



Creating urban agroforests in interstitial city spaces

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Creating Urban Agroforests

Residents of urban areas are often far removed from food production and deeply in need of more accessible green spaces. A special issue in *Urban Agriculture & Regional Food Systems* points to urban agroforests as a solution that meets city-dwellers needs. Here, UARFS editor Sarah Lovell is among scientists and citizens who explain what, exactly, an urban agroforest is, and how we can design and maintain these important spaces.



Jerome Ostentowski, the Central Rocky Mountain Permaculture Institute's founder, in "Phoenix," the large tropical greenhouse/indoor food forest. Photo by Jim Allen.

It's hot. Unbearably hot. The sun ricochets off the windows of storefronts and builds below your feet. Could you fry an egg on the sidewalk today?

You're half a block away and already you can feel it: a cool breeze. It whispers along your cheek, soothes your aching feet as the pavement chills. As you open the gate, you see a few sheltering overstory trees, some shorter fruit trees, a curving path edged by hedges filled with late-summer berries and swaths of herbs growing below. A pack of schoolkids harvests tomatoes from raised beds as a group of gardeners learns about grafting fruit trees in a clearing behind them.

Idyllic, isn't it?



From top to bottom, here are seven layers of production in a food forest: Overstory trees, fruit/nut trees, shrubbery, annuals/perennials, groundcover, aquatic, and fungal layers. Within a city, an urban agroforest serves as both a means of producing food and as a green space for city residents to enjoy. Graphic by Karen Brey.

This is just one possibility for an urban agroforest. They're multifunctional agricultural spaces embedded in the fabric of a city with layers of perennial growth mimicking natural ecosystems while providing produce for their caretakers.

Researchers like Sarah Lovell, Editor of [Urban Agriculture & Regional Food Systems](#)

(UARFS), see urban agroforests as the future for bringing nutritious food and pleasant green spaces to the city residents who need them most.

Here, Lovell is among a top-notch group of scientists digging into the science of urban agroforestry in a new special issue in UARFS.

They'll describe what it takes to design these spaces and how they can make use of often overlooked resources, providing a slew of benefits to the communities who build them.

What is an Urban Agroforest?

A food forest (or forest garden) is a multilayered polyculture space. It's mostly made up of perennial species with up to seven different layers of life. At the top, an overstory layer of trees provides shade and shelter; below that, midstory trees bear fruit or nuts; shrubs cluster beneath those trees, yielding berries or other fruits. At the lowest levels, food forests include herbaceous perennials and annuals, ground cover, root crops,

vines, and fungi. Sometimes you'll even see an aquatic layer, like a stream or pond.

The food forest is as old as agriculture itself. James Allen, former Executive Director of the school of Forestry at Northern Arizona University, likens the food forest to the tropical home garden, where homeowners make valuable, multi-level use of the space right outside their front doors.

"The tropical home garden predates grocery stores," Allen says. "They date back to an era when people had to produce their own food if they were to survive."

The more modern concept of a temperate, urban agroforest has its roots in the "permaculture" movement, a portmanteau of "permanent agriculture" coined by **Bill Mollinson and David Holmgren** in Australia in the 1970s. The ideal permaculture site is a closed system that makes use of any waste it generates, often incorporating livestock, on-site composting, and harvested water resources. The collaboration of Mollinson and Holmgren spurred the **Permaculture Institute**, which issues a **Permaculture Design Certificate** to folks who complete their classes. They're often amateur gardeners or horticulturists, and there's been a real opportunity for scientists to turn their gazes on this holistic method of production.

"We know a lot about agroforests in rural areas, from wind buffers to riparian zones," Lovell says. "But there's definitely room to research the ecosystem services aspect of urban agroforests, and about whether fruit and nuts grown on trees will be safer to eat than ground crops grown in urban soils."

But in urban areas, an agroforest can provide more than just food.

More than 80% of the **U.S. population** lives within urban areas. At the same time, supermarkets selling fresh produce have steadily moved into suburban areas, leaving "

food deserts” in city centers. These deserts, where low-income residents have little access to vegetables, fruits, and whole foods, are associated with higher rates of **chronic disease**.

Food forests, then, could fight food insecurity and provide the positive psychological benefits of green spaces, too. In fact, a recent study in the **Journal of Happiness** found that spending time outdoors was correlated with higher emotional well-being in Austrian citizens during the 2020 COVID-19 lockdowns. Plus, an **Urban Forestry & Urban Greening** review in 2021 found that more biodiverse, natural-looking urban green spaces contributed most positively to the mental health of city dwellers.

