Session 1.6

The Garden of Eden: The role of food forests and urban agriculture in promoting healthy and nutritious food.

Chair: Kathleen Wolf

World Forum on Urban Forests

2nd World Forum on Urban Forests

Washington DC, 2023

Inspired by Nature. Driven by Vision

USING MORINGA OLIFERA TREES TO CREATE GREENER,HEALTHIER AND HAPPIER CITIES FOR ALL

Presented by

MANFRED MUVINGI

BIOTECHNOLOGIST

Founder of Moringa Forest Nursery Company

Presentation Outline

- Introduction
  - Global challenges and local impact
  - The Moringa Olifera Solution
  - Versatility of Moringa Olifera
  - Moringa Olifera nutritional value
  - Afforestation initiative
  - Sustainable propagation techniques
  - The entrepreneur behind

Introduction

- Inspired by nature.
  Driven by vision.
  Jacaranda Tree Story

Global Challenges And Local Impact

- Climate Change
  Deforestation
  Malnutrition
  Water Pollution
  Unemployment

Moringa Olifera Solution

The moringa leaves and seeds are highly nutritious and can be utilized for food,medicine,water purification, soil conservation and other purposes.

Versatility Of Moringa

It’s a fast grower and thrives in Southern African region.
Multipurpose tree species.
Can absorb 20 times more carbon dioxide than other vegetation.

Moringa Nutritional Value

Backyard Makeshift Greenhouse: Pilot Scale

Afforestation Initiative

Tissue Culture Technique

- Micro propagation, tissue culture techniques in a nutritionally defined media under controlled environment, its an approach for quickly replicating plants.
- This technique was chosen to create uniform Moringa Trees within a short period of time
- Germination take 3-4 days with high efficiency.

Sustainable Propagation Techniques: Tissue Culture

Indoors To Greenhouse: Acclimatization

Plantations And Value Addition

- Scaling up production to commercial capacity.
- Creation of employment in the rural areas through commercial plantations establishment.
- Mobilizing more farmers to join the movement.
- Creation of new innovative value added products.

Vermi-composting System

MORINGA
BITES
Tasty and Nutritious
dry roasted nuts with
Moringa powder
50g
MORINGA
BITES
Tasty and Nutritious
dry roasted nuts with
Moringa powder
50g

Goal

- Our ultimate goal is to plant at least 10 million Moringa trees in Zimbabwe by 2025, and we have already given out more than 30 000 trees in urban for free thus far. Creating Greener ,Healthier and Happier Cities for all leaving no one behind.

The Entrepreneur Behind The Initiative

Manfred Muvingi-

A young man from Zimbabwe with a start-up company called Moringa Forest Nursery (pvt) ltd. A holder of an honors in Biotechnology.

MORINGA
FOREST NURSERY

Thank You

Manfred Muvingi | Moringa Forest Nursey

Inspired By Nature. Driven By Vision.

moringaforestnursey@gmail.com

Food and Agriculture Organization of the United Nations

Arbor Day Foundation

POLITECNICO MILANO 1863

ISA

Smithsonian

2nd World Forum on Urban Forests

2023

World Forum on Urban Forests

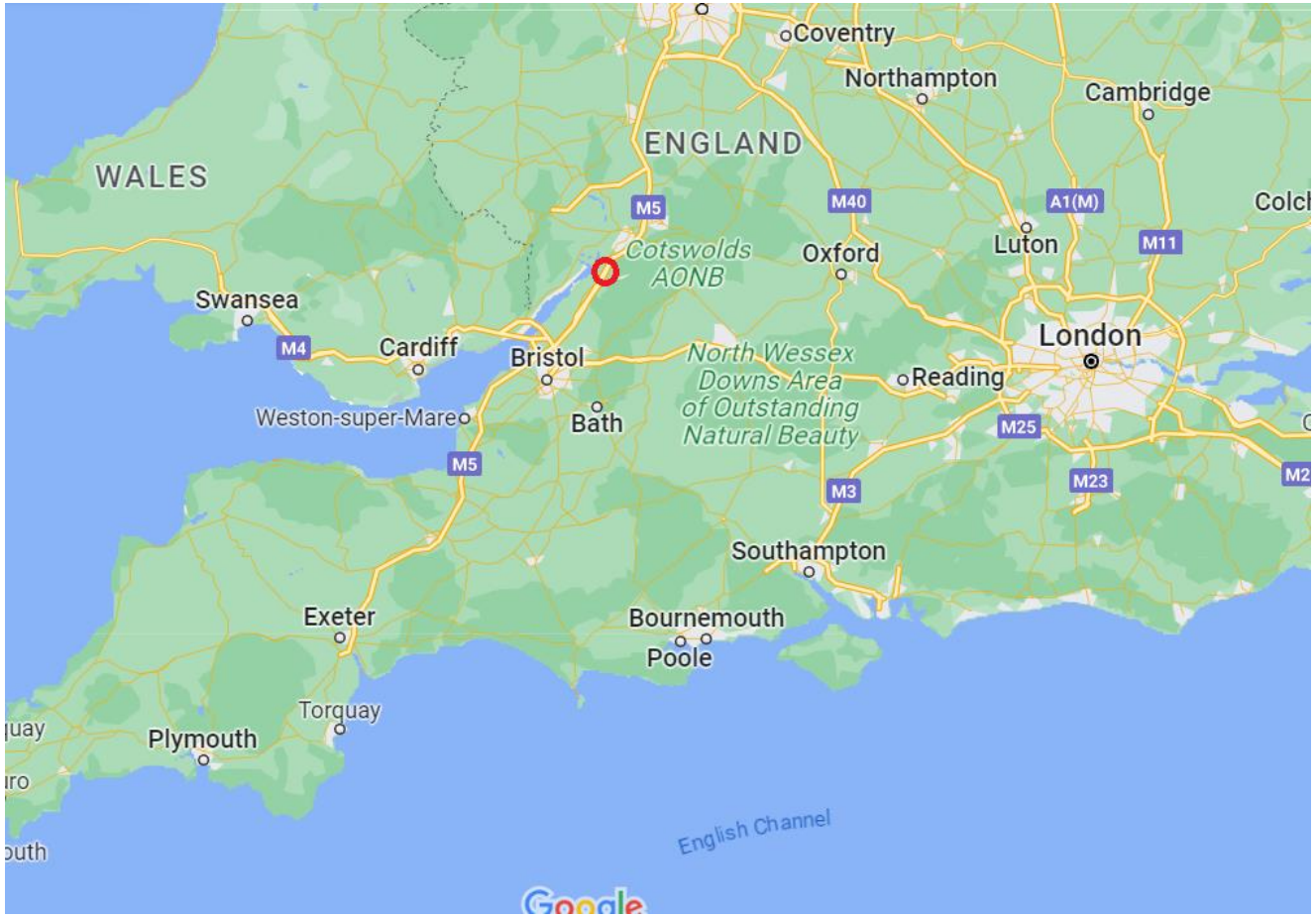
2nd World Forum on Urban Forests

Washington DC, 2023

Stonehouse: Growing a town into an arboretum

John Parker, Arboricultural Association

Stonehouse, Gloucestershire



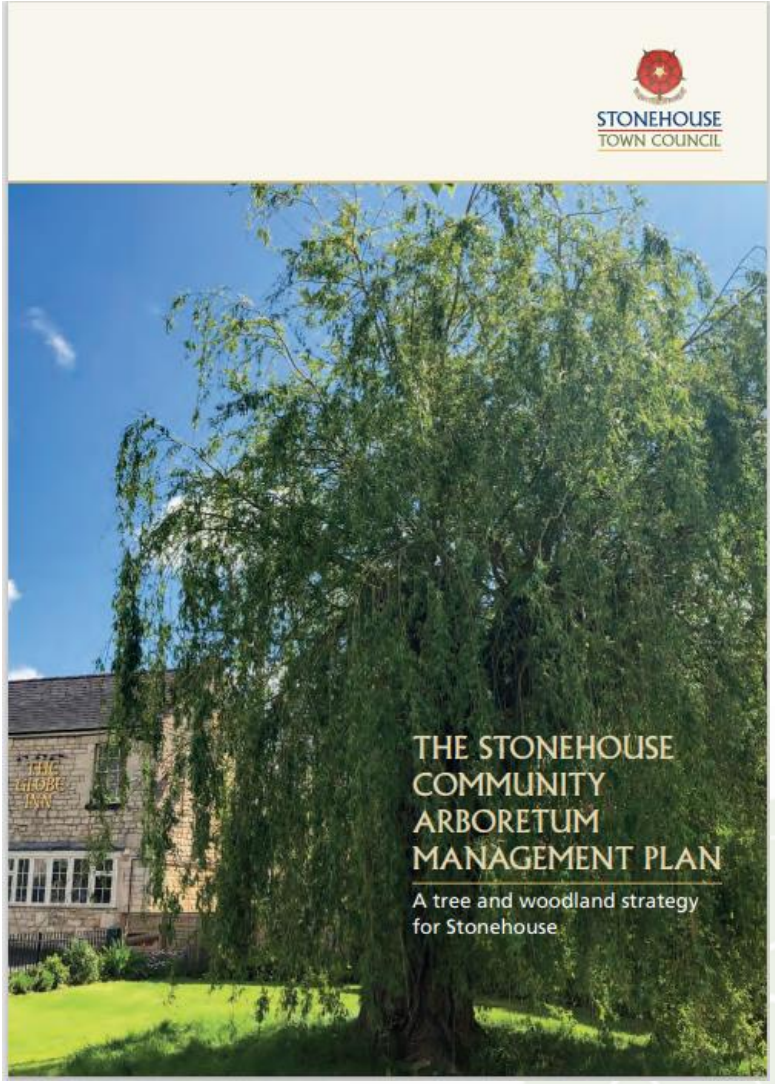
The Stonehouse Community Arboretum

- No gates, no tickets
- Every tree on public and private land
- Engaging the community with their trees
- Professional and volunteer collaboration
- Delivering benefits to the town

- Stonehouse Community Arboretum Management Plan

Management Plan

- Written in 2020-2021
- Professional and public consultation
- Adopted as policy in September 2021



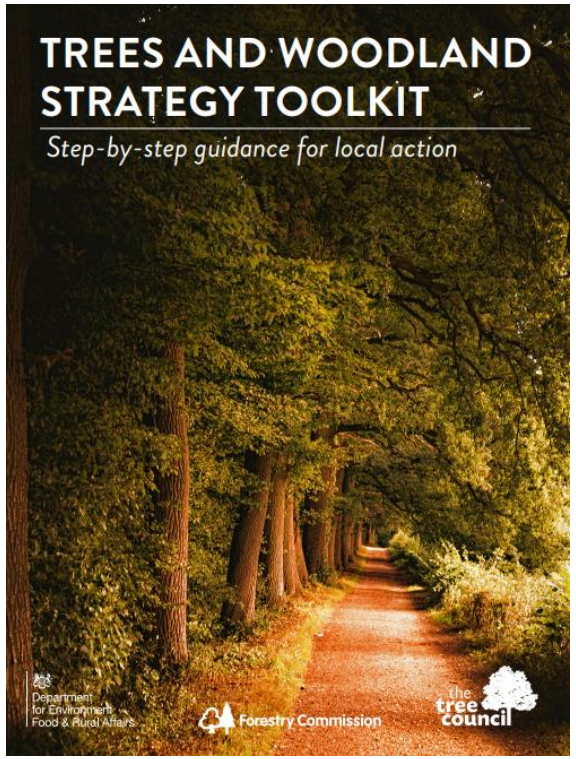
The Stonehouse Tree Charter

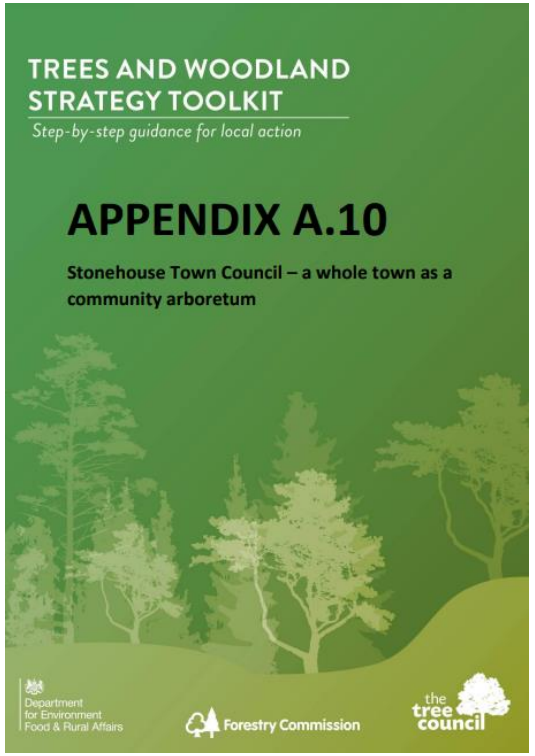
1. Trees will be regarded as an asset, not a liability.
2. Existing trees will be cared for and managed appropriately.
3. New trees will be established responsibly and sustainably.
4. The urban forest of Stonehouse is a Community Arboretum, for everybody.
5. Collaboration will be at the heart of urban forest management.

