

ACSA Collaborative Practice Award

2015-2016 Winner Submission Materials

FAYETTEVILLE 2030: FOOD CITY SCENARIO

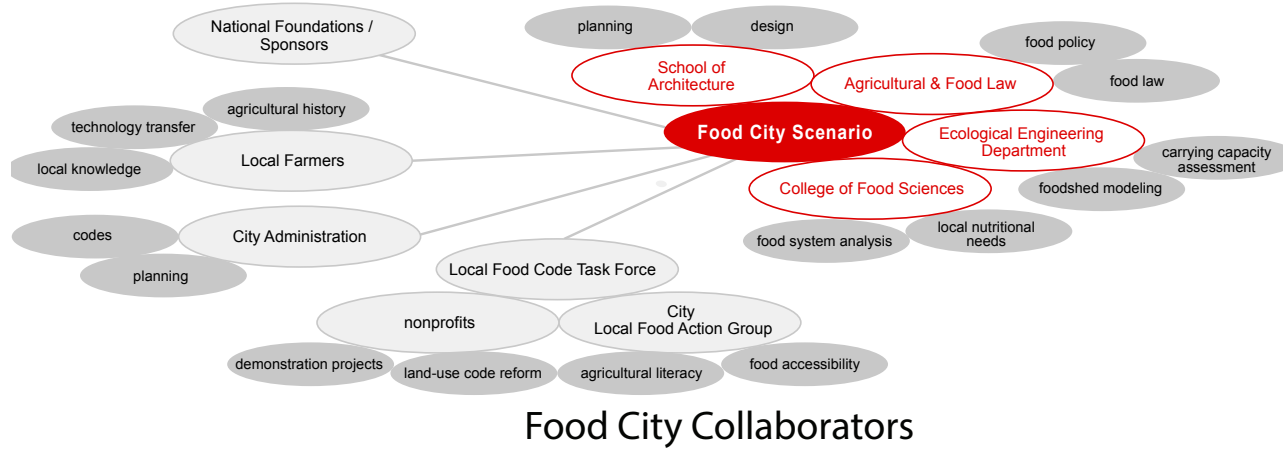
STEPHEN D. LUONI

University of Arkansas

JEFFREY ERWIN HUBER

Florida Atlantic University

Fayetteville 2030: Food City Scenario



Research and Design

- nutritional analysis and landscape carrying capacity assessment for place
- development of scenarios as a planning and design tool
- design frameworks and tools that solve for complex sociocultural problems
- development of food literacy and effective design communication



Report #1
Fayetteville Food Security Metrics

+



Report #2
Fayetteville 2030: Food City Scenario Plan

Awards

- 2012-2013 Decade of Design Grant, American Institute of Architects + Clinton Global Initiative
- 2013 WAN Award for Urban Design: Shortlist
- 2014 CNU Charter Awards: Award of Merit for Best Planning Tool
- 2014 Honorable Mention: 61st Progressive Architecture Award
- 2014 Honorable Mention 61st Progressive Architecture Award
- 2015 EDRA/Places Award of Place Design, Planning and Research
- 2015 Green GOOD DESIGN Award by European Center for Architecture Art Design and Urban Studies

Conferences

- 2014 Annual Meeting of The Congress for the New Urbanism, Buffalo NY
- 2014 AIA Design and Health Summit, Washington DC

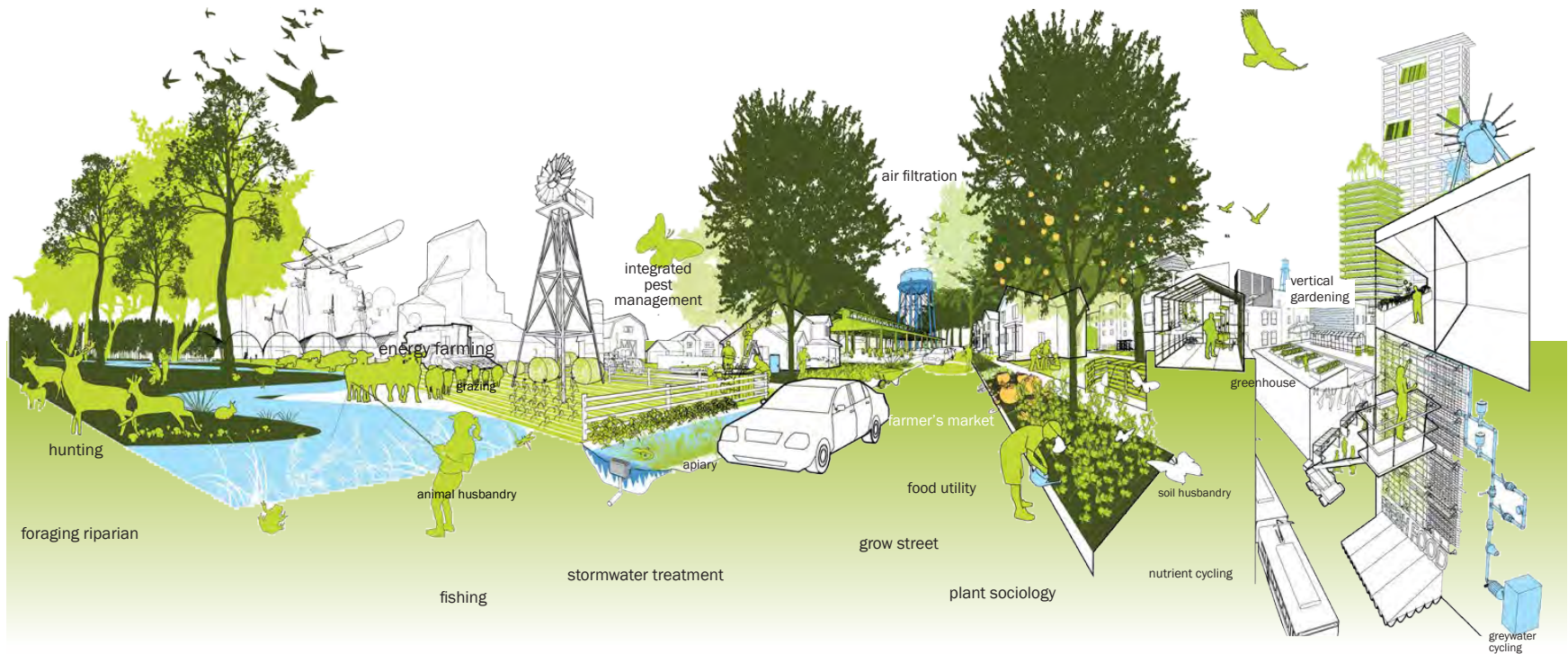
Publications

- Nalina Moses, "The Newest Multi-disciplinary Trend in Architecture Education: Public Health", *AIArchitect*, November 8, 2013, <http://www.aia.org/practicing/AIAB100479>.
- Kim A. O'Connell, "Health Conscious", *Architect*, February 2013, pp 38-39.

Collaborative Process and Impacts

Food City is the result of a multidisciplinary process that addressed municipal-wide nutritional requirements, waste streams, activity centers, social programs, and public policies necessary for implementation.

Fayetteville will double its built environment by 2030. How might that projected growth be harnessed to sustain its food budget through a local urban agriculture network?