Finally, urban agroforests provide notable benefits to urban infrastructure.

“There are so many ecosystem benefits from having more trees in urban environments,” Lovell says. Tree canopy cover can help city planners control microclimates and mitigate the urban heat island effect. Another is the ability of tree roots to help with stormwater infiltration and treatment. “But more importantly, they help people engage with food production and positively impact human health.”

So what’s the best way to design an urban food forest?

Designing an Urban Agroforest

“One of the biggest challenges is finding land,” says John Taylor, an assistant professor at the University of Rhode Island. Though **guerilla gardeners** can make do with small, transient spaces to grow annual plants, planting a tree is a whole different ball game. Urban land is often incredibly expensive, and landowners of vacant lots used for community gardens could sell those spaces for valuable development at any time.

“Someone who is interested in starting a community food forest might want to work with a land trust—or with city government to identify city-owned land that might be transferred to a land trust—for the development of a food forest,” Taylor says.

Once you have the land, it’s time to design the site. Cohesive design principles are at the heart of Taylor and Lovell’s special issue contribution, “Designing Multifunctional Urban Agroforestry with People in Mind” (<https://doi.org/10.1002/uar2.20016>).

The pair first recommend assessing how the location’s position within the city will impact the forest. Buildings may provide some shelter from wind and sun, but they can also increase wind speed and amplify heat. The (often) poor quality of urban soils could mean you need to add organic matter, decrease compaction, or check for contamination. Once you understand the physical limitations and assets of the site, you can remedy them. You could recover nutrients and carbon from organic waste, harvest rainwater from rooftops or greywater from nearby buildings, and group plants that will work in tandem with the typical light, heat, and water availability of the space.

Design in hand, it’s time to pick plants.

“These spaces are an opportunity for people to grow culturally important plants—things they couldn’t necessarily get at the grocery store,” Taylor says. It’s important to make sure the fruits, vegetables, and nuts grown in the forest are varieties



Brad Lancaster (left) talking with James and Katherine Allen. Note the traffic-calming chicane to the right and the welcome shade provided by the larger trees on the left. Photo by Andy Mason.

that community members will eat.



The Dunbar/Spring Neighborhood Community Garden. Note: this has now been leased to a private individual who has a small business on the site. Photo by Jim Allen.

At the same time, Taylor and Lovell recommend starting with a backbone of regionally adapted native plants to construct the infrastructure of the agroforest.

“For your long-lived perennials, choose natives,” Lovell advises. “Then fill in the gaps with annual plants for variety. Those plants can change over time with the community’s preferences, too.”

Not only do native perennials provide edible fruit and nuts, they also provide important habitat for other native species like insects and birds.

Lovell and Taylor also highly recommend including educational experiences and signage. Including education or outreach is a great way to get continued involvement and funding for the space. And informative signs and placards spaced throughout the forest can help give context to folks who might see these spaces as “messy.”

“In the U.S., we’re conditioned to see a manicured front lawn—perfectly mowed, no weeds, no leaves—as something to strive for,” Lovell says. “But if you can adjust people’s perceptions through education, it’s totally possible for people to see ‘messy’ systems are beautiful.”

Finally, including multifunctional gathering spaces provides another layer of utility within the food forest. Things like well-spaced park benches, picnic tables, or open

clearings can create natural resting or meeting places for community members. The location of the food forest matters, too. Taylor pictures them as “pocket parks,” while Lovell describes them as possibilities for the underutilized, “interstitial spaces” within cities.

“These spaces are at the intersection of nature and culture,” Taylor says. “In urban areas, we need more green spaces in places people can interact with them. And by incorporating these into neighborhoods where there has been a history of redlining or less public investment in trees, we can fight urban heat island effects. We can produce food. It’s a win-win.”

Finding Inspiration in the Southwest

There’s one last thing we need to talk about: maintenance. After you’ve done the hard work of planning and planting a food forest, how do you take care of it?

Jim Allen’s done the heavy lifting for us. In his special-issue contribution, “Urban Food Forests in the American Southwest,” he and his coauthor Andrew Mason (retired Director of the [USDA National Agroforestry Center](https://www.usda.gov/nac)) conducted a snowball sample of 14 food forests spanning Arizona, Colorado, New Mexico, and Utah (<https://doi.org/10.1002/uar2.20018>). The two visited these food forests, interviewed their owners when possible, and drew important inspiration for the future.