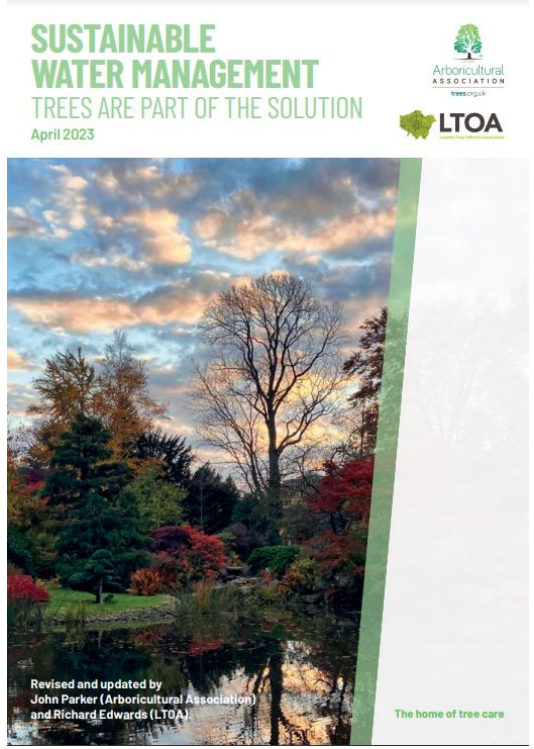
Actions

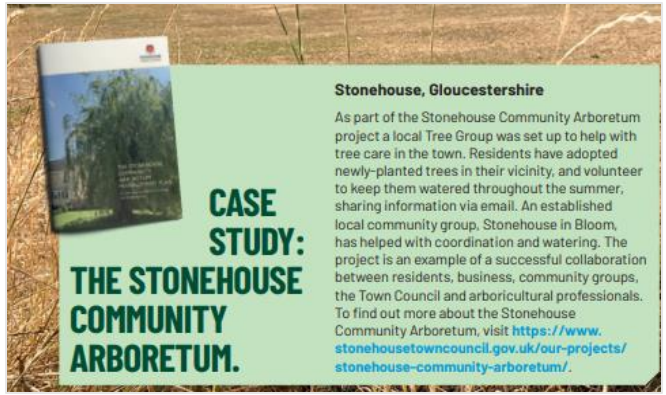
ACTION 3	**Increase tree canopy cover** in Stonehouse to 30% by 2040.
ACTION 5	Only engage **competent**, **qualified arboricultural professionals** to undertake tree work.
ACTION 9	Work to ensure that **at least 95%** of all newly-planted trees are still alive three years after planting.

Referencing

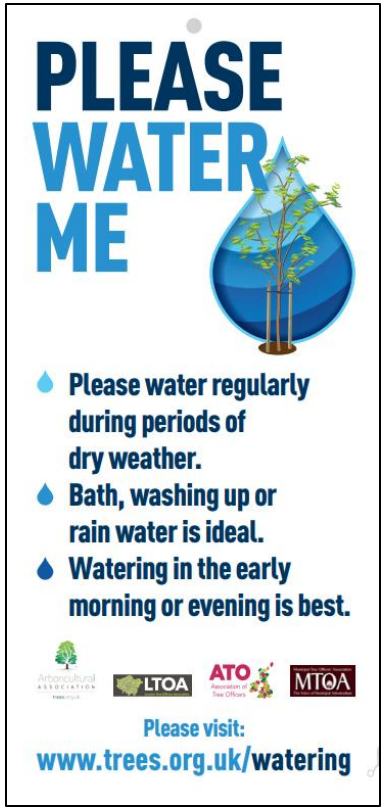




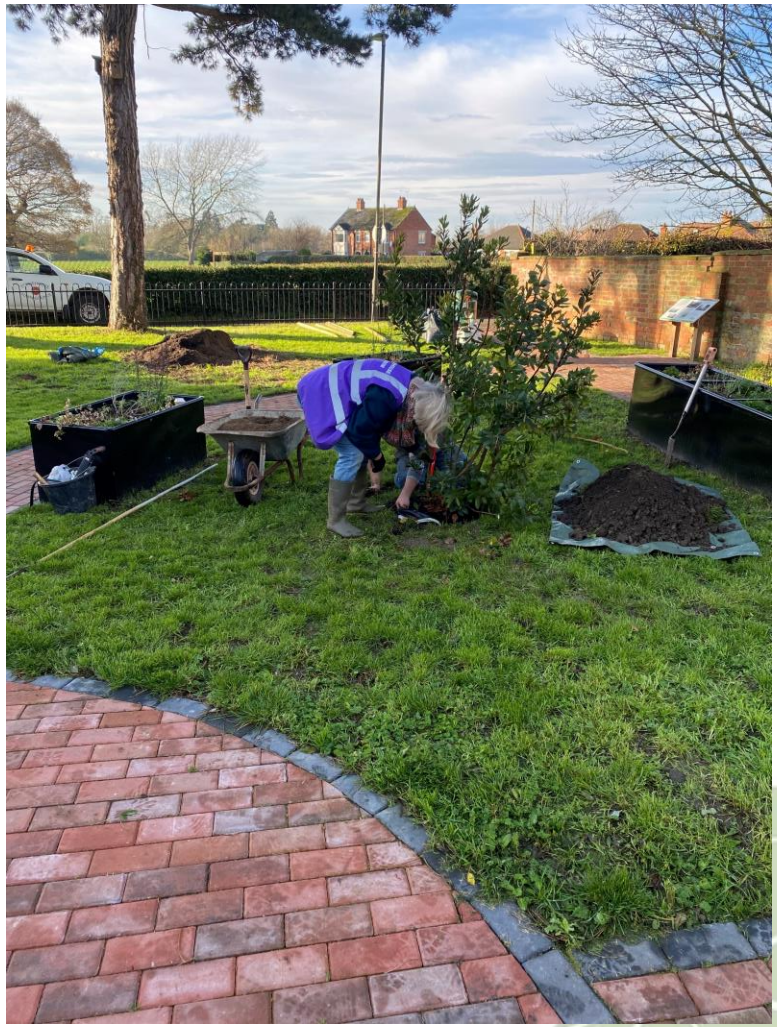




Community engagement



Community engagement



Community engagement

Windmill
Farm
Fruit
Orchards
PRIVATE
FARMLAND
NO PUBLIC VISITS
LIVE FEED
CAMERAS
Enquiries: WindmillFarm2023@gmail.com

Spring Valley Orchard Farm, please remove published photo.

SV

Spring valley orchard
To John Parker

Sat 06/05/2023 14:32

Dear Mr Parker,

We've noticed that page 15 of your published "Arboretum Management Plan" includes an old photo of our oak tree on our private farmland.

Please withdraw this from publication, including from your October 2021 publication, as it misleads the public into believing our private farmland is part of your arboretum project.

Your sincerely,

Spring Valley Orchard Farm

in the context of the principles of the Stonehouse Community Arboretum Management Plan and should be properly planned. This includes considerations such as species selection, provenance, biosecurity, planting, staking/securing, aftercare, the timing of the planting and replacement in the event of failure. It is no longer enough to simply tick an environmental box by selecting a poor-quality tree, planting it in the front garden of a new development and leaving it to die.

5.8 Legally protected trees

Some trees are protected under law. The most common methods of legal protection are contained within the Town & Country Planning Act 1990; these are Conservation Areas and Tree Protection Orders (TPOs). In Conservation Areas, all trees larger than 75mm stem diameter are automatically protected and the Local Planning Authority must be contacted prior to any tree work being undertaken. The area around the canal is included within the Stroud Industrial Heritage Conservation

Some of Stonehouse lies within the Cotswolds Area of Outstanding Natural Beauty (AONB) but this does not bring any additional tree protection beyond Conservation Areas and TPOs. One additional piece of legislation which might be relevant to tree protection and removal is the Forestry Act 1967, which specifies that a felling license is required if you are felling more than 5m³ in one calendar quarter, or more than 2m³ if the timber is to be sold.

5.9 Practical tree protection

Trees can be damaged in a variety of ways, for example during developments or improvement works, such as highway maintenance projects. Above the ground this damage can be caused in the crown of the tree through inappropriate pruning or by direct damage from vehicles. Materials laid up against the stem of a tree can cause direct damage to the bark which might also lead to future pest and disease problems. Changes to ground levels changes around the base of the tree can lead to long-term damage. Below

The Verney Oak

in the context of the principles of the Stonehouse Community Arboretum Management Plan and should be properly planned. This includes considerations such as species selection, provenance, biosecurity, planting, staking/securing, aftercare, the timing of the planting and replacement in the event of failure. It is no longer enough to simply tick an environmental box by selecting a poor-quality tree, planting it in the front garden of a new development and leaving it to die.

5.8 Legally protected trees

Some trees are protected under law. The most common methods of legal protection are contained within the Town & Country Planning Act 1990; these are Conservation Areas and Tree Protection Orders (TPOs). In Conservation Areas, all trees larger than 75mm stem diameter are automatically protected and the Local Planning Authority must be contacted prior to any tree work being undertaken. The area around the canal is included within the Stroud Industrial Heritage Conservation

Some of Stonehouse lies within the Cotswolds Area of Outstanding Natural Beauty (AONB) but this does not bring any additional tree protection beyond Conservation Areas and TPOs. One additional piece of legislation which might be relevant to tree protection and removal is the Forestry Act 1967, which specifies that a felling license is required if you are felling more than 5m³ in one calendar quarter, or more than 2m³ if the timber is to be sold.

5.9 Practical tree protection

Trees can be damaged in a variety of ways, for example during developments or improvement works, such as highway maintenance projects. Above the ground this damage can be caused in the crown of the tree through inappropriate pruning or by direct damage from vehicles. Materials laid up against the stem of a tree can cause direct damage to the bark which might also lead to future pest and disease problems. Changes to ground levels changes around the base of the tree can lead to long-term damage. Below

The Verney Oak

The Globe Willow

The Globe Willow

The Globe Willow

"Village greens" are numerous in and around Stonehouse. Beautifully maintained, they are jealously guarde by the residents who, in 1899, successfully fought a legal battle to retain ownership of them. Here, a fin willow graces Weeping Willow Tree Green

The Globe Willow

The Globe Willow

The Globe Willow

The Globe Willow

The Globe Willow

The Globe Willow

How to care for your own Globe Willow

STONEHOUSE TOWN COUNCIL

New willow trees can be grown easily from cuttings. Simply take a length of healthy willow branch, about 25cm long and the diameter of a pencil, remove all of the leaves and place in a pot of water. In a few weeks, roots will develop from the base (you might need to top up the water). You can then plant your cutting in a pot of compost where it should take root, after which you can either transfer it into a larger pot and keep it there, or plant it in the ground (ensuring you pick a sensible location and have the permission of the landowner!). Alternatively you can cut a length of willow, remove the leaves and insert directly into a pot of compost. Your tree will be a genetic clone of its parent, the Globe Willow.

The Stonehouse Tree Charter contains five key principles that should govern the management of trees in our town. These are:

- Trees will be regarded as an asset, not a liability.
- Existing trees will be cared for and managed appropriately.
- New trees will be established responsibly and sustainably.
- The urban forest of Stonehouse is a Community Arboretum, for everybody.
- Collaboration will be at the heart of urban forest management.

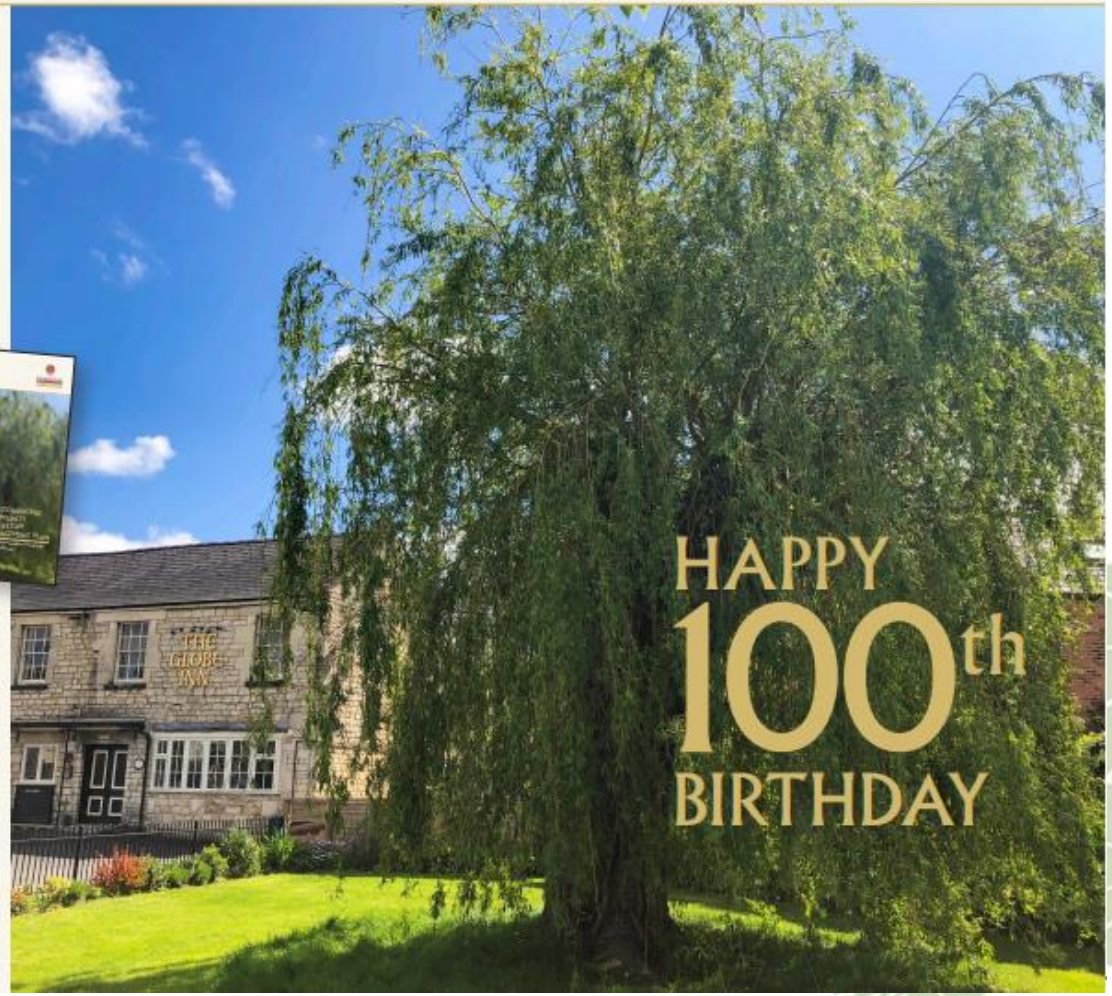
To download the Stonehouse Community Arboretum Management Plan and learn more about trees in Stonehouse, please visit **stonehousetowncouncil.gov.uk**

Arboricultural Association
Tree Care Supporter

To find out more about tree care and arboriculture, please visit **treecare.org.uk**

Arboricultural Association
trees.org.uk

This information sheet was produced by the Arboricultural Association to celebrate the 100th birthday of the Globe Willow and the launch of the Stonehouse Community Arboretum Management Plan on October 3rd, 2021.