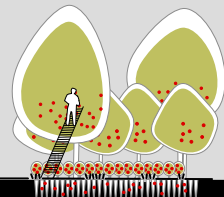
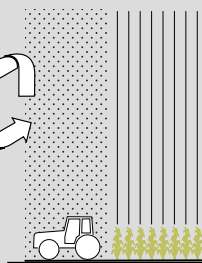
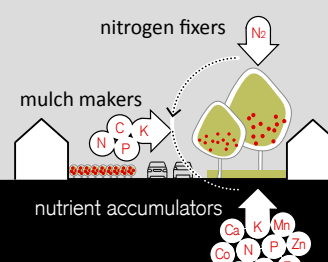
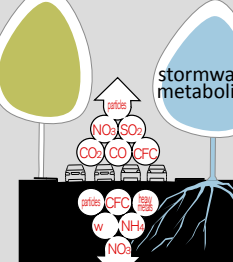
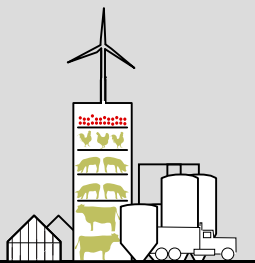

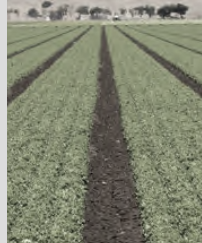





To feed the city through middle scaled food production – inbetween that of the factory farm and the individual garden – you need:

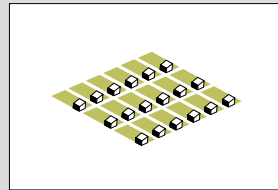
- **Five urban growing guilds**
- **Twenty-two agricultural urban real estate products**
- **Four types of agricultural urban infrastructure**

28% of Fayetteville children are food insecure, the highest rate in the nation. *Food City* realigns growing technologies with urban areas to meet future needs.

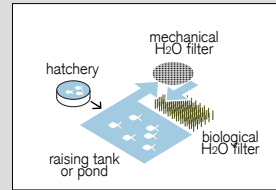
The Five Urban Growing Guilds

<p>fortress plants protect from invasive flora and fauna</p> <p>insectary plants attract insect pollinators</p> <p>repellent plants secrete compounds to repel pests</p> 		<p>nitrogen fixers</p> <p>mulch makers</p> <p>nutrient accumulators</p> 	<p>air scrubber</p> <p>stormwater metabolizer</p> 	
				
<p>permaculture and foraging</p> <p>Permaculture and foraging landscapes like edible forest farms are related to successive perennial landscapes and existing woodlands.</p>	<p>farming and gardening</p> <p>Farming and gardening requiring management of annual landscapes.</p>	<p>GROW street™</p> <p>GROW streets (Gardened Right-of-Way) are associated with public right-of-ways involving orchard-lined streets, fruit and nut boulevards, and edible front yards.</p>	<p>pollution remediation</p> <p>Pollution remediation landscapes support safe urban growing primarily through low impact stormwater management and carbon sinks for air pollution.</p>	<p>waste-to-energy</p> <p>Waste-to-energy districts recycle concentrated production and consumption waste streams from some operations as energy for others.</p>
<p>application: Steep slopes and sites with natural tree cover.</p>	<p>Flat land with access to irrigation.</p>	<p>Retrofitting unused green space or existing streets.</p>	<p>Reactive to high-pollutant site runoff.</p>	<p>Retrofitting wastewater treatment plants.</p>

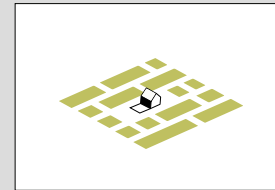
Twenty-Two Agricultural Urban Real Estate Products



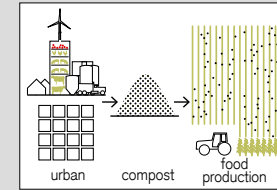
1. allotment garden
often a permanent garden subdivided into parcels for individual non-commercial gardening.



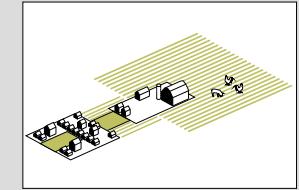
2. aquaculture facility
complex for the farming of aquatic organisms, including fish, crustaceans, mollusks, and plants in closed loop systems.



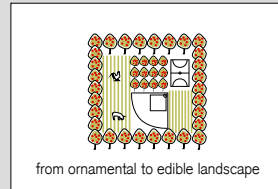
3. community garden
contrary to allotment gardens, this non-commercial garden space is open access and tended collectively by participating gardeners.



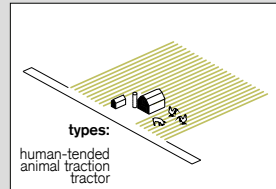
4. composting network
nutrient management of organic waste mixtures through the collection, sequester, and upcycling of decomposed matter into fertilizer for agricultural production.



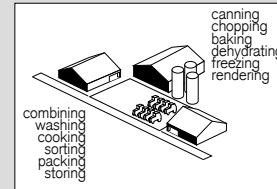
5. development-supported agriculture (DSA)
a residential real estate development that incorporates preservation or incubation of agricultural land use as its primary organizing structure.



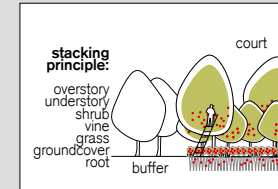
6. edible park
public landscape with mixed uses, including food production which privileges the growing of edible plant communities for harvesting or foraging over ornamental plants.



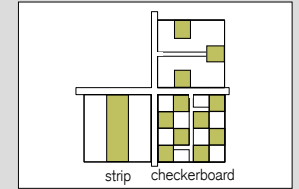
7. farm
area of land, body of water, or structure devoted primarily to commercial food production (produce, grain, and livestock), fiber, or fuel.



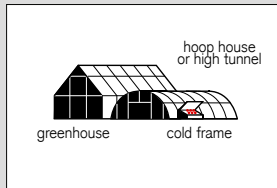
8. food hub
the rise of middle scale farming entails new facilities that aggregate food for collection, processing, and distribution.



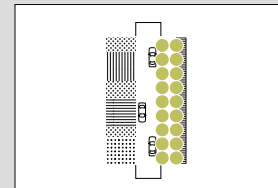
9. forest garden
seven-layer polyculture food production hosted in woodland ecosystems, intermixing fruit and nut trees, herbs, vines, shrubs, fungi, and perennial vegetables.



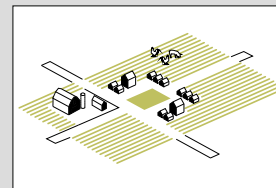
10. garden block
an urban residential block scaled and organized to include shared growing space for food and/or material production within the block's interior.



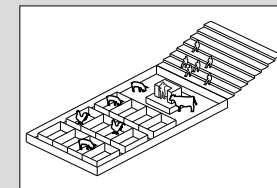
11. greenhouse
transparent or translucent structure in which plants are grown, the smallest type being the miniature cold frame. Hoop houses are becoming common for animal husbandry.



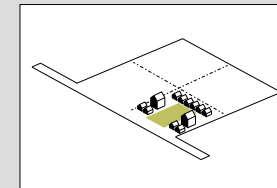
12. GROW Street™ (Gardened Right-of-Way)
public right-of-ways that incorporate food production involving orchard-lined streets, fruit boulevards, planting strips or tree lawns, and edible front yards.



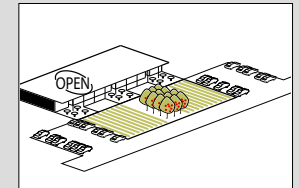
13. hamlet
a form of peri-urban cluster development involving a group of houses and processing facilities arranged around agricultural production or distribution.



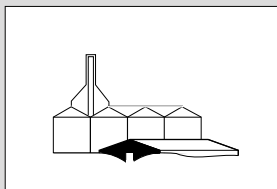
14. livestock exchange/arena
relocalization of food production involves revitalization of local wholesale markets, where services related to animal trade, valuations, breeding, and processing are offered.



