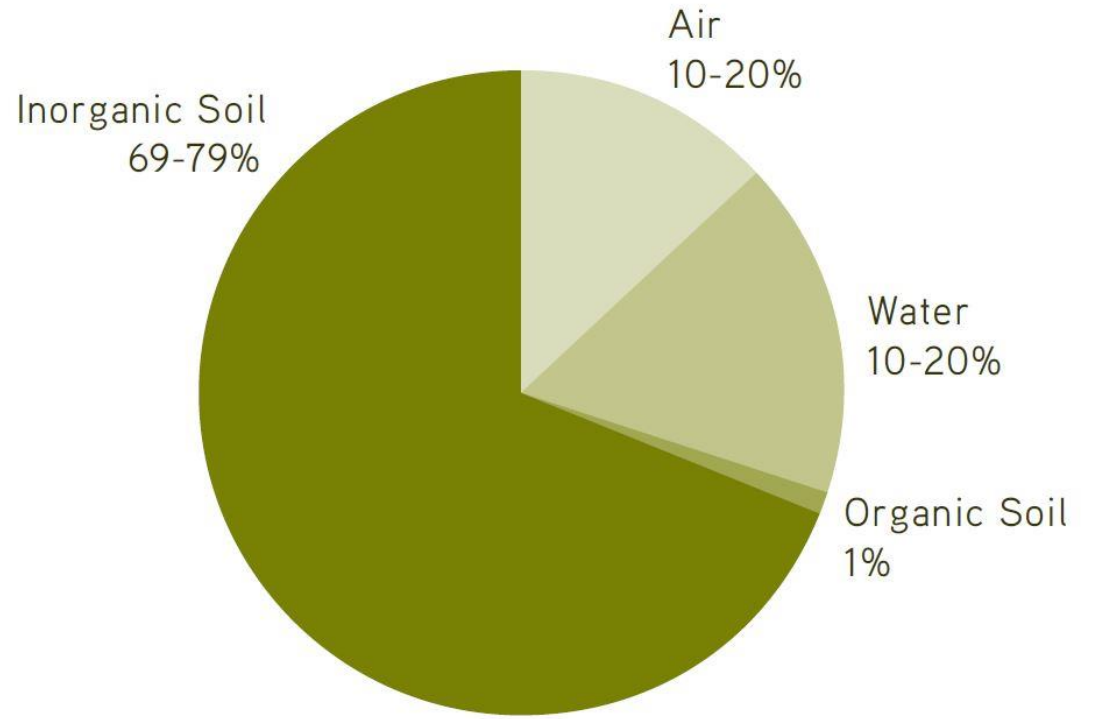
- Genetic variation is important to consider when planting trees in urban landscapes because it can affect the trees' ability to adapt to local environmental conditions, resist pests and diseases, and support biodiversity.
- Acclimation processes can lead to Adaptation t

### What we don't know:

- Lack of research regarding existing tree populations – at a local level



FOREST SOILS



URBAN SOILS



## **Limitation #1 - Soil quality:**

- Urban soils are often degraded or contaminated, which can limit plant growth and ultimately reduce biodiversity.



## **Soil health is the foundation for healthy ecosystems:**

- Healthy soils are rich in organic matter, nutrients, and beneficial microorganisms, which contribute to the growth and survival of trees and plants.
- Soil health supports the entire food web.
- Degraded or contaminated soils can negatively impact plant growth and can lead to declines in biodiversity.
- Contaminants in soil can accumulate in plants and move up the food chain, potentially causing harm to animals and humans that consume them.

**Phytoremediation** is defined as a method “**using green plants to remove, contain or render environmental contaminants harmless**”.

- Urban soils are often contaminated with pollutants.
- Provide nesting sites and shelter for birds and insects, while also attracting pollinators and other beneficial species.





# The link between biodiversity and human health.

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- Studies have suggested that exposure to green spaces may have a positive impact on the immune development of children. One potential explanation for this is the "hygiene hypothesis," which proposes that exposure to microbes early in life can train and strengthen the immune system, reducing the risk of allergies and autoimmune diseases.
- Here are a few examples of studies that have explored this topic:
- A 2017 study published in the journal *Environmental Health Perspectives* looked at the relationship between greenness around homes and the development of the immune system in infants. The researchers measured the amount of green space within 100 meters of each infant's home and collected blood samples to measure immune system markers. They found that infants living in greener areas had higher levels of regulatory T cells, which play a key role in controlling the immune response and preventing allergies and autoimmune diseases.
- A 2018 study published in the journal *Science Advances* looked at the impact of a forest school program on the immune systems of preschool children in Finland. The children spent one day a week in a forest environment, engaging in activities like climbing trees and collecting plants. The researchers found that the children who participated in the forest school program had lower levels of pro-inflammatory cytokines (markers of inflammation) and higher levels of anti-inflammatory cytokines compared to children in a control group. The authors suggest that exposure to diverse microbes in the forest environment may have contributed to these changes.
- A 2020 study published in the journal *Environmental Research* looked at the relationship between green space exposure and allergies in children in Spain. The researchers measured the amount of green space within 100, 300, and 500 meters of each child's home and collected information about allergies and asthma. They found that children living in greener areas had a lower risk of allergic rhinitis (hay fever) and that the protective effect was strongest for children who spent more time playing outdoors.



## Indicators of biodiversity:

Note: If you are managing for indicators, they are no longer reliable indicators.



UGA1509040

## **Reducing pesticide reliance:**

- Tolerating low levels of non-damaging herbivorous insects
- Diversity of flowering annual and perennial herbaceous and woody plants
- Providing habitat for beneficial organisms to increase their populations.
- **Assess if the ecosystem is out of balance?**



## **Limitation # 2 – Limited space:**

- Difficult to plant a diverse mix of tree species or to create large enough habitat patches to support a wide range of wildlife.
- Infrastructure



### **Limitation # 3 - Fragmentation:**

- Urban forests are often fragmented and isolated from other green spaces.
- Restricts movement of plants and animals to move between habitats.
- Difficult to maintain diversity (biodiversity and genetics)



## Limitation #4 - Stakeholders

- **Conflicting priorities:** The definition of 'value'.
- **Limited resources:** Budget funding or staffing limitations.
- **Limited input:** Arborists may not have a seat at the table when it comes to decision-making about urban design and development.
- **Communication:** Differences in terminology or understanding of tree care practices



## **Arboriculture connects all stakeholders.**

Arborists are the ones who apply the research through management practices, we work within the ecosystems daily, while also being the main point of contact with clients and often are the educators regarding the urban forest.

How much time do you spend talking with clients?

**WHEN YOU'RE AT A NORMAL PEOPLE PARTY,**

**AND NO ONE WANTS TO TALK ABOUT TREES.**



# Summary

- **Plant diverse species, preserve mature trees.**
- **Consider genetic variation and genetic diversity when planting or planning.**
- **Promote ecosystem function not just tree diversity.**
- **Ecosystem and tree health start at the soil.**
- **Support native plant species when possible.**
- **Understand that not all non-native species are destructive.**
- **Provide habitat, food, shelter for predator and beneficial species.**
- **Promote public education and talk trees. Be passionate.**
- **Stop having an attitude towards other stakeholders.**



# Questions?

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[Kbreuker@unb.ca](mailto:Kbreuker@unb.ca)

IG: @climbtrees.raisebees

Podcast: Tangled Trees (Free on Apple Podcasts & Spotify)