Conclusions

- Stonehouse: A normal town
- Caring for existing trees
- Establishing new ones
- Engaging the community
- Improving the town
- Telling stories through trees

Thank you

John Parker| Arboricultural Association

www.trees.org.uk

john@trees.org.uk

Food and Agriculture Organization of the United Nations

Arbor Day Foundation

POLITECNICO MILANO 1863

CISEF

ISA

Smithsonian

2nd World Forum on Urban Forests

2023

World Forum on Urban Forests

2nd World Forum on Urban Forests

Washington DC, 2023

Millennium Kids Case Study

The role of youth voice in urban greening for climate adaptation and mitigation

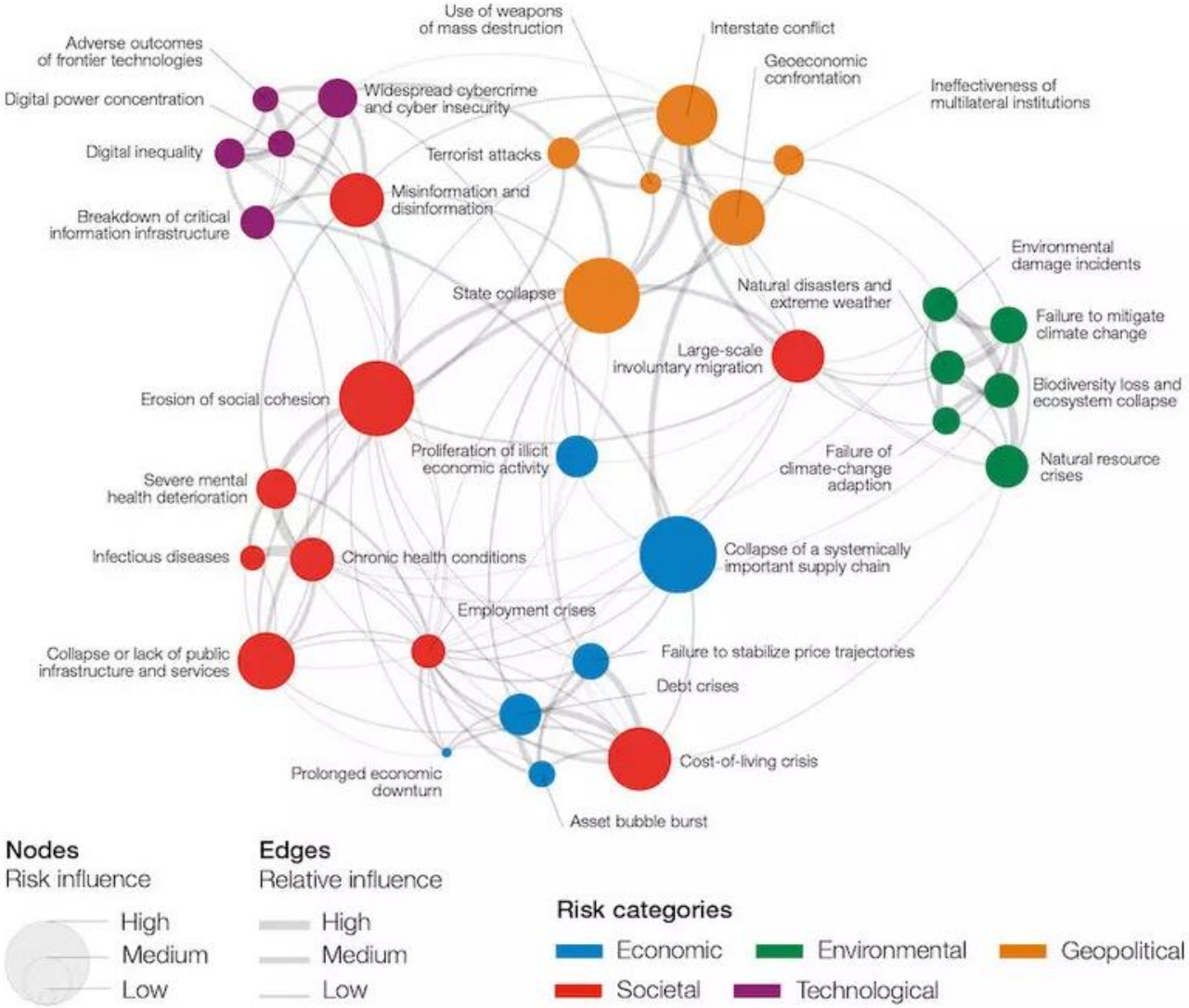
Presented by

Aelwen Johnstone

Heather Johnstone

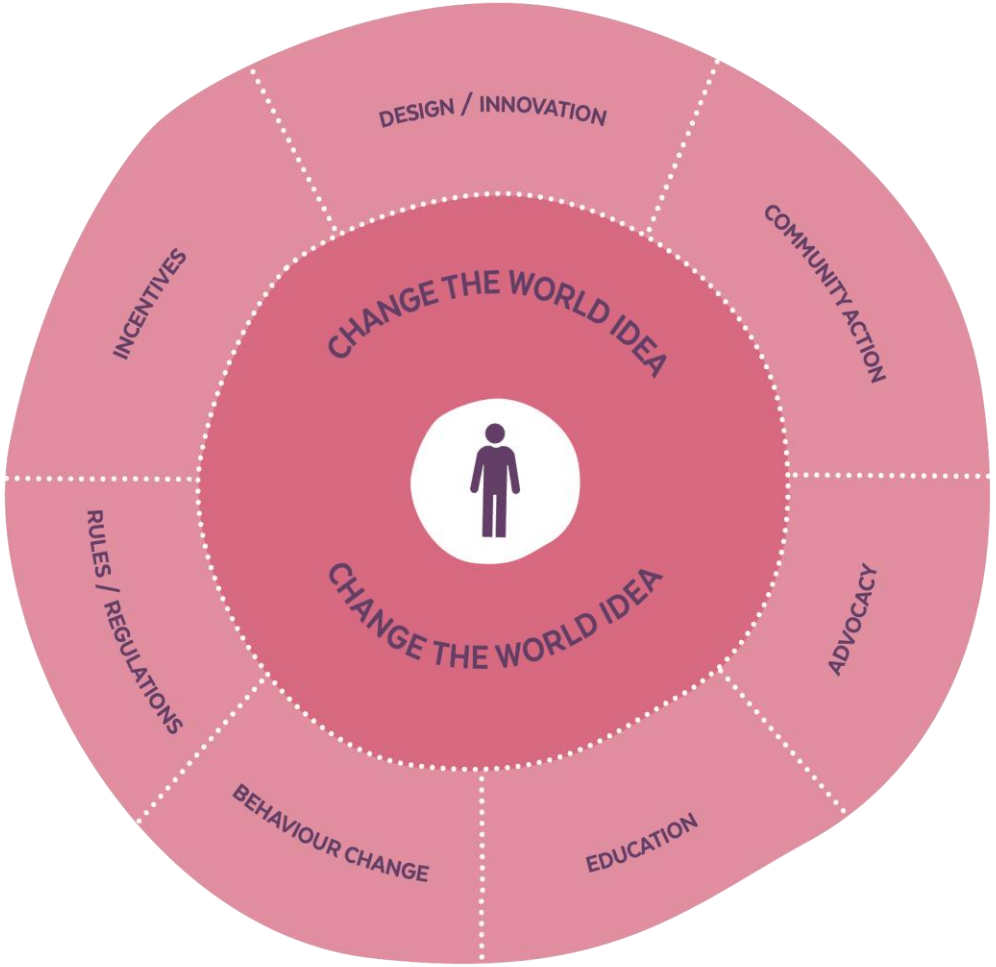
The age of the polycrisis

Millennium Kids, Green Lab Fundraiser . 2021



World Economic Forum, Global Risks landscape: an interconnectedness map, Global Risks Perception survey 2022-2023

Youth Voice



Millennium Kids, Avenues for Youth Led Social Change. 2020

Millennium Kids, Youth Board, staff and mentors at Lake Claremont with UNAWA Award for outstanding environmental achievement. 2019

The Green Lab Program

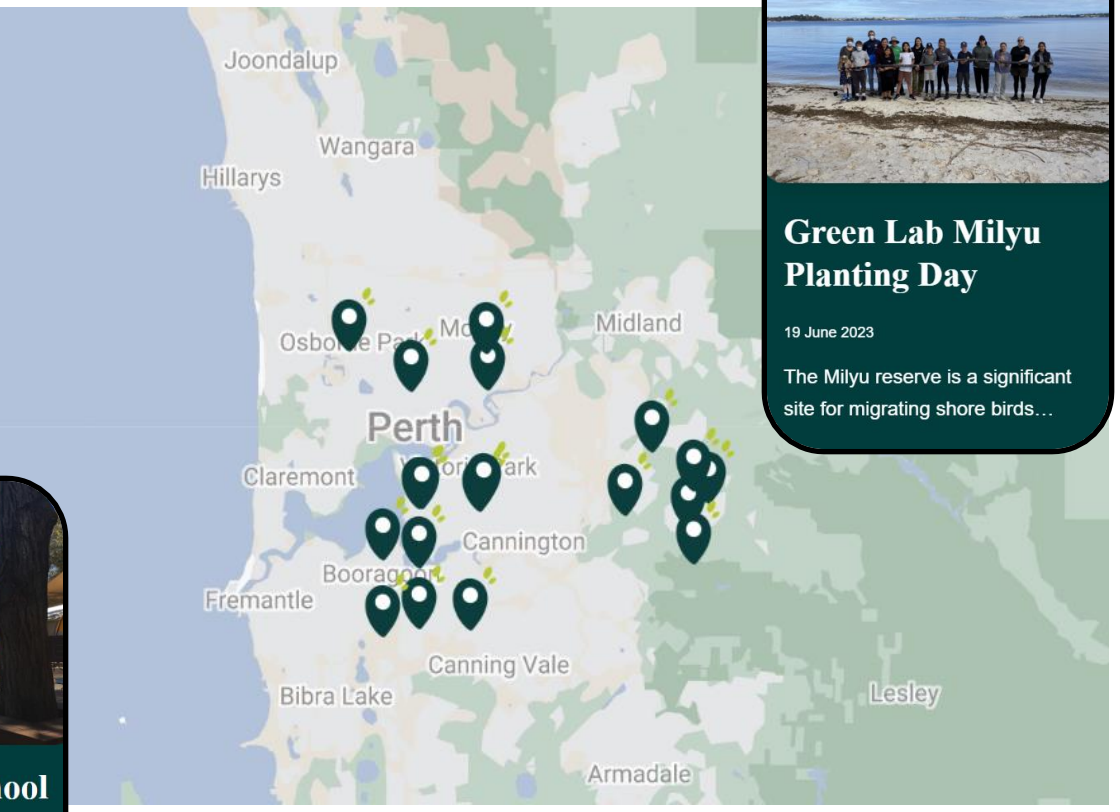
- School projects
- Community Projects
- Individual Projects
- Events
- Online (Green Lab Challenge, Mentoring)

Cohen Cares - Do You?

From his backyard, Cohen has grown up watching black cockatoos feeding in several big Cape Lilac trees in a drainage sump on Kooyon

St Columba's School Bayswater

Our school playgrounds are hot in summer and the areas are small. We need to make a map and plan where we can plant more trees.