“What’s most amazing about food forests here in the Southwest is that people are making really creative use of water,” Allen says. “They’re growing low water-use plants that also produce food, and in one neighborhood in Tucson, they’re harvesting rainwater, using monsoon rains to fill up infiltration basins.”

This neighborhood—Dunbar/Spring—was inspired by a resident named Brad Lancaster, who started by converting his own yard to a food forest that requires minimal water.

Before long, he was helping neighbors do the same and using permaculture principles to create miniature agroforests in public spaces like traffic circles and chicanes.

As Allen and Mason showed in their paper, Lancaster uses more than Tucson's 11 inches of yearly rainfall—he also harnesses greywater from his outdoor shower and washing machine to water multiple trees on his property. In fact, he has a nifty hose connected to his washer that he switches between pipes leading to different trees in his yard, effectively reusing and filtering water that would otherwise move through the wastewater system. Lancaster, in fact, gave a [TEDx talk](#) in 2017 about his experiences.

"Visiting these gardens made me feel so optimistic about what can be done," Allen says. "There's so much food we could be producing without increasing our water use. We could be making good use of water that would otherwise be wasted."

In another example of a private citizen making strides in urban agroforestry, Beverly Todd created the Crestview Forest Garden in her own backyard in Farmington, NM. For the past 20 years, Todd has planted, harvested, and maintained a thriving forest with more than 160 different species, ranging from towering Siberian elm trees to underground sunchokes and everything in between.

"People think starting a food forest has to be expensive, but it doesn't," Todd advises. "Go slow; plant what you can each year. I got a lot of trees from the New Mexico Conservation Seedling Program, and if you're willing to be patient, they're very



Brad Lancaster's washing machine grey water system. The outlet pipe from the washing machine can be moved to provide water to four different fruit trees. Photo by Andy Mason.

affordable.”

Todd also recommends attending seed-sharing events, learning skills like grafting fruit trees, and finding ways to exchange seedlings or starts with friends and neighbors. She opens her garden to others, offering them bulbs, cuttings, and plenty of produce to take home.

Like the Dunbar/Spring neighborhood, her food forest is more than just her personal project—it inspires others to try their hand at growing more of their own food. Todd and Lancaster serve as poignant images of how private citizens have pioneered urban agroforests in challenging places.

But there is still much that researchers can contribute.

In the future, Lovell hopes to see (and do!) more research about the psychological and social benefits of these spaces. There’s a wide-open space for collaboration with communities and scientists to continue testing whether fruits and nuts grown on woody perennial species are **safe to eat**—and how city residents perceive the safety of food grown in urban food forests. But most of all, there are opportunities to bring people closer to their food, instilling them with new knowledge and a sense of self-sufficiency.

Ultimately, one of the biggest benefits of food forests may just come from the connections that their caretakers form with the land and the place in which they live.

Dig Deeper

Journal Articles

The special Urban Agroforestry issue from *Urban Agriculture & Regional Food Systems* can be found here: <https://bit.ly/3ryQs1X>.

Read Lovell's editorial, "Urban Agroforestry and Its Potential Integration Into City Planning Efforts," here: <https://doi.org/10.1002/uar2.20000>.

Read Allen and Mason's article, "Urban Food Forests in the American Southwest," here: <https://doi.org/10.1002/uar2.20018>.

Read Taylor and Lovell's article, "Designing Multifunctional Urban Agroforestry with People in Mind," here: <https://doi.org/10.1002/uar2.20016>.

Podcasts

Check out these new/upcoming episodes of the Societies' podcast, *Field, Lab, Earth* (available at <https://fieldlabearth.libsyn.com>):

- On 18 Mar. 2022, Dr. Sarah Lovell discusses multifunctional agroforestry and how it can be used at the landscape level.
- On 15 Apr. 2022, Dr. John Munsell discusses public food forests and their challenges in small municipalities.

Books

Read the revised Third Edition of *North American Agroforestry*, edited by Harold E. "Gene" Garrett, Shibu Jose, and Michael A. Gold. This authoritative and insightful exploration of alternative land use systems demonstrates the positive interactions between trees and crops when they are grown together.

Find it by going to Wiley.com and searching for the book title—use code "NAA35" for 35% off until 30 Mar. 2022.

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