URBAN FOOD FORESTRY

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LUCSUS Lund University Centre for Sustainability Studies

A Multifunctional Strategy for Enhancing Landscape Sustainability

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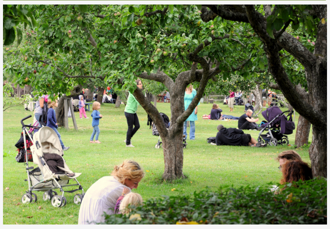
URBANFOODFORESTRY.ORG

Urban Food trees can contribute to food security and climate resilience

Rapid global urbanization and climate change challenge urban sustainability. Ensuring food security for the 70% of the projected 9 billion people who will live in cities in 2050 is an increasing challenge, as urban food supplies are presently characterized by their vulnerability to energy price volatility, world market instability, and extreme weather conditions. Here we propose and test the benefits of "urban food forestry": the practice of growing perennial woody food-producing species ("food trees") near where people live in dense settlements, where the produce may be best utilized.

Urban Food Forestry in Brief



Public Orchard in Stockholm, Sweden

By combining the social, economic and environmental benefits of urban forestry and urban agriculture, urban food forestry represents a uniquely multifunctional land use. These benefits are being recognized by a growing number of municipal governments and urban citizens, as evidenced by a sharp rise in funding and donations for urban food forestry projects.

Innovative cities plan for urban food forestry, but most focus on food for wildlife, not people

We analyzed the contents of 30 urban forestry master plans from cities across North America (2099 pages in total) and determined that **the majority (23 cities, or 77%) did not mention "fruit" or "food" in the context of human consumption, but did mention "wildlife," implying that urban forest planning currently prioritizes wildlife habitat over food for human consumption.** However, four recently completed master plans (3 in British Columbia and 1 in California) incorporated food tree planting into their plans. Furthermore, we found that municipal governments were frequently spearheading or collaborating with citizens on UFF initiatives, sometimes on very large scales (such as in Vancouver).

Designing initiatives to plant, map, and harvest food trees would maximize the benefits of urban food forestry

Figure 1. The "Three Pillars" of urban food forestry

We identified 37 initiatives in North America and Europe through an iterative online search, and analyzed their mission statements and activities. We developed a framework for the "Three Pillars" of UFF (Figure 1): planting, mapping, and harvesting. Planting initiatives focus on establishing public orchards, or planting food trees in public parks. Mapping initiatives typically use Google Maps to collaboratively map urban fruit trees, such as shown for San Francisco below (Figure 2). Harvesting initiatives focus on gathering fruit from both publicly- and privately-owned trees, and often have websites where community members can register their trees for picking. A major portion of harvested produce is donated to food banks, and several projects harvest over 20,000 pounds per year. **We found that only three initiatives (or 8%) engaged in all three activities (planting, mapping, and harvesting), and 73% engaged in only one of the three activities. (See an updated version of the initiative analysis, plus news and resources, at urbanfoodforestry.org).** Mapping can help visualize the urban food forest in relation to areas where fruit and vegetable consumption are likely to be lowest, and help prioritize future plantings based on local need (Figure 2).

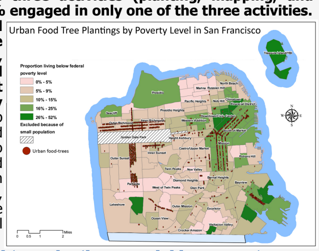


Figure 2. Urban food tree plantings overlaid on poverty map of San Francisco, which could be used to guide future plantings. (Data from urbanforestmap.org and U.S. Census)

Case study: Modest plantings of apple trees on public land could meet the caloric gap of the entire food-insecure population in Burlington, VT

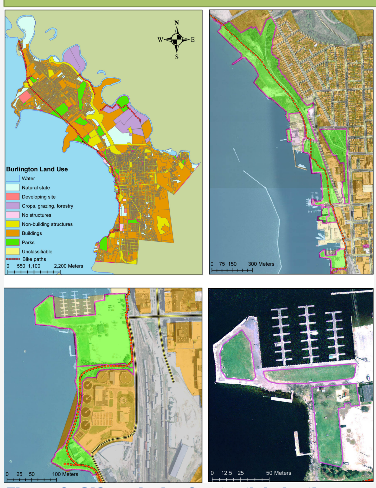


Figure 3. GIS analysis of potential planting areas (green) of current open space in Burlington, VT

We used GIS to **identify 180 ha of publicly accessible open space in Burlington, Vermont, which could be potentially planted with food trees (Figure 3)**, which represents 4.5% of total city area. We then analyzed the productive capacity of this land (Figure 4).