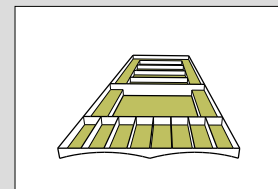
15. pocket neighborhood
a cluster of 4-16 homes centered around a commons and other shared landscapes, including parking and growing spaces, which typically fits within a city block fabric.



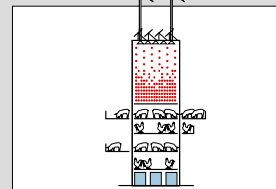
16. restaurant farm
farm-to-table compact where a farm, usually an artisanal operation, dedicates its product to locavore eateries.



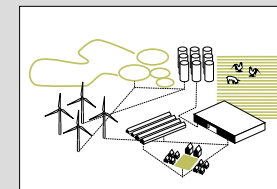
17. storage
food production for resiliency requires community-scaled storage including cold storage, silos, and cellars.



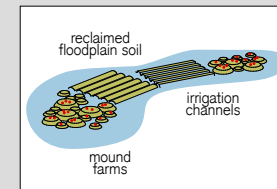
18. thermal garden wall
system of masonry or concrete walls deployed as heat sinks in gardens to trap and retain solar radiation.



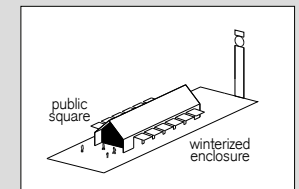
19. vertical farm
high-yield farming in low-to-high rise buildings.



20. waste-to-energy district
form of energy recovery among symbiotic operations in which waste streams from contributing operations are redirected as energy inputs for recipient operations.



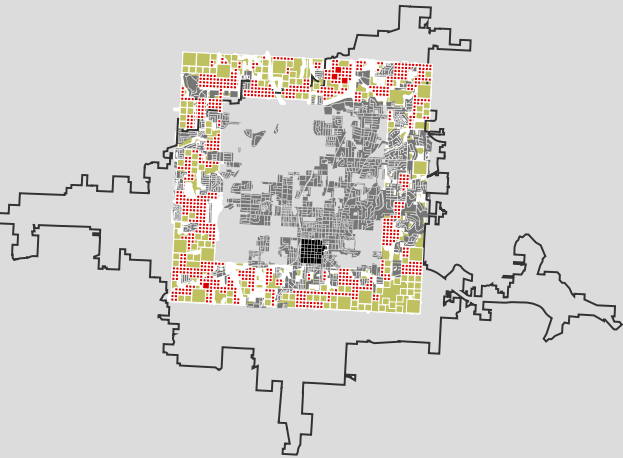
21. wetland farming
polyculture food production involving annual and perennial plants hosted in wetland landscapes, mostly intermixing berries, nuts, grains, seeds, and tubers.



22. winter farmers market
permanent facility in cold to temperate climates that houses producer-to-consumer food purchases year round beyond the summer months.

Food City adds these hybrid alternatives to the nineteen standard real estate product types constituting mainstream land development (see Christopher Leinberger's list in his *The Option of Urbanism: Investing in a New American Dream*).

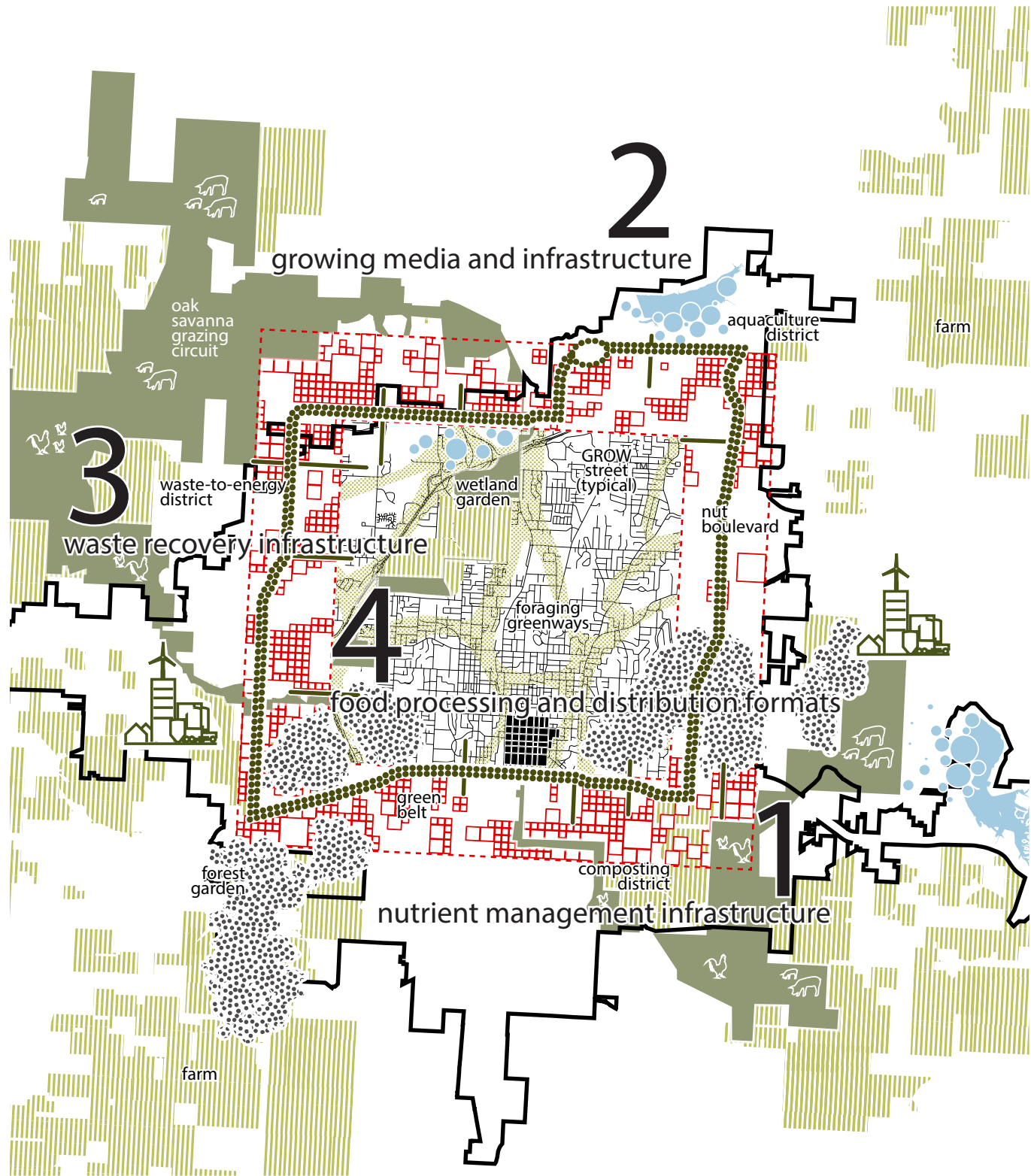
Middle scale urban food production requires **four new types of infrastructure.**



2030 Greenbelt Proposal

Food City establishes a greenbelt that intensifies agricultural systems and urban densities at 15 units per acre along Fayetteville's patchy ring road landscape.

- population 73,580 (projected 140k by 2030)
 - college town
 - hill town
 - 46" annual rainfall
- USDA Hardiness Zone 6b: -5F to 0F



Scenario planning visualizes possibilities unconsidered in conventional city planning processes.