Green Lab Milyu Planting Day

19 June 2023

The Milyu reserve is a significant site for migrating shore birds…

Millennium Kids Green Lab Locations, www.greenlab.org.au, 2023

My Green Lab Project

Site 1 (2015-2016)	Site 1 and 2: 2017-2018	Site 2: 2019-2020	Site 3-4: 2021-2022	2023 and beyond
Asked Mum if we could plant trees on drainage basin, she helps me with some research and organizes meetings. Meet with Local Government, business and Water Corporation Seek funding Create designs	Joined MK Site 1 not progressed due to site capacity issues and staff changes Joined the MK Youth Board Second site investigated, meet stakeholders (Local governments, new Water Corp Staff), seek funding. Develop skills through MK	2 Community consultation workshops with local Primary School, Subject matter experts Awarded Grant Unable to receive written permission To progress, Grant lost Site adjacent to major project, handed ideas to Metronet No longer included in decisions around site Millennium Kids Green Lab program begins	Site analysis South Perth, including i-tree canopy, site design stakeholder engagement, election promised funding, change of government. Site not progress. Site chosen, designed and scoped with Town of Victoria Park Budget cuts meant unable to be completed in 2023. Skill building; learning to use my voice.	Advocacy and education Parliament House, Sustainability Fair, 2 public forums with the Environment minister and WFUF Fundraising with Multicultural lions of WA Lions Currently without a viable site or funding. Reconnected with Watercorp Presented at WFUF

Johnstone, A. Green Lab project, www.greenlab.org.au, 2023

Education for behavior change

Education and advocacy

Advocacy

Citizen

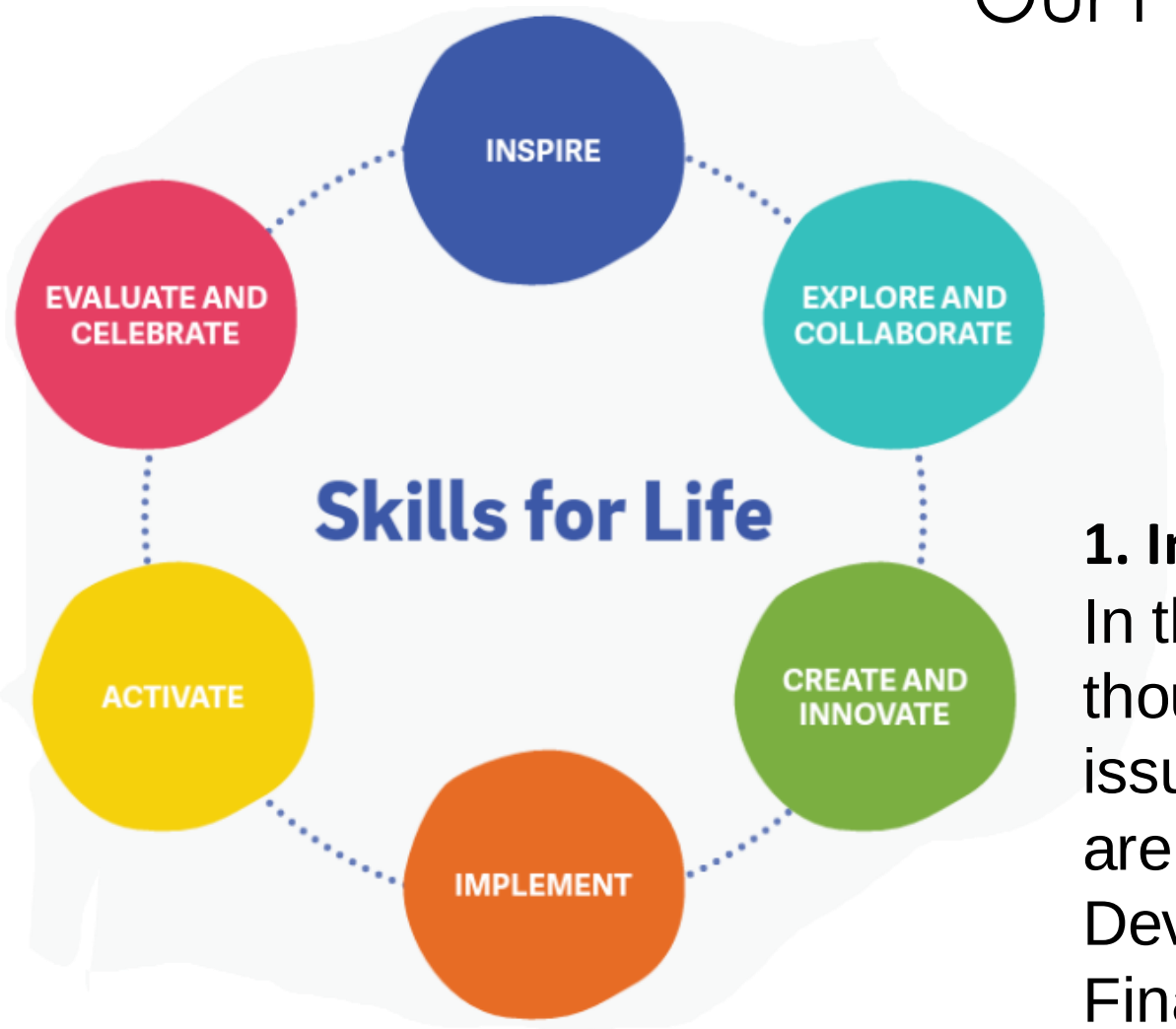
Scientist →

Design

Engagement

Millennium Kids. Green Lab project initiatives 2017-2023

Our Process



Millennium Kids. Skills for life process. www.greenlab.org.au, 2023

1. Inspire

In the first stage, participants engage in thought-provoking play to help identify the issues and opportunities for change. These are then mapped against the UN Sustainable Development Goals, validated and prioritised. Finally, participants review examples of other youth-led projects.

Thank you

Aelwen Johnstone | Millennium Kids

www.greenlab.org.au

info@milleniumkids.com.au

Food and Agriculture Organization of the United Nations

Arbor Day Foundation

POLITECNICO MILANO 1863

Smithsonian

2nd World Forum on Urban Forests

2023

World Forum on Urban Forests

2nd World Forum on Urban Forests

Washington DC, 2023

Urban tree-based food production system for climate action and biodiversity conservation in West Africa dryland cities: Insight from Niger

Presented by

Moussa Soulé, PhD,

Fulbright and TWAS Fellow

Faculty of Sciences and Techniques (FST)

University Dan Dicko Dankoulodo of Maradi (UDDM), Maradi, Niger

Introduction (1/1)

- The worldwide urban population is already 55% and expected to rise to 68% by 2050, with 90% of this increase taking place in Asia and Africa (UN, 2022);

  This will expand rapidly the expansion of urban areas to rural areas (Conversion of agricultural lands in to urban areas, cutting down of the food tree species, etc.);

  This leads to unemployability of rural people and increases loss of green jobs;

  This will increase the food demand mostly in urban areas.

Introduction (1/2)

For instance, about 70% of a country's food supply is consumed in cities but 90% of the food in developing countries comes from rural areas (Bereuter et al., 2016).

The increased food demand in the urban areas due to the rapid growing urban population will be exacerbated by the effects of climate change which is affecting the world´s food production systems (Intergovernmental Panel on Climate Change (IPCC), 2022; Parry et al., 2004).

It will increase the global conflicts (FAO, 2022).

Urban food availability is vulnerable as rural areas' food production is which is under threat (IPCC, 2022).

Introduction (1/3)

Potential solutions to overcome urban food scarcity due to the aforementioned drivers include:

1. Urban agriculture (Gerster-Bentaya, 2013),

2. Urban food forestry (Salbitano et al., 2019).

Urban food forestry can increase food security (Clark and Nicholas, 2013; Vannozzi Brito and Borelli, 2020);

It provides other socio-economic and ecological services such as carbon sequestration and urban biodiversity conservation (Clark and Nicholas, 2013; Salbitano et al., 2019; Vannozzi Brito and Borelli, 2020);

Furthermore, urban food forestry as green urban space is an umbrella climate action which is key to meeting the Sustainable Development Goals (SDGs) (Borelli and Conigliaro, 2018; Lorenzo-Sáez et al., 2021).

Introduction (1/4)

Most studies that looked at the role of food tree species in carbon sequestration were done outside urban areas (Dao et al., 2021; Sharma et al., 2021);

Beyond the scarcity of studies on the role of urban food tree species in sequestering carbon, no single study tried to use original data to determine the typology, structure, functions with focus on climate actions and tree biodiversity conservation in West Africa Sahel, region with unique socio-economic, political and ecological challenges.

Niger is a land-locked country in the Sahel region facing a food deficit and is one of the highest rates in the world (3.71%).

About 80% of its population live in rural areas and the majority of them rely on subsistence farming, fishing, and the collection of non-timber forest products for their livelihood.

The cities in Niger such as the city of Niamey (Hassoumi, 2019) are dependent on the rural areas and foreign countries to get fruits.

Introduction (1/5)

Nearly 20 percent of the population cannot meet their food needs because of factors such as inadequate agricultural production, security constraints and high demographic growth (WFP, 2023).

Exploring the structure of urban food forests of Niger is central to food security and nutrition.

Therefore, this study tries to provide urban food forest data for the urban planners in order to incorporate food forests into their designs for achieving food security in Niger.

2. Materials and methods

- Urban food forest in Niger : combination of edible species (tree and herbaceous plants) in the urban and peri-urban settings.

- Methods for data collection : Forest inventory and ethnobotanical survey;
- Methods for data analysis : Allometric model, Biodiversity index, ANOVA and Kruskal Wallis tests were used.

Two types food forest in Niamey city (School and administrative areas
Source : Moussa Soule, 2017

2.Materials and Methods

Table 1. Number of plots and area per urban food forest types in two cities (Niamey and Maradi)

Cities	Food forest types	Number of plots	Area(ha)
Niamey		21	3.98
Maradi	Administrative areas	24	3.6
Niamey		9	1.87
Maradi	Commercial areas	11	0.97
Niamey	Public large urban	33	7.37
Maradi	green spaces	17	3.93
Niamey		51	3.75
Maradi	Residential areas	23	1.72
Niamey		45	2.74
Maradi	Road	42	1.7
Niamey		26	6.74
Maradi	School	26	5.34
Niamey		17	4.25
Maradi	Peri-urban forests	12	3
Niamey		202	30.7
Maradi	Total	155	20.25

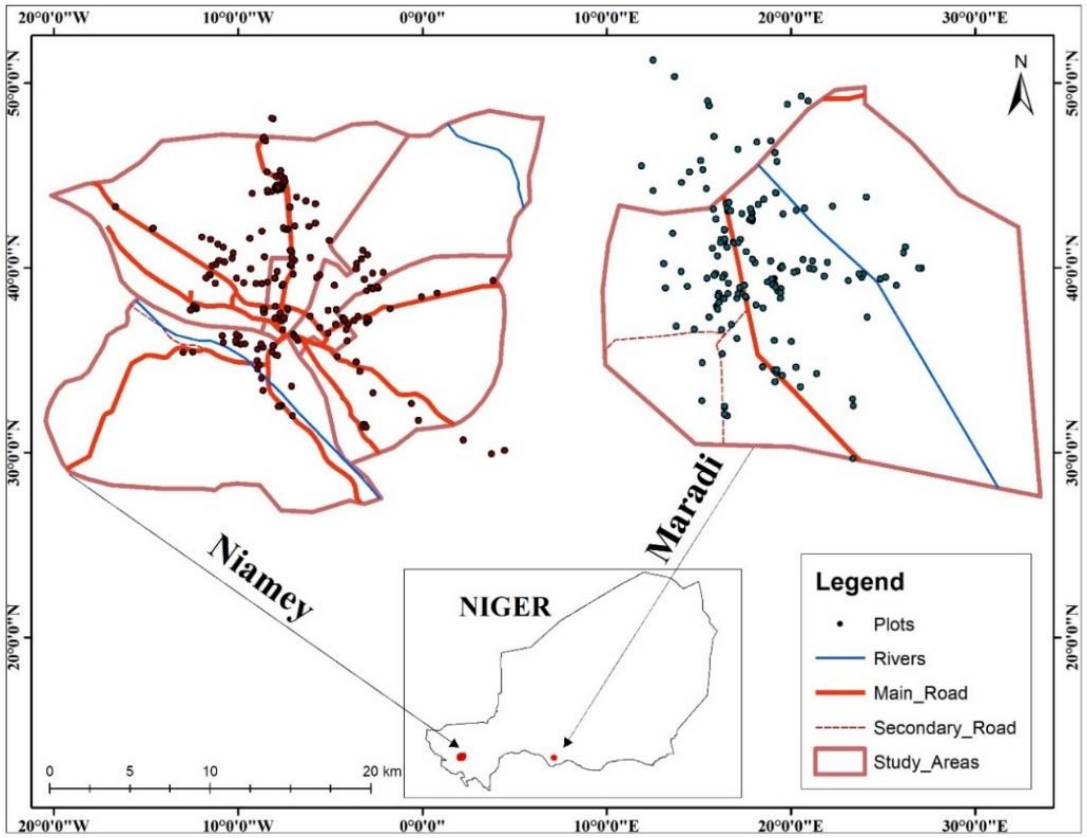


Figure 1: Study area and urban food forestry plots in the two cities

3.1 Results and Discussion

Table 2: Urban food forests (UFF) composition

Cities	Food forest types	Richness	Shannon	Evenness	Exotic	Native
		Woody species diversity			Nativity of species	
Niamey	Administrative areas	22	2.28	0.74	9	13
Maradi		26	2.70	0.83	11	15
Niamey	Commercial areas	5	1.39	0.86	0	5
Maradi		18	2.63	0.91	7	11
Niamey	Forested areas	25	2.27	0.70	5	20
Maradi		25	2.82	0.88	6	19
Niamey	Residential areas	29	2.77	0.82	16	13
Maradi		36	3.24	0.90	17	19
Niamey	Roads	14	3.27	0.40	7	7
Maradi		14	2.35	0.89	3	11
Niamey	Schools	14	1.17	0.65	2	12
Maradi		18	2.54	0.88	06	12
Niamey	Peri-urban forests	11	1.60	0.67	0	11
Maradi		12	2.33	0.94	1	11
Niamey	Total	50	3.86	0.99	22	28
Maradi		52	2.71	0.88	18	27
Niamey	P-values	0.32	0.42	0.42	0.65	0.41
Maradi		0.43	0.30	0.54	0.33	0.35