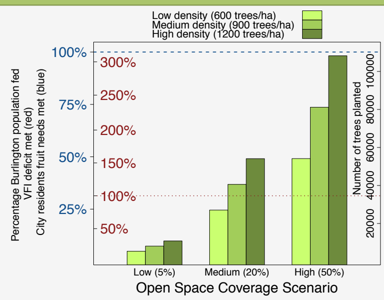


Figure 4. Apple production capacity of open space in Burlington, VT under 9 planting scenarios

We calculated the potential caloric yield of Burlington's open space under 9 different planting scenarios (planting trees at low, medium, or high density on 5%, 20%, or 50% of available public open space), assuming apple trees were planted and received no chemical inputs. These yields were compared to the caloric needs of the "very food insecure" (VFI) population of Burlington, based on USDA data, as well as the minimum daily fruit intake recommended by the World Health Organization (200g/day). We calculated that each mature apple tree could yield over 13,000 edible kilocalories per year, and that **100% of the Very Food Insecure population's caloric deficit could be met by planting 16% (29 hectares) of Burlington's open space at a modest density of 900 apple trees per hectare.** The minimum recommended fruit intake of 98% of Burlington's entire population could be met by planting half of available open space at half the density of commercial orchards (Figure 4).

Thirty tree species recommended for urban food forestry, based on edibility and climate resilience

Latin name	Type of plant	Common name	Commercially Cultivated for food?	Widely recognized and marketed?	Palatable when eaten raw?	Can be eaten without special preparation?	Edibility Rating	Hardy to (degrees Celsius)	Drought tolerant?
Vaccinium angustifolium	Short bush	Lowbush blueberry	Yes	Yes	Yes	Yes	5	-40	Yes
Vaccinium corymbosum	Tall bush	Highbush blueberry	Yes	Yes	Yes	Yes	5	-40	Yes
Malus domestica	Tall tree	Apple	Yes	Yes	Yes	Yes	5	-40	Yes
Prunus cerasus	Short tree	Sour cherry	Yes	Yes	Yes	Yes	5	-40	Yes
Vitis labrusca	Vine	Fox Grape	Yes	Yes	Yes	Yes	5	-35	Yes
Pyrus communis	Large tree	European pear	Yes	Yes	Yes	Yes	5	-30	Yes
Fragaria vesca	Groundcover	Alpine strawberry	Yes	Yes	Yes	Yes	5	-30	Yes
Vaccinium membranaceum	Short bush	Black huckleberry	Yes	Yes	Yes	Yes	5	-30	Yes
Rubus fruticosus	Short bush	Blackberry	Yes	Yes	Yes	Yes	5	-25	Yes
Pyrus pyrifolia	Short tree	Asian pear	Yes	Yes	Yes	Yes	5	-25	Yes
Lycium barbarum	Short tree	Goji berry	Yes	Yes	Yes	Yes	5	-25	Yes
Prunus armeniaca	Short tree	Apricot	Yes	Yes	Yes	Yes	5	-20	Yes
Hippophae rhamnoides	Large bush	Sea buckthorn	Yes	No	Yes	Yes	4	-40	Yes
Amelanchier alnifolia	Short tree	Saskatoon	Yes	No	Yes	Yes	4	-40	Yes
Lonicera caerulea	Short bush	Haskap, honeyberry	Yes	No	Yes	Yes	4	-40	Yes
Pinus koraiensis	Tall tree	Korean pine nut	Yes	Yes	Yes	No	4	-35	Yes
Castanea mollissima	Tall tree	Chinese chestnut	Yes	Yes	Yes	No	4	-25	Yes
Lycium chinense	Short tree	Chinese boxthorn	Yes	No	Yes	Yes	4	-25	Yes
Prunus cerasifera	Short tree	Cherry plum	No	Yes	Yes	Yes	4	-25	Yes
Diospyros virginiana	Large tree	American persimmon	Yes	Yes	Yes	No	4	-25	Yes
Ziziphus zizyphus	Tall tree	Jujube	Yes	No	Yes	Yes	4	-20	Yes
Corylus americana	Short tree	American Filbert	Yes	Yes	Yes	No	4	-20	Yes
Passiflora incarnata	Vine	Maypop	Yes	Yes	Yes	No	4	-20	Yes
Prunus tomentosa	Short tree	Nanking cherry	No	No	Yes	Yes	3	-40	Yes
Elaeagnus multiflora	Tall bush	Goumi	No	No	Yes	Yes	3	-35	Yes
Cornus mas	Short tree	Cornelian cherry	No	No	Yes	Yes	3	-25	Yes
Morus alba	Large tree	White mulberry	No	No	Yes	Yes	3	-20	Yes
Castanea sativa	Large tree	Sweet chestnut	Yes	Yes	No	No	3	-20	Yes
Morus nigra	Large tree	Black mulberry	No	No	Yes	Yes	3	-20	Yes

Table 1. Climate-Food-Species Matrix: Recommended Urban Food Trees for Temperate Climates

We assessed the 250 urban forestry species identified in the "Climate-Species Matrix" of Roloff et al. (2009) for food production potential using 5 edibility criteria. From these, we identified 19 suitable food trees, and added 51 species from our own research. Of the 70 total species on the resulting Climate-Food-Species Matrix, **we found 30 species to be highly suitable for urban food forestry in temperate climates based on their cold and drought tolerance, as well as edibility (Table 1). These can be used as a guide to urban planners in selecting suitable urban food trees.**

Acknowledgements & References

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CHANS-Net International Network of Research on Coupled Human and Natural Systems

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