New Development at 15 units/acre
2000 acres
(projected population 135,000)

dairy	veg
poultry	fruit
pork	nuts
grain	

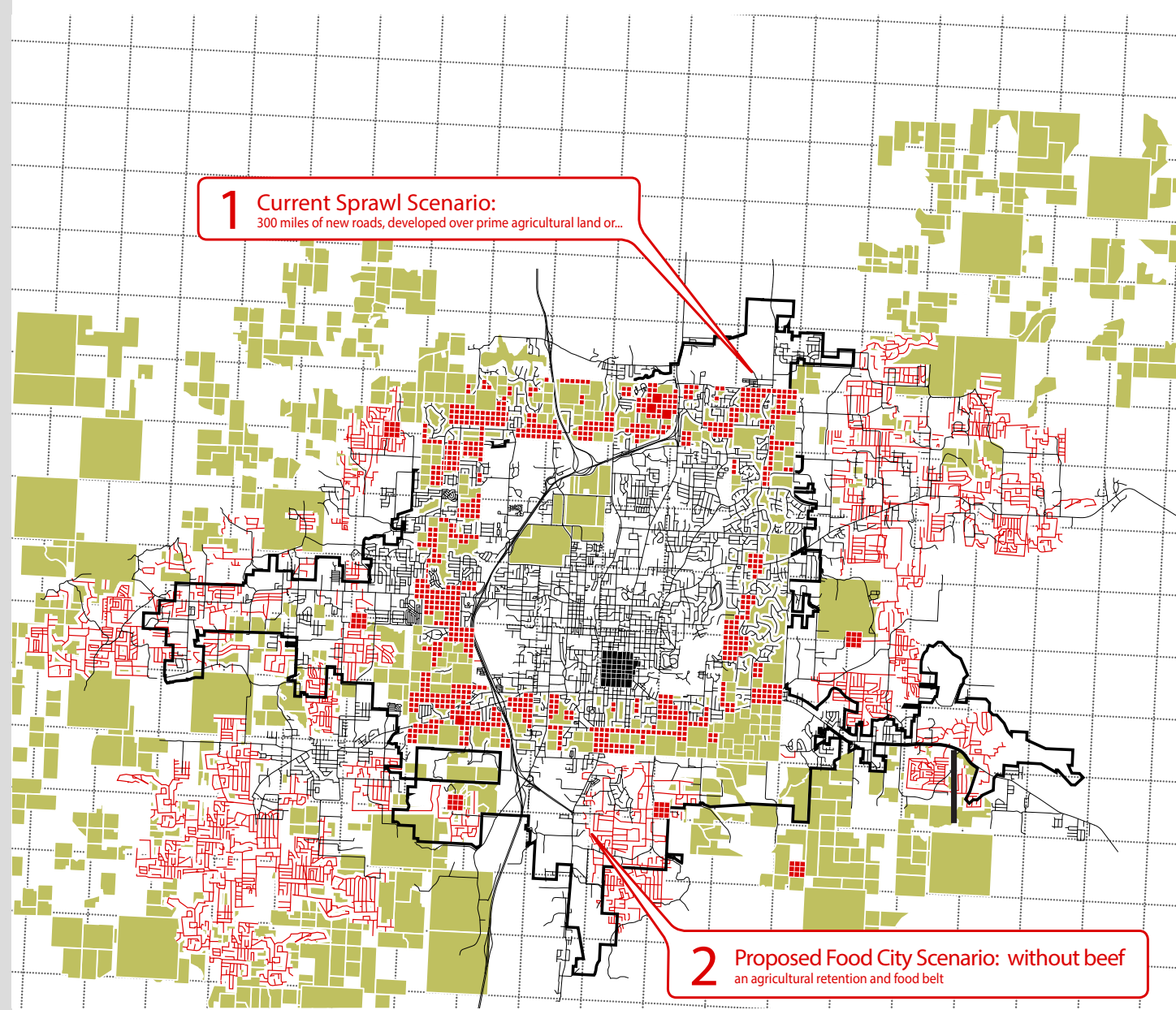
Agriculture Footprint without Beef
35,000 acres of food
(.25 acres per person)

current city footprint
35,000 acres

or...

dairy
poultry
pork
veg
fruit
nuts
grain
beef

Agriculture Footprint with Beef
162,000 acres of food
(1.2 acres per person)



1 Current Sprawl Scenario:
300 miles of new roads, developed over prime agricultural land or...

2 Proposed Food City Scenario: without beef
an agricultural retention and food belt

0 2 miles

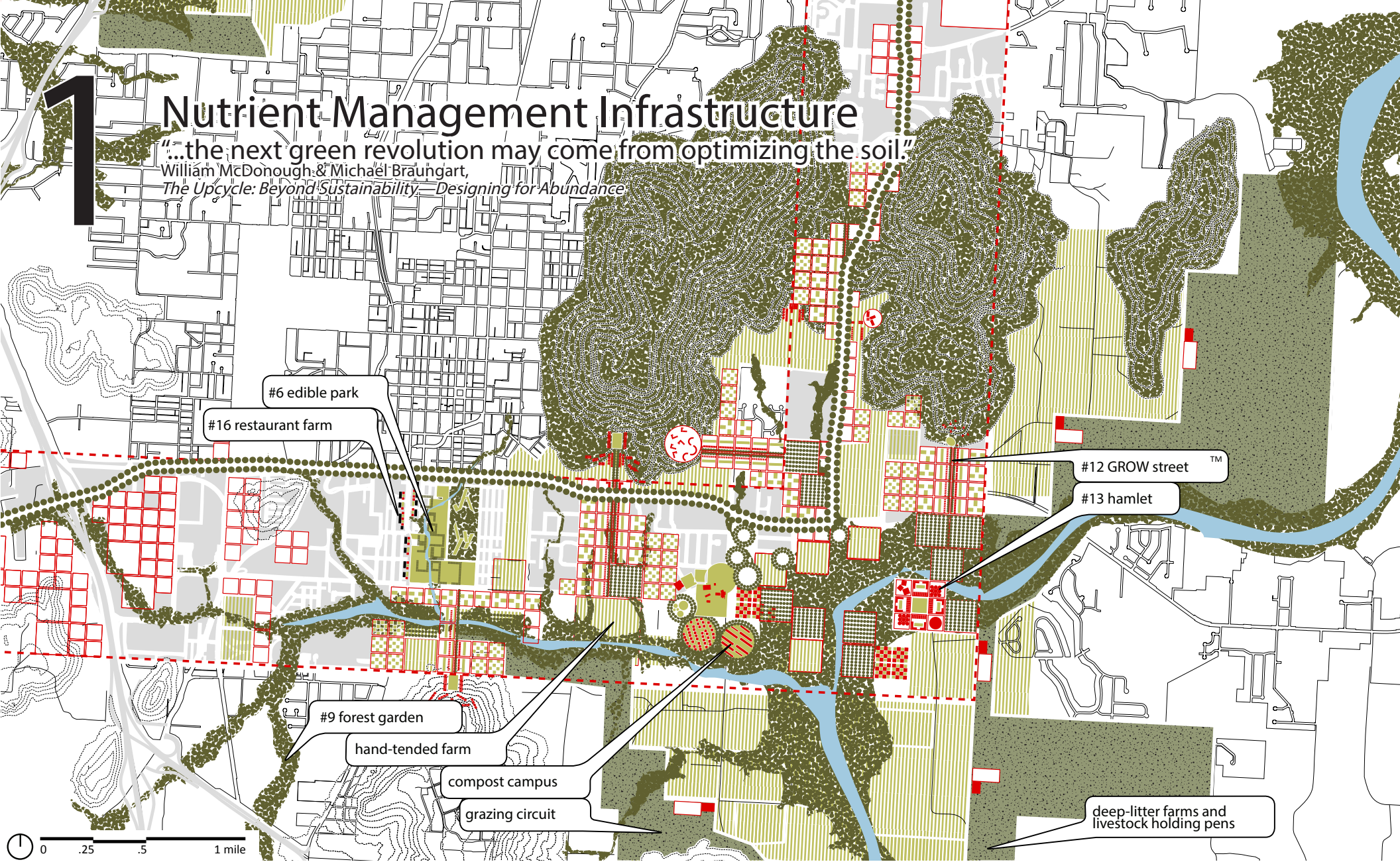
2030 Growth Scenario Driver : Food

Most cities have only a three-day supply of food sourced from globalized supply chains....“We are nine meals away from anarchy”. Food as a driver of city planning processes introduces the role of adaptation to unpredictability and disruption in building resilience and greater prosperity.