- Residential urban food forests had the highest number of food tree species in two Sahel cities compared to the other urban food forest types;
- Indigenous food tree species dominate 58% of the tree food flora;
- The mistletoe (*Tapinanthus dodoneifolius*) on the urban trees is consumed in both cities;
- *Balanites aegyptiaca* and *Mangifera indica* are the dominant food tree species;
- UFF in Niamey and Maradi is multi-layered and polycultural food systems composed of herbaceous and woody species which confirmed the definition of (Allen and Mason, 2021; Park et al., 2019).
- Key implications: Urban food security, green jobs creation, climate actions, biodiversity conservation (Focus on the use of local tree species), urban botany education, etc.
- For example, in the list of the recorded food tree species, there is *Adansonia digitata* (Baobab tree) which is an economic food tree species, great source of minerals and vitamins, particularly of vitamin C (Stadlmayr et al., 2020).

List of the recorded tree species

No	Species	Families	Niamey	Maradi	List of food
1	*Anacardium occidentale* L.	Anacardiaceae	yes		Fruit
2	*Lannea microcarpa* Engl. & K. Krause	Anacardiaceae	yes	yes	Fruit
3	*Mangifera indica* L.	Anacardiaceae	yes	yes	Fruit
4	*Sclerocarya birrea* (A. Rich.) Hochst	Anacardiaceae	yes	yes	Fruit
5	*Annona muricata* L.	Annonaceae		yes	Fruit
6	*Annona senegalensis* Pers.	Annonaceae	yes	yes	Fruit
7	*Annona squamosa* L.	Annonaceae	yes	yes	Fruit
8	*Cocos nucifera* L.	Arecaceae	yes		Fruit
9	*Borassus aethiopum* Mart.	Arecaceae	yes	yes	Fruit
10	*Hyphaene thebaica* (L.) Mart	Arecaceae	yes	yes	Fruit
11	*Phoenix dactylifera* L.	Arecaceae	yes	yes	Fruit
12	*Phoenix reclinata* Jacq.	Arecaceae	yes		Fruit
13	*Vernonia amygdalina* Del.	Asteraceae		yes	Leaves
14	*Balanites aegyptiaca* (L.) Del.	Balanitaceae	yes	yes	Flowers and fruit
15	*Kigelia africana* (Lam.) Benth	Bignoniaceae	yes	yes	Fruit
16	*Boscia senegalensis* (Pers.) Lam. ex Poir.	Capparaceae	yes		Fruit
17	*Maerua crassifolia* Forssk.	Capparaceae	yes	yes	Leaves
18	*Carica papaya* L.	Caricaceae	yes	yes	Fruit
19	*Neocarya macrophylla* (Sabine) Prance	Chrysobalanaceae	yes		Fruit
20	*Terminalia catappa* L.	Combretaceae	yes	yes	Fruit
21	*Diospyros mespiliformis* Hochst. ex A. Rich.	Ebenaceae	yes	yes	Fruit
22	*Manihot esculenta* Crantz	Euphorbiaceae	yes	yes	Cassava root and leaves
23	*Acacia holosericea* A. Cunn. ex G. Don	Fabaceae	yes	yes	Fruit
24	*Vachellia sieberiana* DC.	Fabaceae	yes		Gum
25	*Delonix regia* (Boj.) Raf.	Fabaceae	yes	yes	Fruit
26	*Dialium guineense* Willd.	Fabaceae	yes		Fruit
27	*Parkia biglobosa* (Jacq.) R. Br. ex G. Don	Fabaceae	yes	yes	Fruit
28	*Parkinsonia aculeata* L.	Fabaceae	yes	yes	Fruit
29	*Piliostigma reticulatum* (DC.) Hochst.	Fabaceae	yes	yes	Fruit
30	*Senegalia senegal* (L.) Willd.	Fabaceae	yes	yes	Gum
31	*Sesbania pachycarpa* DC. Em.Guill. Et Perr.	Fabaceae		yes	Leaves
32	*Tamarindus indica* L.	Fabaceae	yes	yes	Fruit and leaves
33	*Vachellia seyal* Del.	Fabaceae	yes	yes	Gum

List of the recorded tree species

34	*Vitex doniana* Sweet	Lamiaceae	yes	yes	Fruit
35	*Vitex simplicifolia* Oliv.	Lamiaceae	yes	yes	Fruit
36	*Tapinanthus dodoneifolius* (DC.) Danser	Loranthaceae	yes		Leaves
37	*Punica granatum* L.	Lythraceae	yes		Fruit
38	*Adansonia digitata* L.	Malvaceae	yes	yes	Fruit and leaves
39	*Cola cordifolia* (Cav.) R. Br.	Malvaceae	yes	yes	Fruit
40	*Sterculia setigera* Del.	Malvaceae		yes	Fruit
41	*Theobroma cacao* L.	Malvaceae	yes		Fruit
42	*Ficus platyphylla* Del.	Moraceae	yes	yes	Fruit
43	*Ficus sycomorus* ssp. gnaphalocarpa (Miq.) C.C. Berg	Moraceae	yes	yes	Fruit
44	*Ficus thonningii* Blume	Moraceae	yes	yes	Fruit
45	*Morus alba* L.	Moraceae	yes		Fruit
46	*Moringa oleifera* Lam.	Moringaceae	yes	yes	Fruit and leaves
47	*Moringa stenopetala* (Baker f.) Cufod.	Moringaceae	yes	yes	Fruit and leaves
48	*Psidium guajava* L.	Myrtaceae	yes	yes	Fruit
49	*Syzygium malaccense* (L.) Merr. & L.M.Perry	Myrtaceae	yes		Fruit
50	*Averrhoa carambola* L.	Oxalidaceae	yes		Fruit
51	*Ziziphus mauritiana* Lam	Rhamnaceae	yes	yes	Fruit
52	*Ziziphus mucronata* Willd.	Rhamnaceae	yes		Fruit
53	*Ziziphus spina-christi* (L.) Desf.	Rhamnaceae		yes	Fruit
54	*Citrus grandis* (L.) Osbeck	Rutaceae		yes	Fruit
55	*Citrus limon* (L.) Burm. f.	Rutaceae	yes	yes	Fruit
56	*Citrus reticulata* Blanco	Rutaceae	yes	yes	Fruit
57	*Citrus sinensis* (L.) Osbeck	Rutaceae		yes	Fruit
58	*Blighia sapida* Koenig	Sapindaceae	yes	yes	Fruit
59	*Vitellaria paradoxa* Gaertn. f.	Sapotaceae	yes	yes	Fruit

3. 2 Results and Discussion

Table 2: Urban food forests (UFF) composition

Cities	Food forest types	Richness	Shannon	Evenness	Exotic	Native
		Woody species diversity			Nativity of species	
Niamey	Administrative areas	22	2.28	0.74	9	13
Maradi		26	2.70	0.83	11	15
Niamey	Commercial areas	5	1.39	0.86	0	5
Maradi		18	2.63	0.91	7	11
Niamey	Forested areas	25	2.27	0.70	5	20
Maradi		25	2.82	0.88	6	19
Niamey	Residential areas	29	2.77	0.82	16	13
Maradi		36	3.24	0.90	17	19
Niamey	Roads	14	3.27	0.40	7	7
Maradi		14	2.35	0.89	3	11
Niamey	Schools	14	1.17	0.65	2	12
Maradi		18	2.54	0.88	06	12
Niamey	Peri-urban forests	11	1.60	0.67	0	11
Maradi		12	2.33	0.94	1	11
Niamey	Total	50	3.86	0.99	22	28
Maradi		52	2.71	0.88	18	27
Niamey	P-values	0.32	0.42	0.42	0.65	0.41
Maradi		0.43	0.30	0.54	0.33	0.35

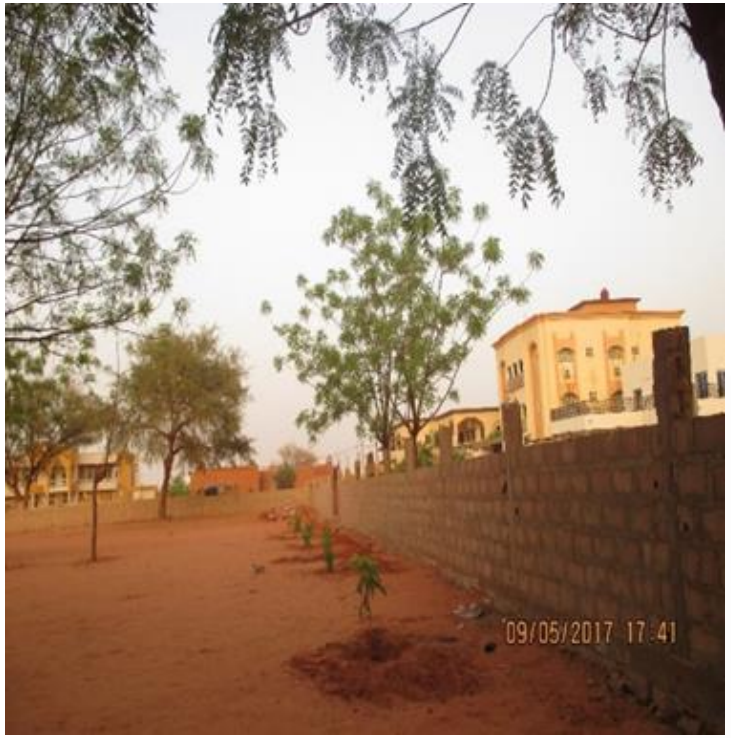
- Our study revealed the use of indigenous tree species in the urban food forestry in the two cities such as *Balanites aegyptiaca*, Ziziphus *spina-christi*, *Boscia senegalensis*, *Vitellaria paradoxa*, etc.
- The use of local tree species such as *Balanites aegyptiaca*, and *Ziziphus spina-christi* is key to the human nutrition as reported that by (Mokria et al., 2022) the aforementioned tree species were good sources of nutrient including minerals.
- Added to that, we have recorded the *Dialium guineense* which its fruit is a good source of iron, magnesium and copper (Ayessou et al., 2014).
- This is key to the local biodiversity conservation as the native tree species can enhance the urban forest diversity and cover which have reported to increase the diversity of native birds (Villaseñor et al., 2021).
- The dominance of Fabaceae could be due the nature of the food tree species in this family such as *Tamarindus indica*, *Parkia biglobosa*, *Dialium guineense* and some gum tree species such as *Acacia senegal*, etc.

3. 3 Results and Discussion

Table 3. Urban food forest' structural characteristics

Cities	Urban food forest types	Stem density (ha) (DBH ≥ 5 cm)	Basal area (m^2/ha)	Tree cover (%)
Niamey	Administrative	32.65	1.85	13.43
Maradi	areas	49.44	3.73	15.29
Niamey	Commercial areas	3.21	0.54	2.38
Maradi		49.48	2.33	9.73
Niamey	Residential areas	19.47	1.92	6.06
Maradi		54.65	2.77	11.45
Niamey	Forested areas	28.36	2.35	8.90
Maradi		29.00	1.17	5.76
Niamey	Schools	13.95	0.60	3.36
Maradi		6.74	0.62	2.36
Niamey	Roads	20.07	3.33	12.43
Maradi		18.24	1.83	6.97
Niamey	Peri-urban forests	24	1. 47	4.70
Maradi		7.67	2.41	2.44
Niamey	Overall	2027	1.72 ± 0.24	7.32 ± 0.3
Maradi		2456	2.12 ± 1.03	7.71 ± 4.77
	P-values	-	0.00	0.00
		-	0.00	0.00

- Our study shows high structural values such as the values of tree cover, basal area and stem density;
- Key implications: Urban heat and runoff reduction, air pollution removal,



Mosque food forest in Niamey city
Source : Moussa Soule, 2017

3.4 Results and Discussion

Table 4. Carbon stock across the urban food forest types in Niamey and Maradi cities

Cities	Urban Food forest types	Number of stems (DBH ≥ 5 cm)	Mean (StDev) DBH (cm)	Mean (StDev) Height (m)	Biomass carbon (t/ha)
Niamey	Administrative areas	128	23.68 ± 12.68	7.01 ± 2.96	0.78
Maradi		178	27.15 ± 15.04	6.31 ± 2.89	6.83
Niamey	Commercial areas	6	43.36 ± 17.87	8.13 ± 1.93	1.25
Maradi		48	19.01 ± 15.59	5.19 ± 2.77	4.75
Niamey	Residential areas	73	26.89 ± 23.71	6.23 ± 2.53	3.30
Maradi		94	20.58 ± 15.02	5.27 ± 2.55	4.90
Niamey	Forested areas	209	26.80 ± 18.32	5.86 ± 3.024	4.61
Maradi		114	19.36 ± 11.80	4.91 ± 0.2.51	2.09
Niamey	Schools	94	18.88 ± 14.03	6.36 ± 3.16	1.35
Maradi		36	30.00 ± 16.60	6.35 ± 2.53	1.09
Niamey	Roads	55	37.70 ± 26.61	6.83 ± 2.44	5.95
Maradi		31	30.66 ± 18.70	7.18 ± 2.52	3.48
Niamey	Peri-urban forests	102	23.11 ± 15.81	4.54 ± 2.36	2.70
Maradi		25	27.27 ± 13.60	5.84± 2.50	1.08
Niamey	Overall	667	28.63 ± 8.72	6.42 ± 1.02	2.85 ± 1.92
Maradi		526	24.86 ± 5.07	5.86 ± 0.81	3.58 ± 2.11
	P-values	-	0.00	0.00	0.00
		-	0.00	0.00	0.69

The native food tree species contributed about 82% of the total carbon stock in while the contribution of exotic food tree was 18% Niamey city.