Nutrient Management Infrastructure

"...the next green revolution may come from optimizing the soil."

William McDonough & Michael Braungart,
The Upcycle: Beyond Sustainability—Designing for Abundance



1

Compost Campus

These territories are structured around citywide resource recovery and upcycling to reclaim essential biological macronutrients—phosphorous, nitrogen, and potassium—from waste.

- 1 White River
- 2 composting facility
- 3 anaerobic and aerobic composting
- 4 vermicomposting (worm-based)
- 5 stormwater management
- 6 food forest
- 7 residential garden block
- 8 hand-tended farm
- 9 tractor farm
- 10 deep litter farm
- 11 GROW Street™



Precedent:
San Francisco CA, Jepson Prairie



Precedent:
Edmonton CA, Composting Facility

Municipal composting facilities for large-scale waste recovery and nutrient management are necessary in rebuilding healthy soil—the key to local farming.

pollutant remediation guild uses plants that can control odors and treat stormwater or remove airborne particulates.

windbreaks provide wildlife refugia and soil protection from wind erosion.

shelterbelts provide refuge for livestock, control odors, and can be productive landscapes.

GROW Street™
Garden Right-of-Way

1

GROW Street™ Gardened Right-Of-Way

The desire and ability to produce food is socially transmitted. Gardened Right-Of-Ways privilege food production and other non-traffic functions within the street yet still accommodate vehicular uses.



usufruct laws provide the legal right to harvest fruit from private or public property if it overhangs, or is accessible from, public and even semi-public space.



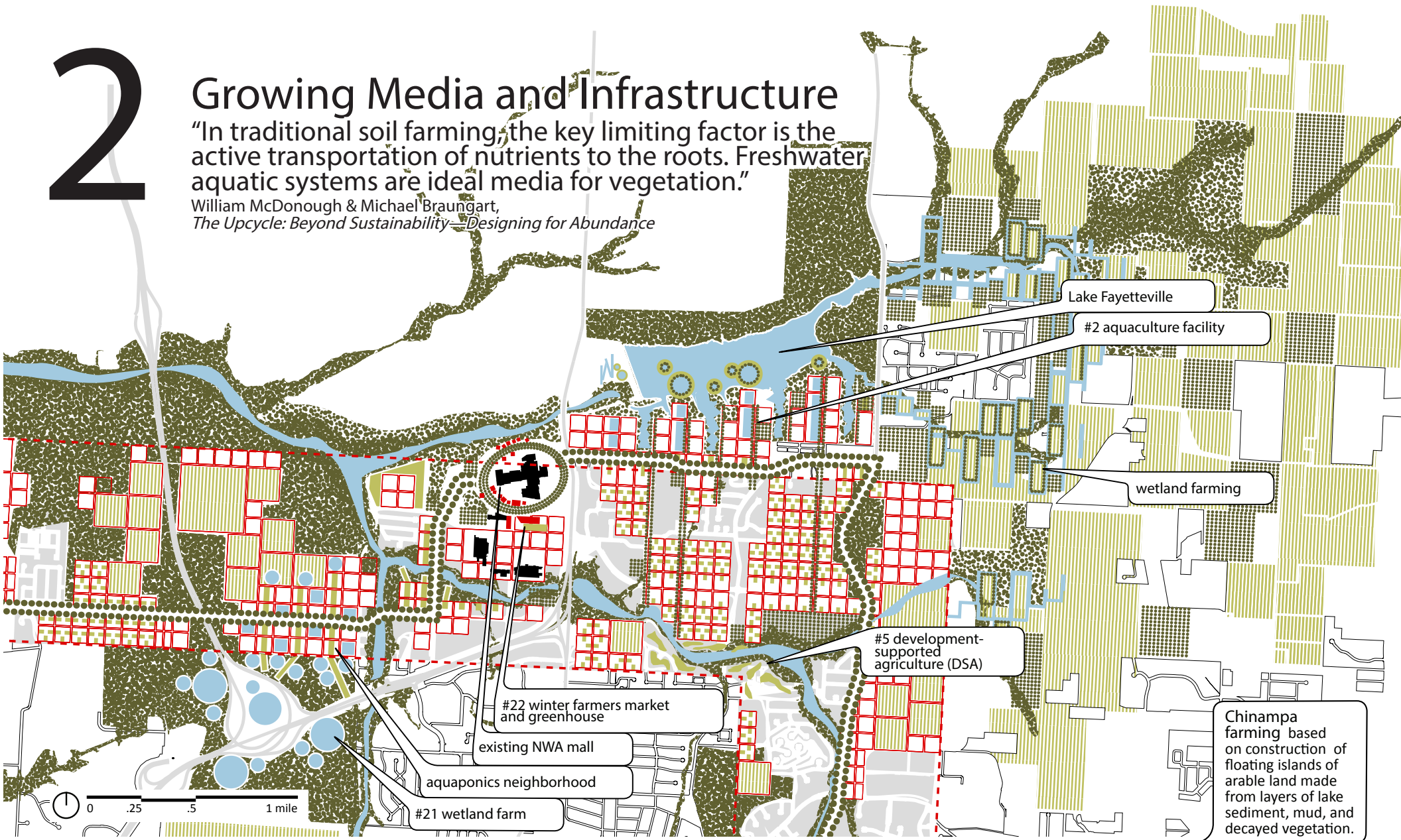
Low Impact Development pollution remediation plant guild supports GROW street.

2

Growing Media and Infrastructure

"In traditional soil farming, the key limiting factor is the active transportation of nutrients to the roots. Freshwater aquatic systems are ideal media for vegetation."

William McDonough & Michael Braungart,
The Upcycle: Beyond Sustainability—Designing for Abundance



Chinampa farming based on construction of floating islands of arable land made from layers of lake sediment, mud, and decayed vegetation.