The indigenous food tree species contributed about 67% to the total carbon stock while the exotic food tree species (33%).

Among the exotic food tree species, mango trees contributed about 79% of the total carbon stored in the exotic urban food trees while *Balanites aegyptiaca* represent 40% of the total carbon sequestered by the local tree species.

Key implications: Inclusion of the urban food forest in climate change mitigation policy, urban heat and runoff reduction, air pollution removal

5. Conclusions

- This study determined the floristic composition of urban food forest types across 7 urban land use and land cover types.

- Our findings revealed that is high food tree species diversity with more native food tree species used the urban food forestry in Niamey and Maradi cities.

- In addition to that, urban food forest in both cities store a considerable amount of carbon which needs to be considered the Nationally Determined contribution of Niger in order to mobilize more climate finance for the large urban food forestry projects to fight food insecurity and malnutrition in the country.

- It recommends the massive use of edible species to improve food security, biodiversity conservation, carbon stock and climate resilience of urban areas in Niger during the urban planting initiatives.

6. Some references

- Allen, J.A., Mason, A.C., 2021. Urban food forests in the American Southwest. Urban Agriculture and Regional Food Systems 6, 1–12. https://doi.org/10.1002/uar2.20018
- Bereuter, D., Glickman, D., Reardon, T.A., 2016. Growing Food for Growing Cities.
- Borelli, S., Conigliaro, M., 2018. Urban forests in the global context.http://www.fao.org/3/i8707en/I8707EN.pdf. Unasylva 69, 3–79.
- FAO, 2022. Ukraine: Note on the impact of the war on food security in Ukraine, Ukraine: Note on the impact of the war on food security in Ukraine. https://doi.org/10.4060/cb9171en
- Hassoumi, D., 2019. Approvisionnement de Niamey en fruits et légumes: Acteurs de production et commercialisation. Aflash-Revue-Mdou.Org 6, 79–92.
- IPCC, 2006. Volume 4: agriculture, forestry and other land use. In: 2006 IPCC guidelines for national greenhouse gas inventories. Intergovernmental Panel on Climate Change (IPCC), IPCC/IGES, Hayama, Japan. IGES, Hayama, Japan.
- Salbitano, F., Fini, A., Borelli, S., Konijnendijk, C.C., 2019. Editorial - Urban Food Forestry: Current state and future perspectives. Urban Forestry and Urban Greening 45. https://doi.org/10.1016/j.ufug.2019.126482
- Selvarani, V., James, H., 2009. Multiple inflammatory and antiviral activities in Adansonia digitata (Baobab) leaves, fruits and seeds. Journal of Medicinal Plants Research 3, 576–582.

Thank you

Moussa Soulé
University Dan Dicko Dankoulodo of Maradi (UDDM), Maradi, Niger
soule.moussa@fulbrightmail.org

Food and Agriculture Organization of the United Nations
Arbor Day Foundation
POLITECNICO MILANO 1863
CIGEF
ISA
Smithsonian

2nd World Forum on Urban Forests

2023

World Forum on Urban Forests

2nd World Forum on Urban Forests

Washington DC, 2023

Garden of Eden

Swale: A Floating Food Forest in New York City

Presented by

Mary Mattingly and Bram Gunther

WEEKS
WEEKS
WEEKS 226
MILLER

Swale, a floating food forest, Bronx, 2018

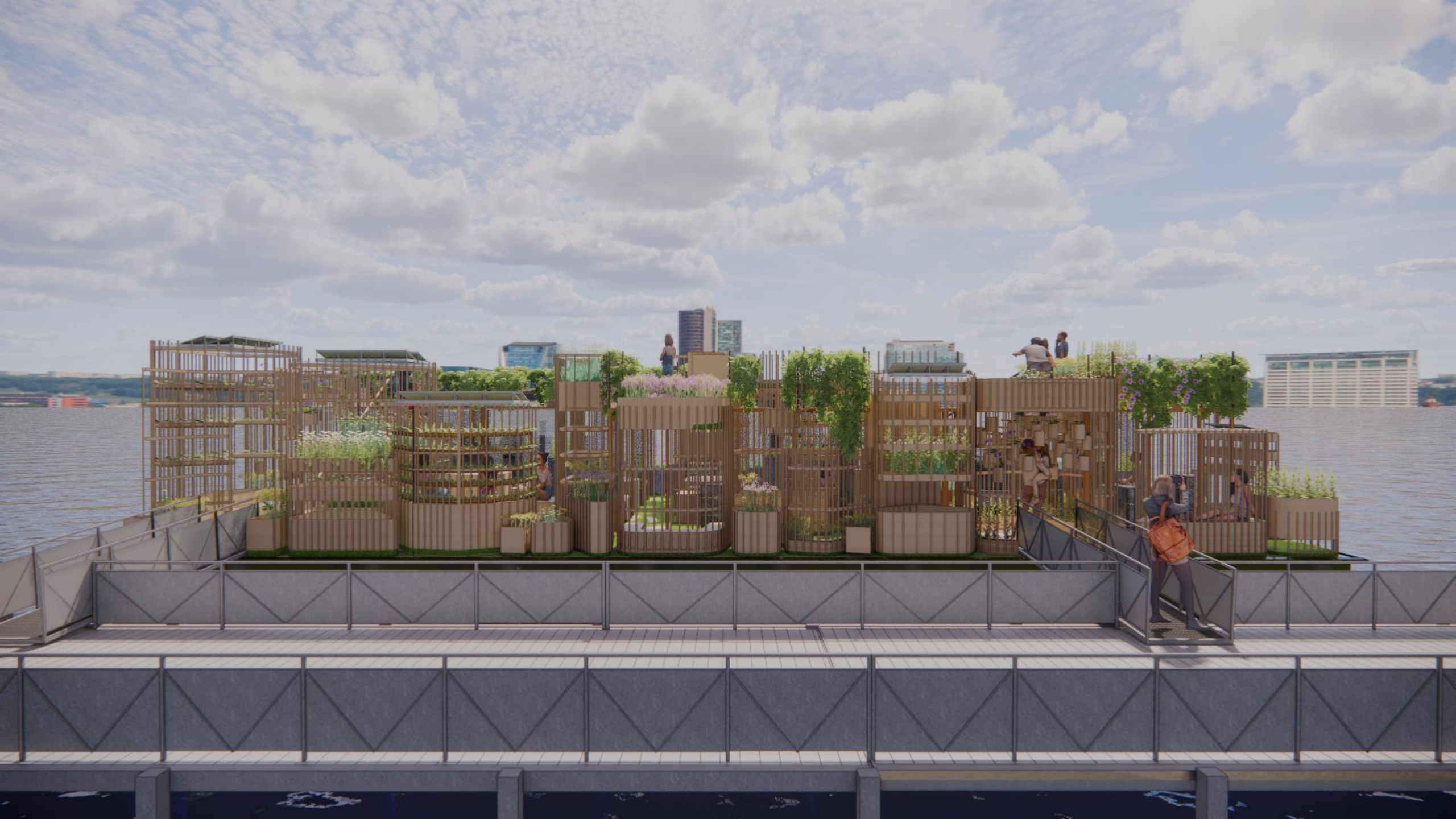
Young foragers on Swale in Brooklyn; and a forager's bag on Governors Island, 2017

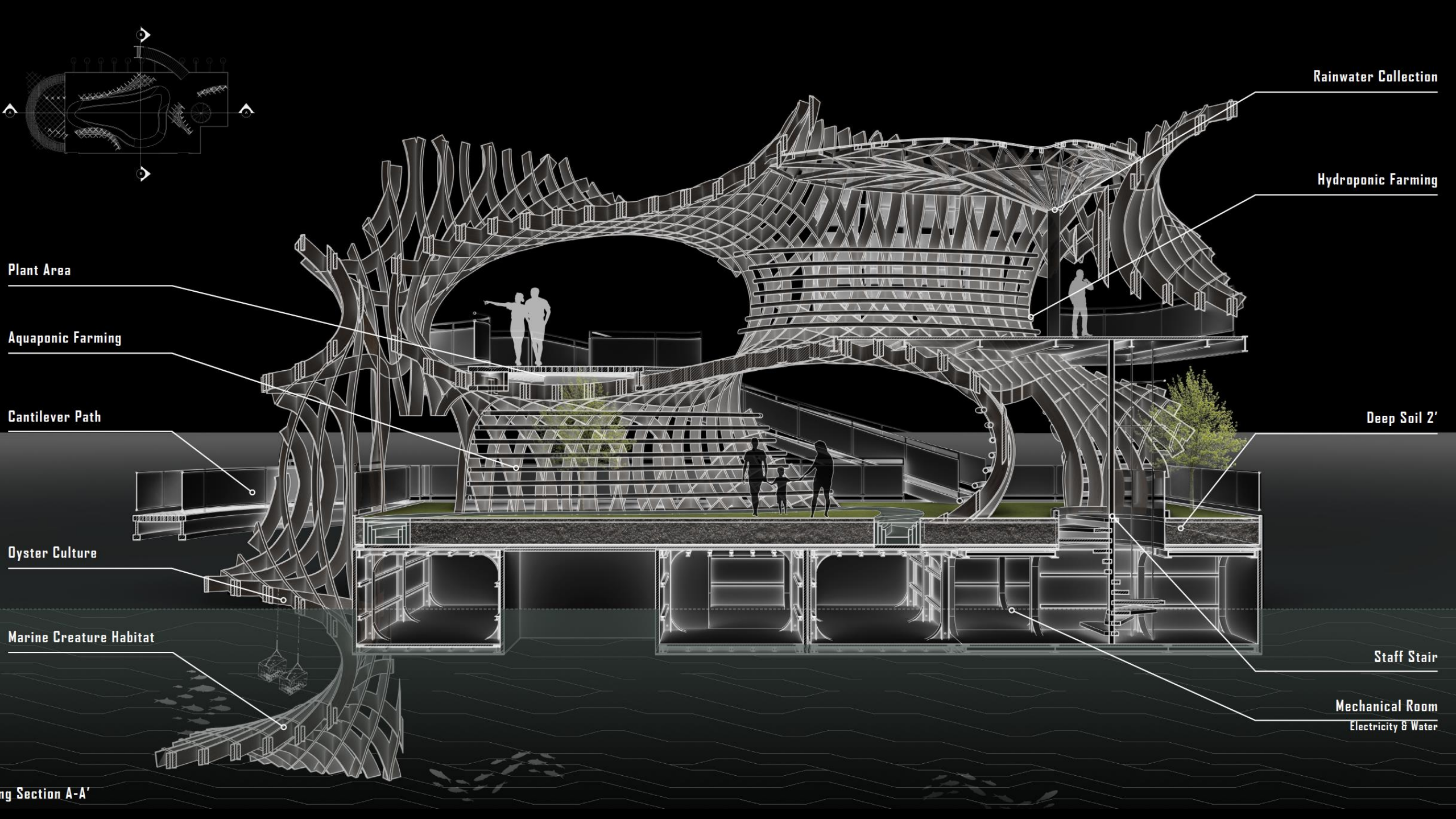
Swale food forest, Brooklyn Bridge Park Pier 6, 2017