Lake Fayetteville, Existing



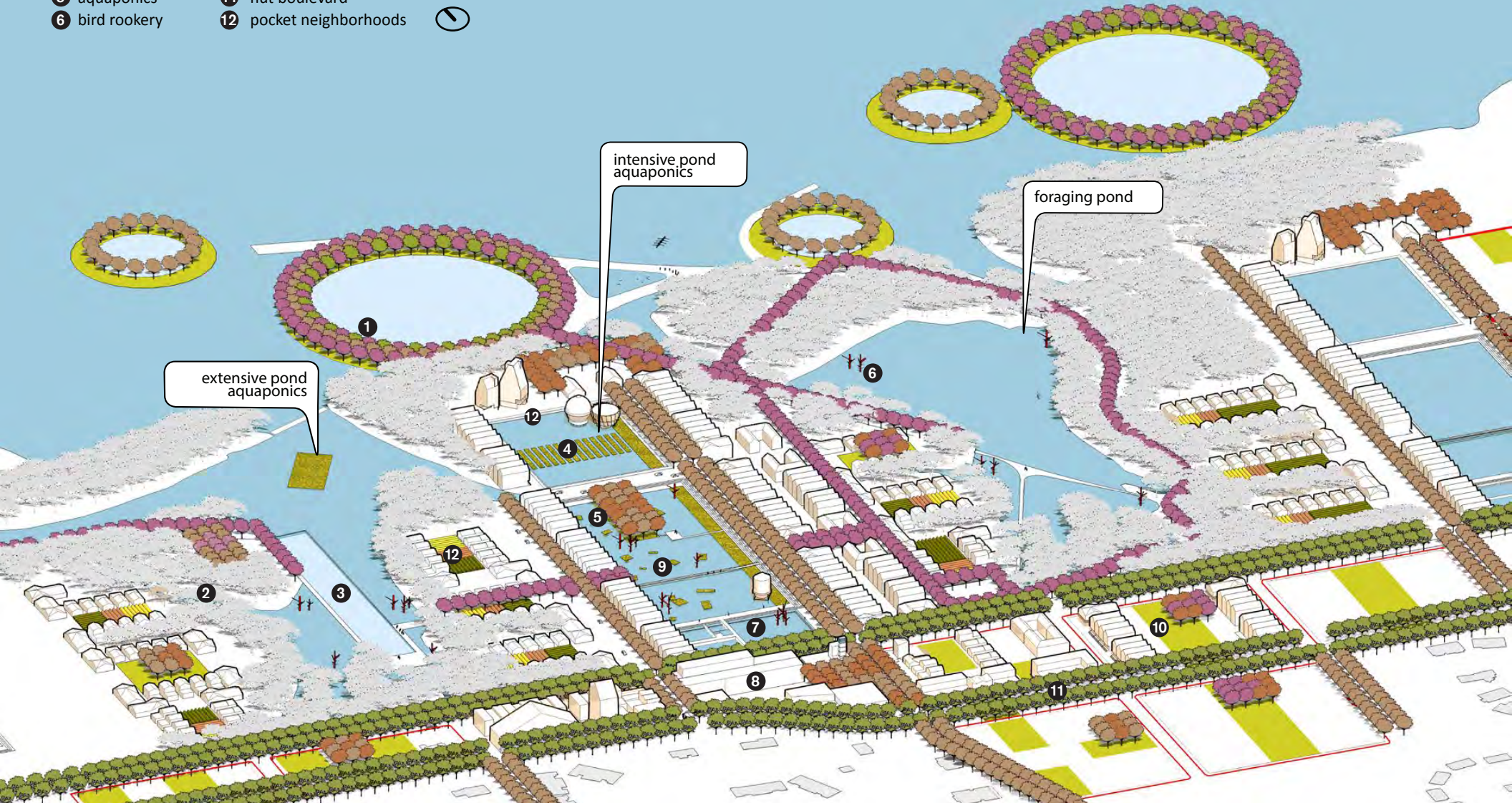
Precedent:
Examples of Chinampa Farming

2

Lake Neighborhood: Integrated Pond Systems

The infrastructure for sustainable aquaponics doubles as a development amenity for neighborhoods. Aquaponics harness the lake's ecology, including cultivation of wetland landscape guilds, to address one of the biggest problems associated with aquaculture: management of fish waste.

- 1 grow-out pond
- 2 wetlands
- 3 suspended pond
- 4 water tower
- 5 aquaponics
- 6 bird rookery
- 7 floating gardens
- 8 hatchery
- 9 nursing pond
- 10 residential garden block
- 11 nut boulevard
- 12 pocket neighborhoods



2

Ponds as the New Commons

Aquaculture technologies range from intensive to extensive, the latter being integrated pond systems among urban land uses. The phases of aquaculture include broodstock holding, hatchery, nursing, grow-out, and quarantining (for acclimation and disease control). Much research is still needed to determine the scalability of systems and fit within urban land uses, as well as an understanding of fish social structures.

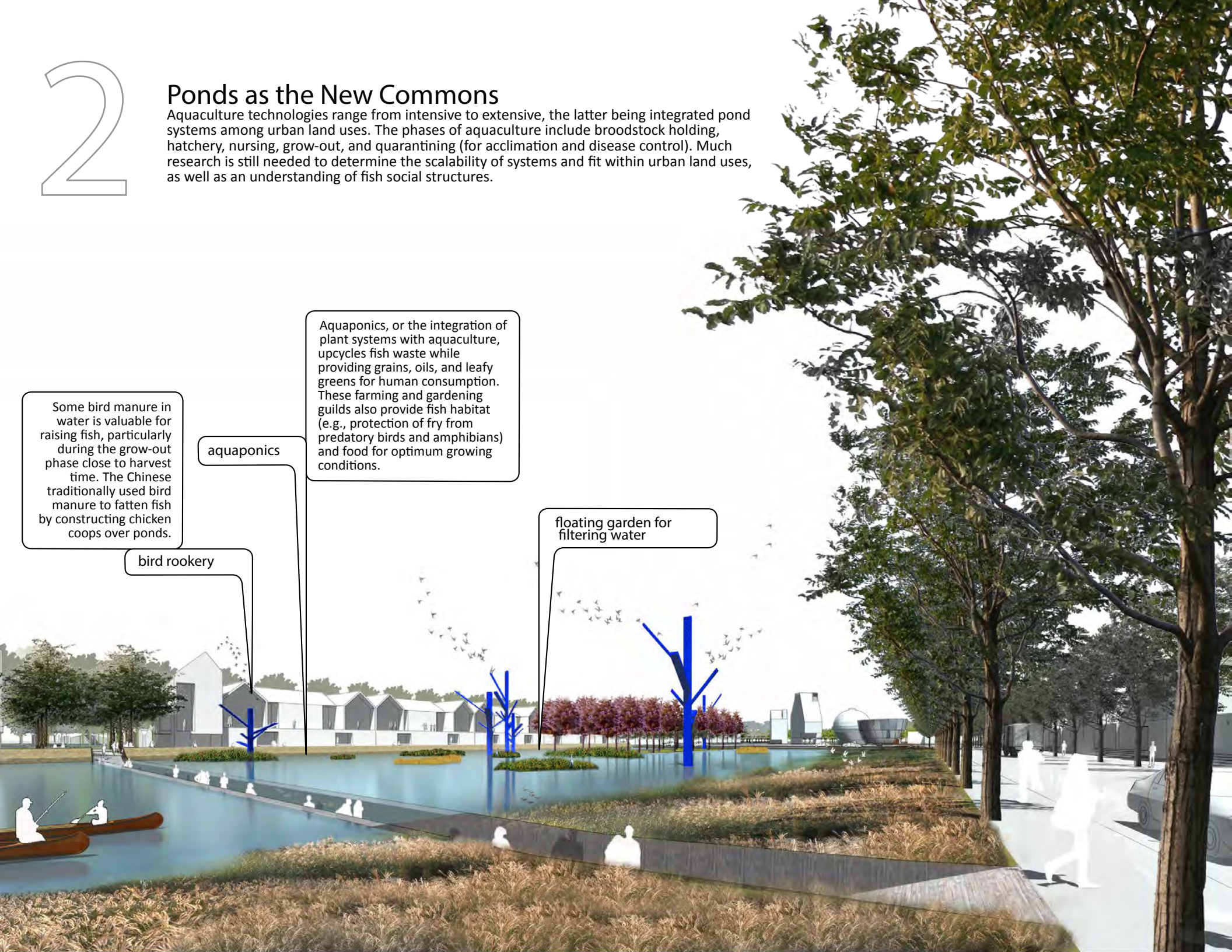
Some bird manure in water is valuable for raising fish, particularly during the grow-out phase close to harvest time. The Chinese traditionally used bird manure to fatten fish by constructing chicken coops over ponds.

bird rookery

aquaponics

Aquaponics, or the integration of plant systems with aquaculture, upcycles fish waste while providing grains, oils, and leafy greens for human consumption. These farming and gardening guilds also provide fish habitat (e.g., protection of fry from predatory birds and amphibians) and food for optimum growing conditions.

floating garden for filtering water



2

Edible Park

Public facilities, like Fayetteville's Walker Park, are ideal places to substitute productive edible landscapes for ornamental landscapes.

- 1 existing riparian
- 2 existing sports fields
- 3 nut and fruit *allees*
- 4 food forest
- 5 community gardens
- 6 parking garden
- 7 commercial corridor retrofit
- 8 pocket neighborhood



Walker Park, Fayetteville



Food awareness overemphasizes the cultivation of food on vacant lots or the improvised community garden, which tend to be placeholder solutions. Planting public spaces with perennial foodscapes institutionalizes the role of food in the city and is the best chance for advancing agricultural literacy. It matters where food is planted and that it is even allowed.

Technologies for increasing the productivity of urban growing



Precedent:
California State Capital Orange Groves



Pollarding



Pleaching



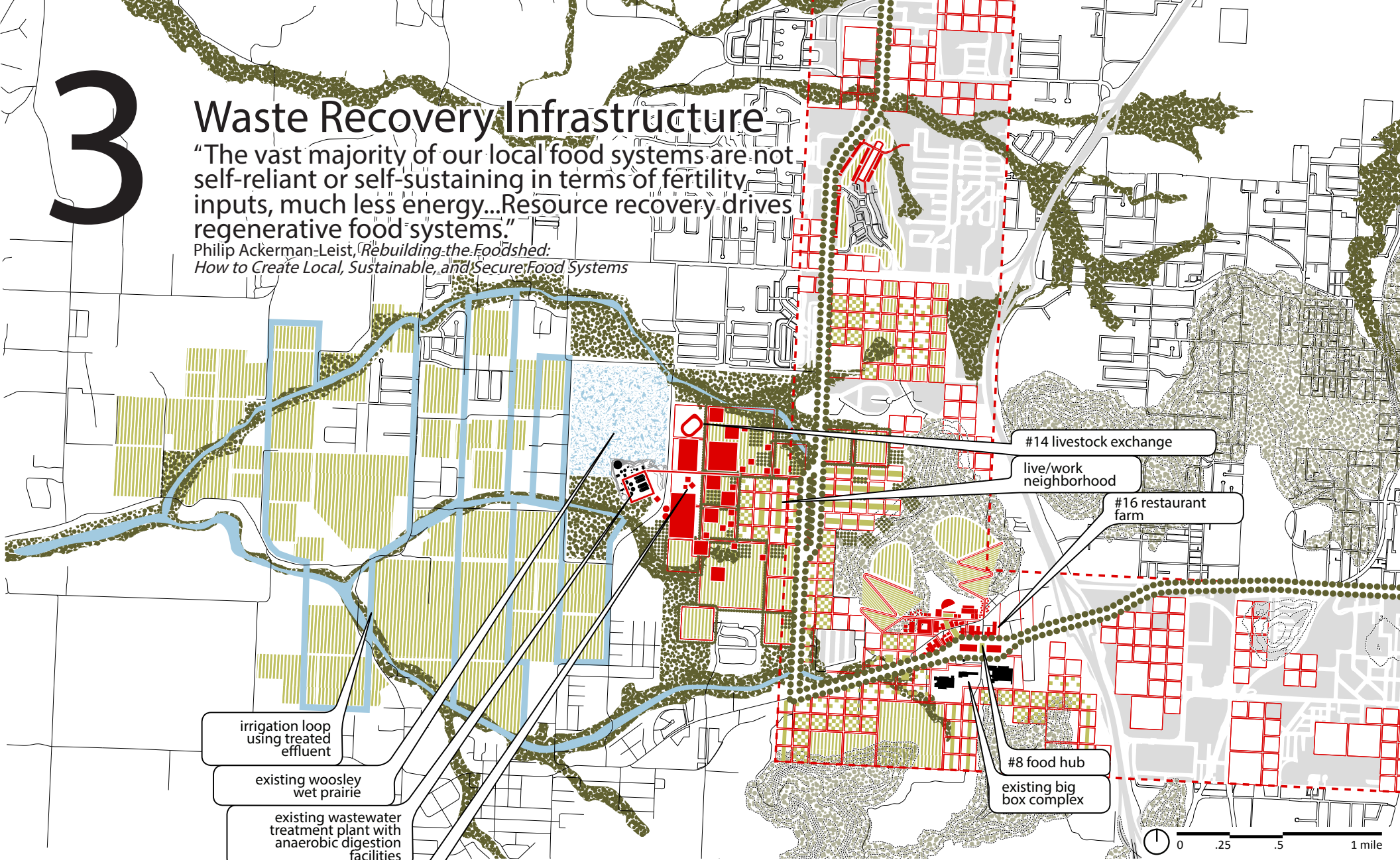
Cordoning

3

Waste Recovery Infrastructure

"The vast majority of our local food systems are not self-reliant or self-sustaining in terms of fertility inputs, much less energy...Resource recovery drives regenerative food systems."

Philip Ackerman-Leist, *Rebuilding the Foodshed: How to Create Local, Sustainable, and Secure Food Systems*



3

Waste-to-Energy Facility

Located at the city's Westside Wastewater Treatment Plant, waste recovery facilities sort, reclaim, and upcycle nutrients in waste streams.

- 1 existing wastewater treatment plant
- 2 existing legacy meadow
- 3 anaerobic digester
- 4 cogeneration plant and grazing roof
- 5 vertical farm
- 6 greenhouse
- 7 biosolids storage and distribution
- 8 livestock exchange
- 9 animal-traction farm
- 10 residential garden block
- 11 hamlet on nut boulevard
- 12 live/work neighborhood



3

Microgeneration Park: Soil-to-Soil Loop

Aggregation of heavy energy users facilitates the small-scale generation of heat and power. Inputs and outputs are exchanged and upcycled as a supplement to central grid-connected power. "Appropriate technology" considers efficiencies in scales and power intensities of a technology as it is aligned with an intended outcome for a given location. The goal of cross-programming these land uses is to move toward a zero-waste production ecosystem.



Precedent:
Greengro Technologies Hydroponic Farm



Precedent:
Vancouver BC, Valcent Vertical Farm

In vertical greenhouses production rates per square foot can be as high as ten times that of conventional farming depending on the crop. While a recent Dutch study showed that vegetables grown in greenhouses require 57 times the energy than comparables grown in an open field, security and yield may trump efficiency—especially when energy inputs that would have otherwise been left for waste become available.