Swa

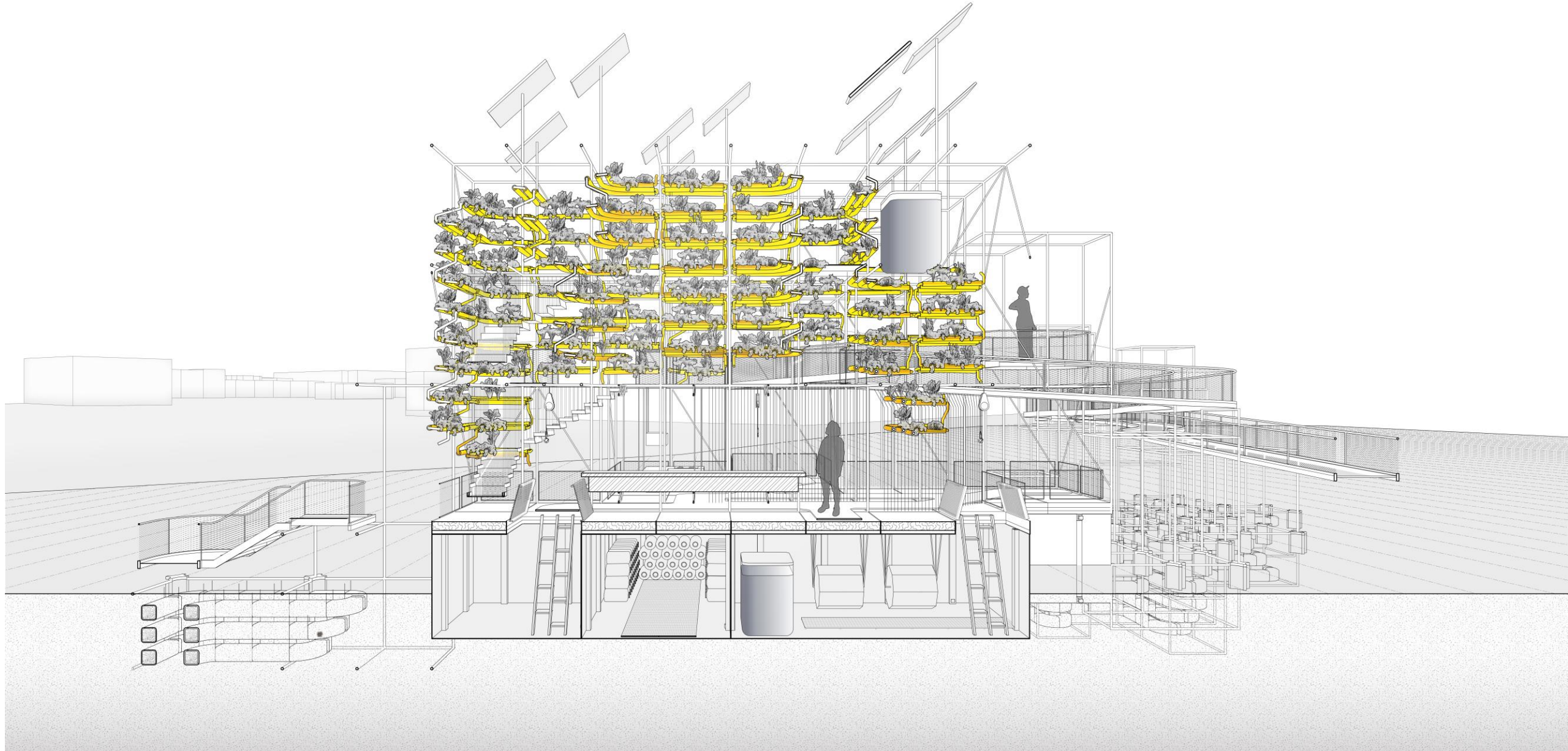
A Rebel United Society

Concrete Plant Park's "Foodway" 2017 - present





ng Section A-A'



Thank you

Mary Mattingly and Bram Gunther | Swale

Food and Agriculture Organization of the United Nations

Arbor Day Foundation

POLITECNICO MILANO 1863

ISA

Smithsonian

2nd World Forum on Urban Forests

2023

World Forum on Urban Forests

2nd World Forum on Urban Forests

Washington DC, 2023

Supporting Healthy and Inclusive Communities Through Community-led Arboreta

Presented by

Colette Copic, The Morton Arboretum

Jessica Turner Skoff, Sue Paist, Murphy Westwood, Trinity Pierce, & Aarón Siebert-Llera

Key Terms

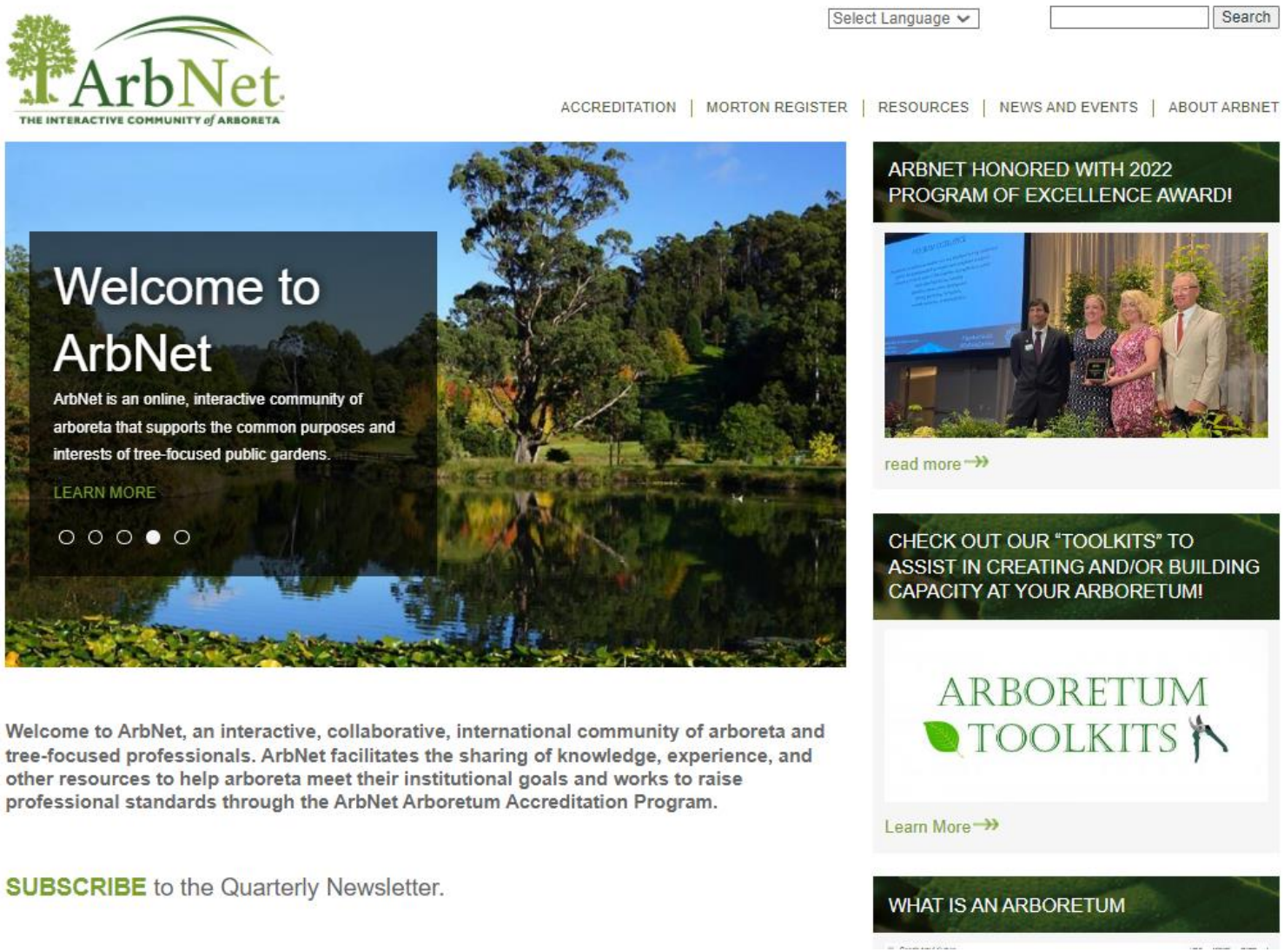
Arboretum - a living, outdoor tree museum

Accreditation - a recognition of achievement based on a set of requirements

ArbNet accredited arboretum- a designated space that fulfilled the requirements of ArbNet to achieve this official status

ArbNet

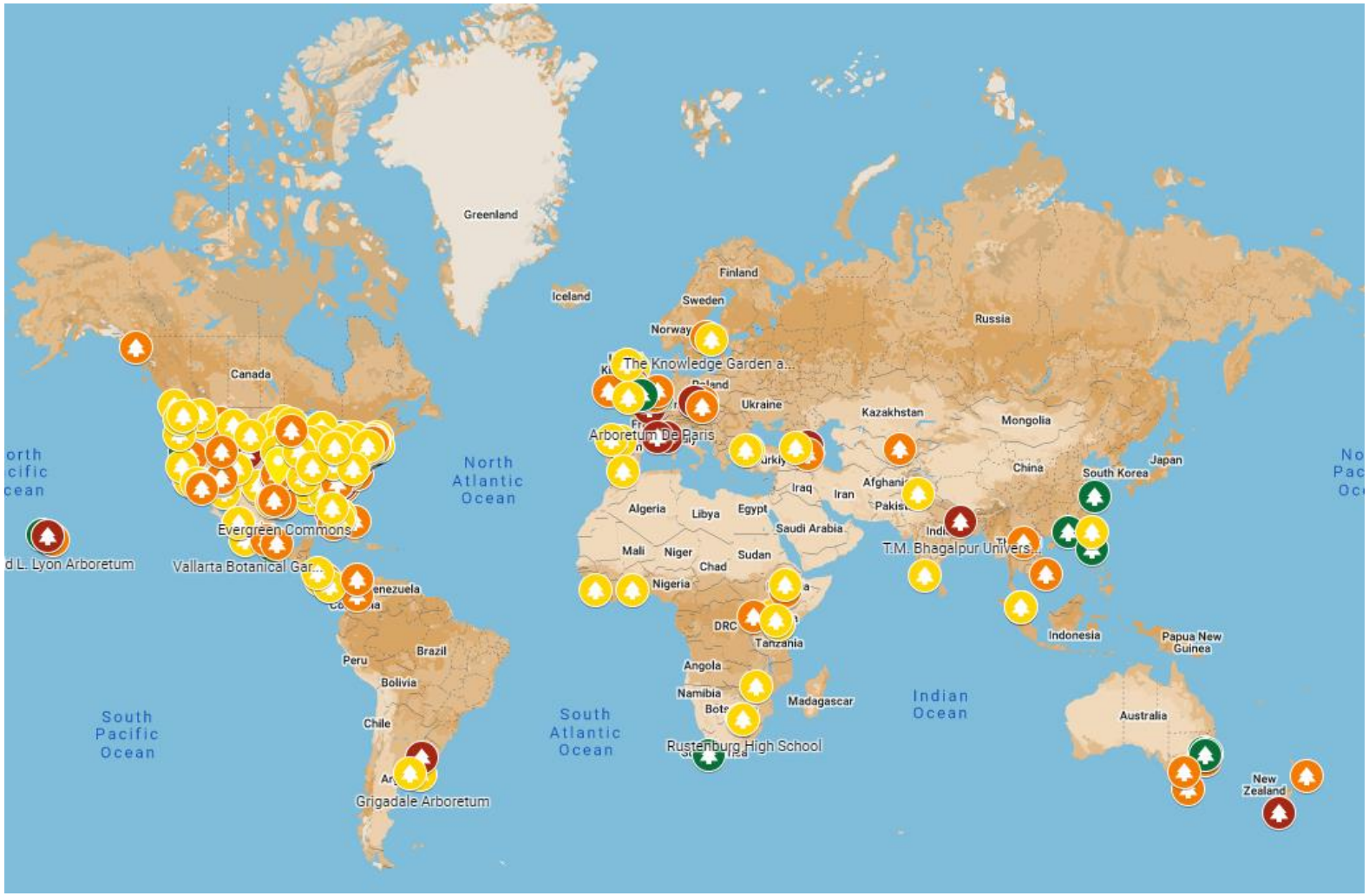
- Recognizes arboreta that have achieved a certain level of tree diversity and professional care through the ArbNet accreditation program



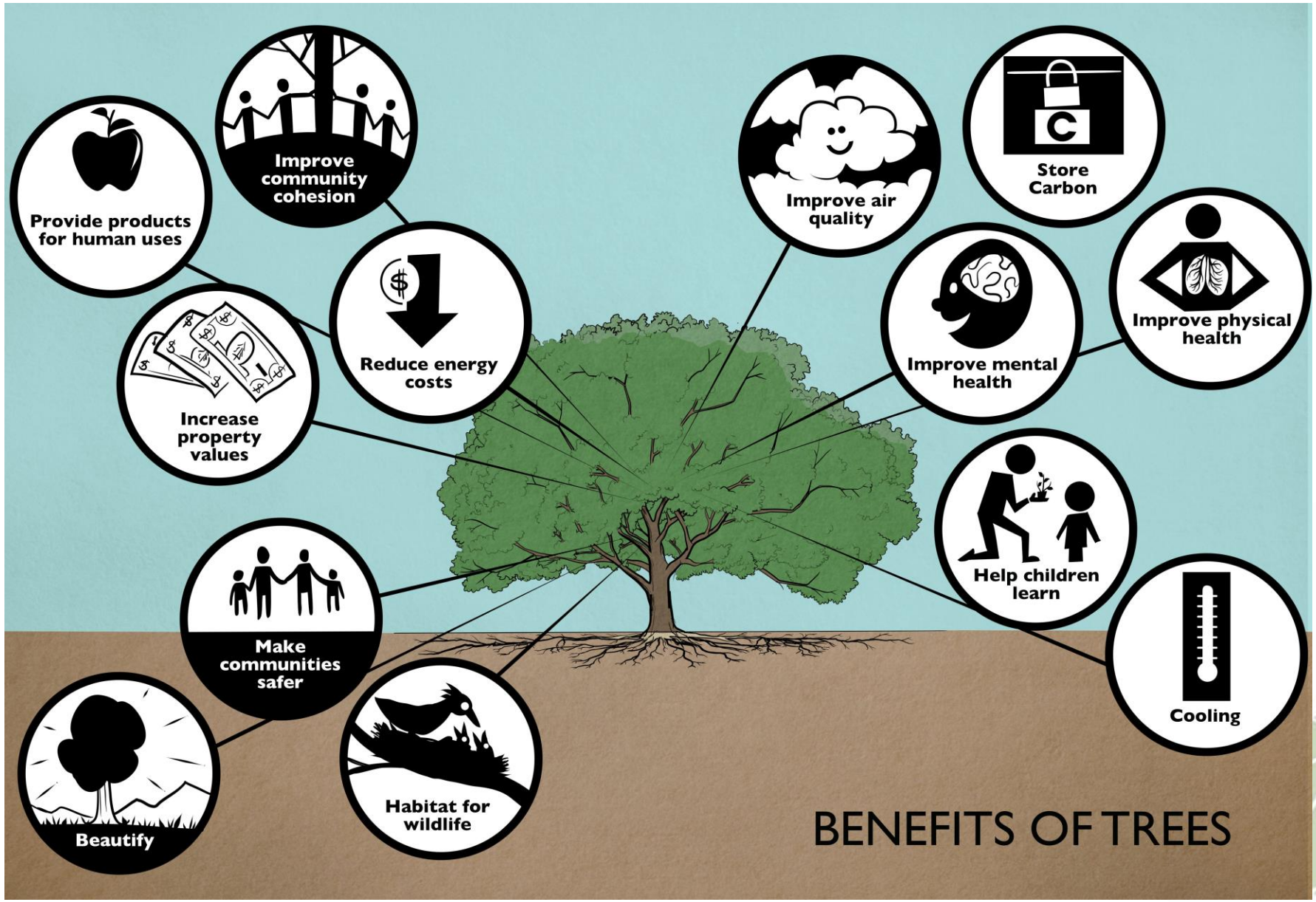
ArbNet Arboretum Accreditation Program

	LEVEL I	LEVEL II	LEVEL III	LEVEL IV
Arboretum plan	■	■	■	■
Organizational or governance group	■	■	■	■
Labeled tree and woody plant taxa				
25+	■			
100+		■		
500+			■	■
Staff or volunteer support				
Volunteer or paid	■			
Paid management		■	■	■
Curator			■	■
Scientific or conservation staff				■
Public dimension				
Public access and at least one event per year	■	■	■	■
Enhanced public and educational programs		■	■	■
Substantial educational programming			■	■
Collections policy		■	■	■
Collaboration with other arboreta			■	■
Collections data sharing with networked collections			■	■
Agenda for tree science, planting, and conservation			■	■
Collections conservation				■

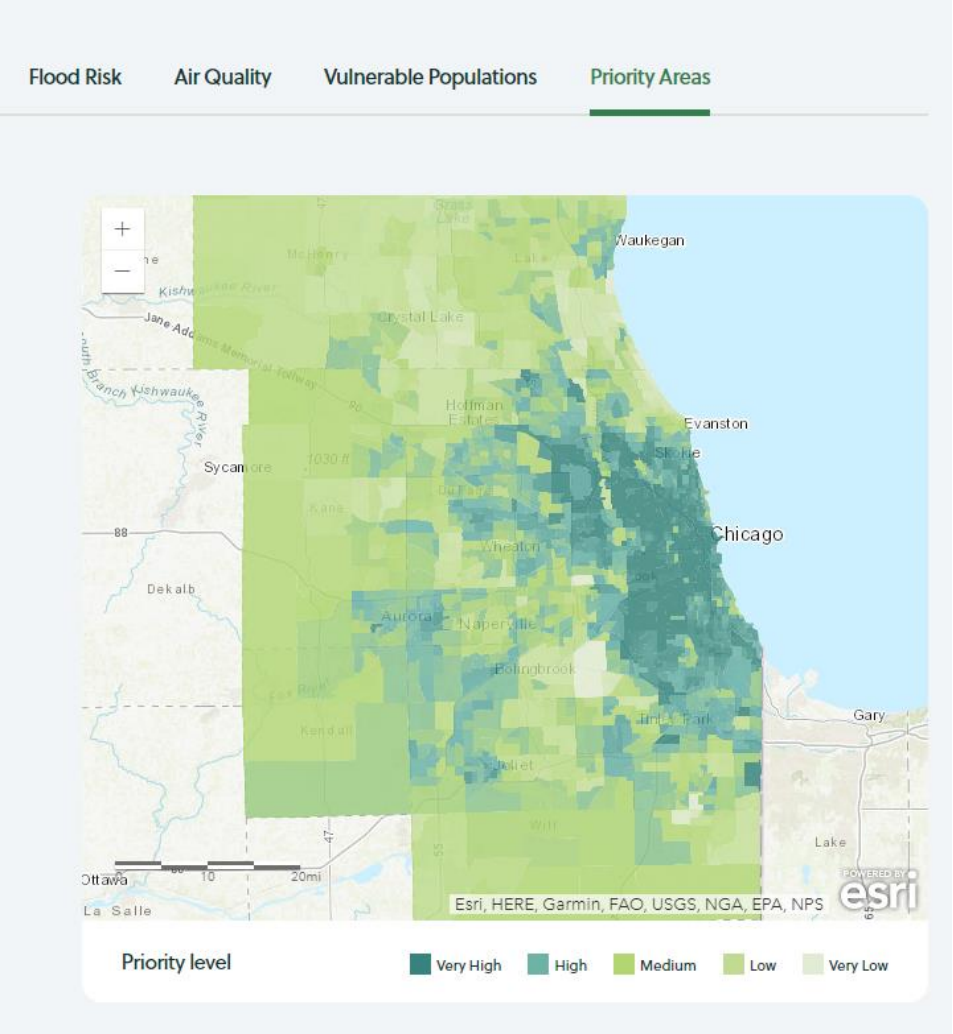
600+ accredited arboreta across the globe

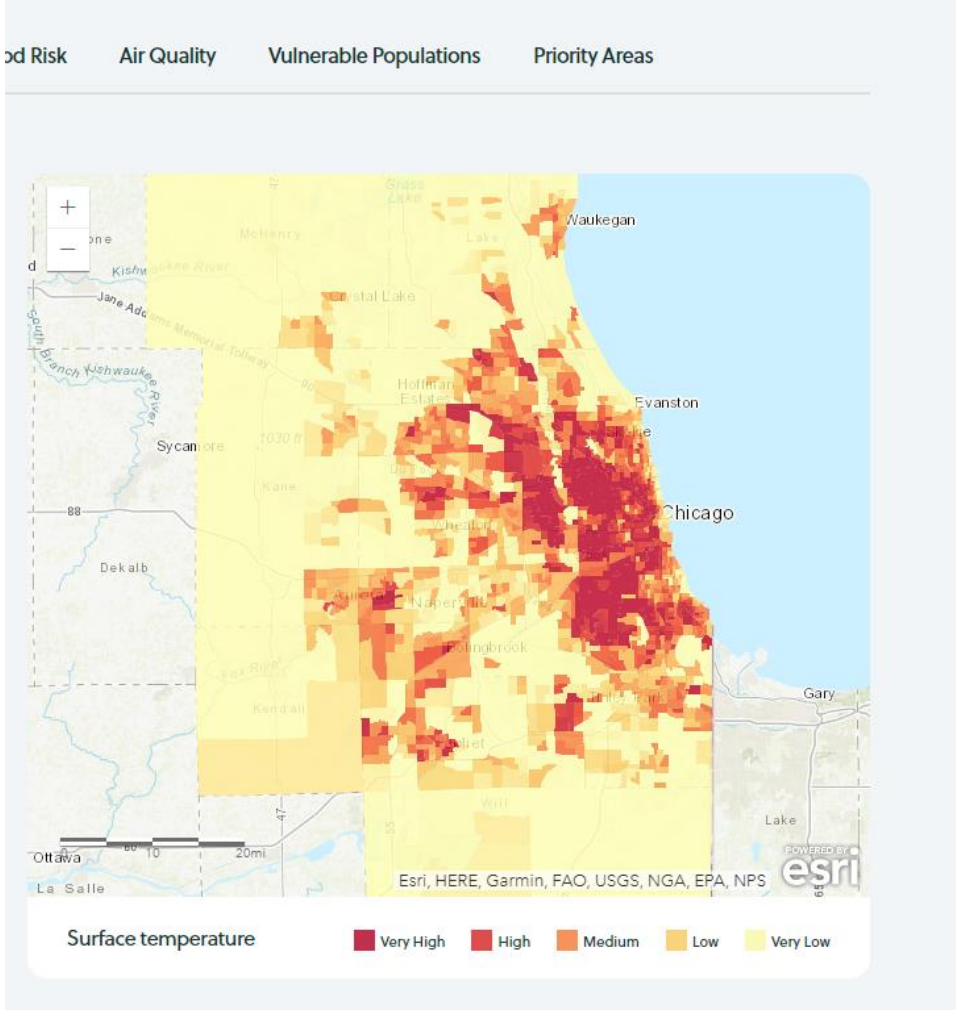


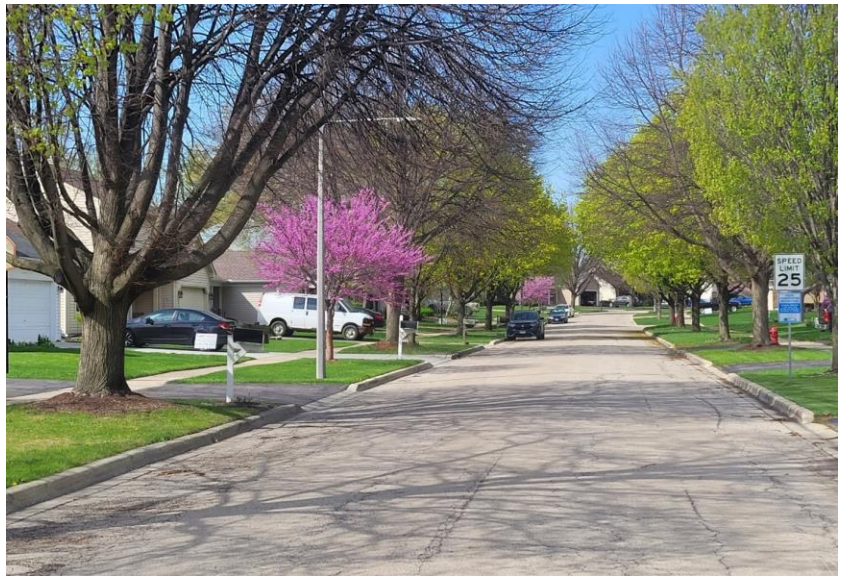
PAUSE FOR A
MASSAGE


Provide products for human uses
Improve community cohesion
Reduce energy costs
Increase property values
Improve air quality
Store Carbon
Improve mental health
Improve physical health
Help children learn
Cooling
Make communities safer
Habitat for wildlife
Beautify
BENEFITS OF TREES

Trees and the benefits they provide are not equitably distributed in the Chicago region






SPEED
LIMIT
25

Building Relationships

- Focus groups with community leaders
- Community tree plantings
- ArbNet Trainings
- Survey
- One on Ones (relationship building)
- Volunteering time for their projects

John Mazur Arboretum, Franklin Park IL

Start by Listening

- Provide resources to support communication on the benefits of trees
- Increase accessibility of tree inventories
- Increase connectivity and resource sharing between community-led arboreta

John Mazur Arboretum, Franklin Park, IL

Elevate existing community goals and achievements

LAKE COUNTY NEWS-SUN

Waukegan middle school students plant fruit trees program; ‘Doing this will make our planet better’

By Steve Sadin
Lake County News-Sun • Apr 13, 2023 at 11:41 am

What can **you** do to support diverse arboreta and the communities they serve?

- Meet your communities where they are at
- Understand what is important to community members - *not* what you think is important
- If there is arboretum interest, you can use the ArbNet accreditation criteria as a guide

What can **you** do to support diverse arboreta and the communities they serve?

- Become a part of the ArbNet network → free accreditation program
- Sign up for our newsletter to learn about upcoming opportunities for community-led arboreta!
- Reach out: Andrea Brennan, ArbNet Leader, abrennan@mortonarb.org

Thank you

This project was made possible in part by the Institute of Museum and Library Services [Grant #: ARPML-250622-OMLS-22].

Colette Copic, Sue Paist | The Morton Arboretum

arbnet@mortonarb.org

INSTITUTE of Museum and Library SERVICES

Food and Agriculture Organization of the United Nations

Arbor Day Foundation

POLITECNICO MILANO 1863

ISA

Smithsonian

CEUs

Session 1.6: The Garden of Eden: The role of food forests and urban agriculture in promoting healthy and nutritious food

PP-23-3560

World Forum on Urban Forests