Woolsey Wet Prairie
(named top 50 bird-watching
spot in America)

Westside Wastewater
Treatment Plant

livestock exchange arena

aquaponic greenhouse
(municipal fish hatchery)

birdwatcher pier
(waste loop)

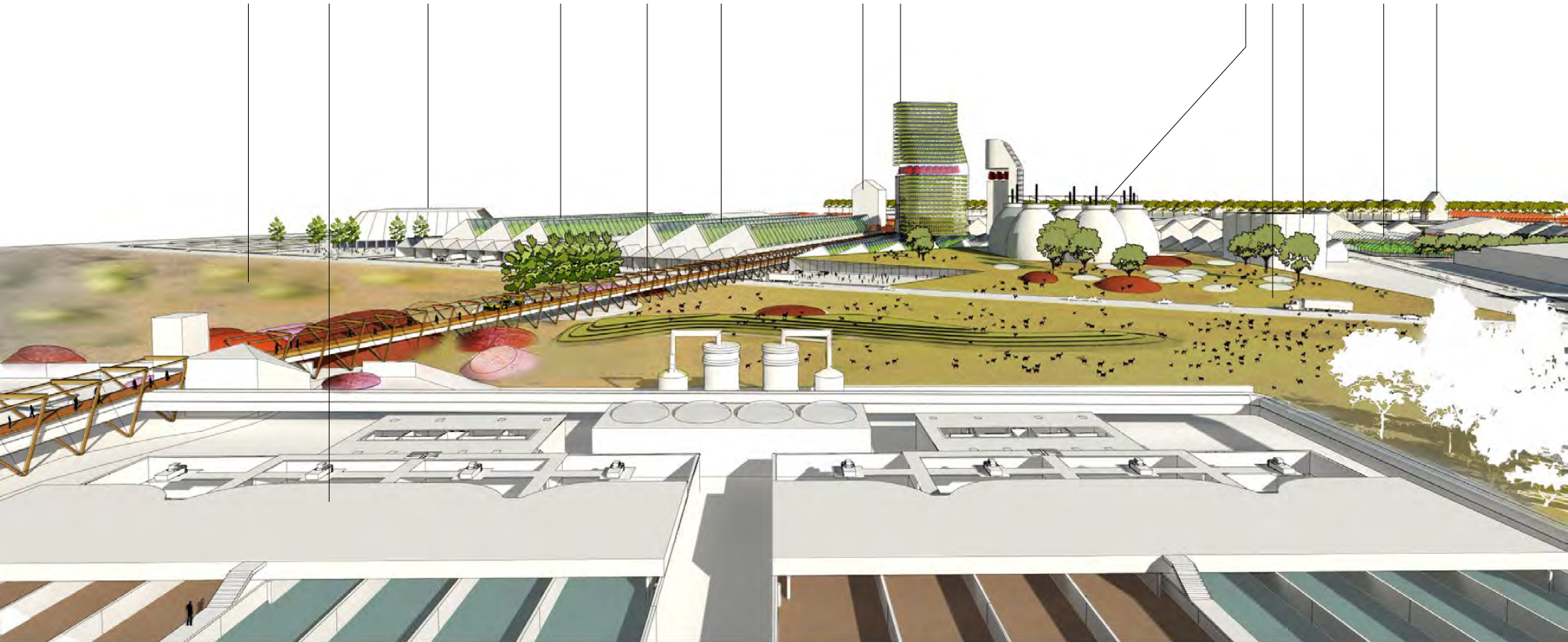
biosolid drying greenhouse

distillery and brewery tower
vertical farm

biogas production park
ungulate grazing area
silage and grain storage

greenhouse

granary



4

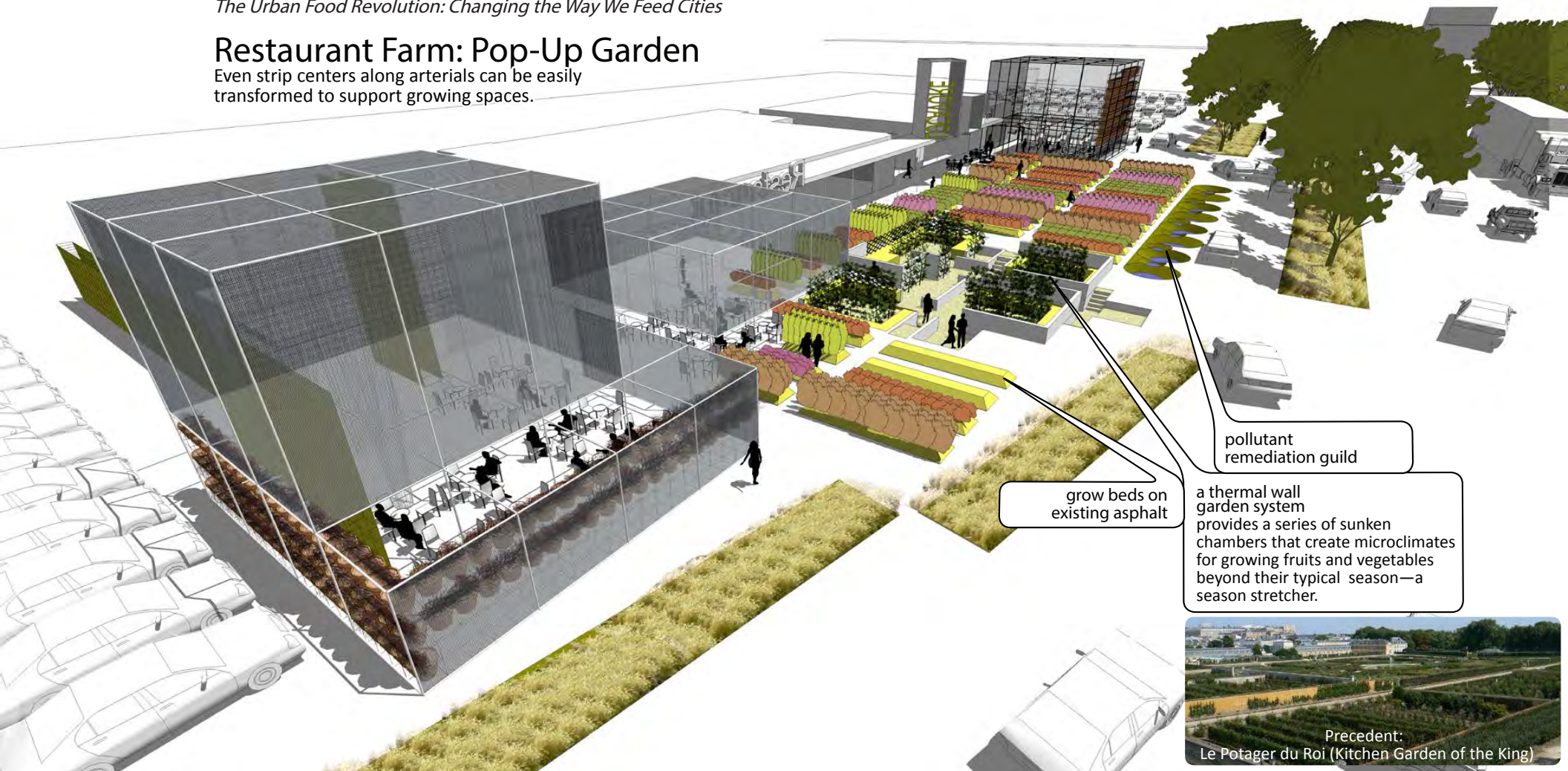
Food Processing/ Distribution Formats

“The more consumers insist on fresh, local food, the more businesses will spring up to supply local seeds, test soil, package and sell compost, manage temporary land leases, supply local processing, grow indoor greens, develop farm-centered subdivisions, invest in technological innovations—and a lot more.”

Peter Ladner,
The Urban Food Revolution: Changing the Way We Feed Cities

Restaurant Farm: Pop-Up Garden

Even strip centers along arterials can be easily transformed to support growing spaces.



grow beds on existing asphalt

pollutant remediation guild

a thermal wall garden system provides a series of sunken chambers that create microclimates for growing fruits and vegetables beyond their typical season—a season stretcher.



Precedent:
Le Potager du Roi (Kitchen Garden of the King)

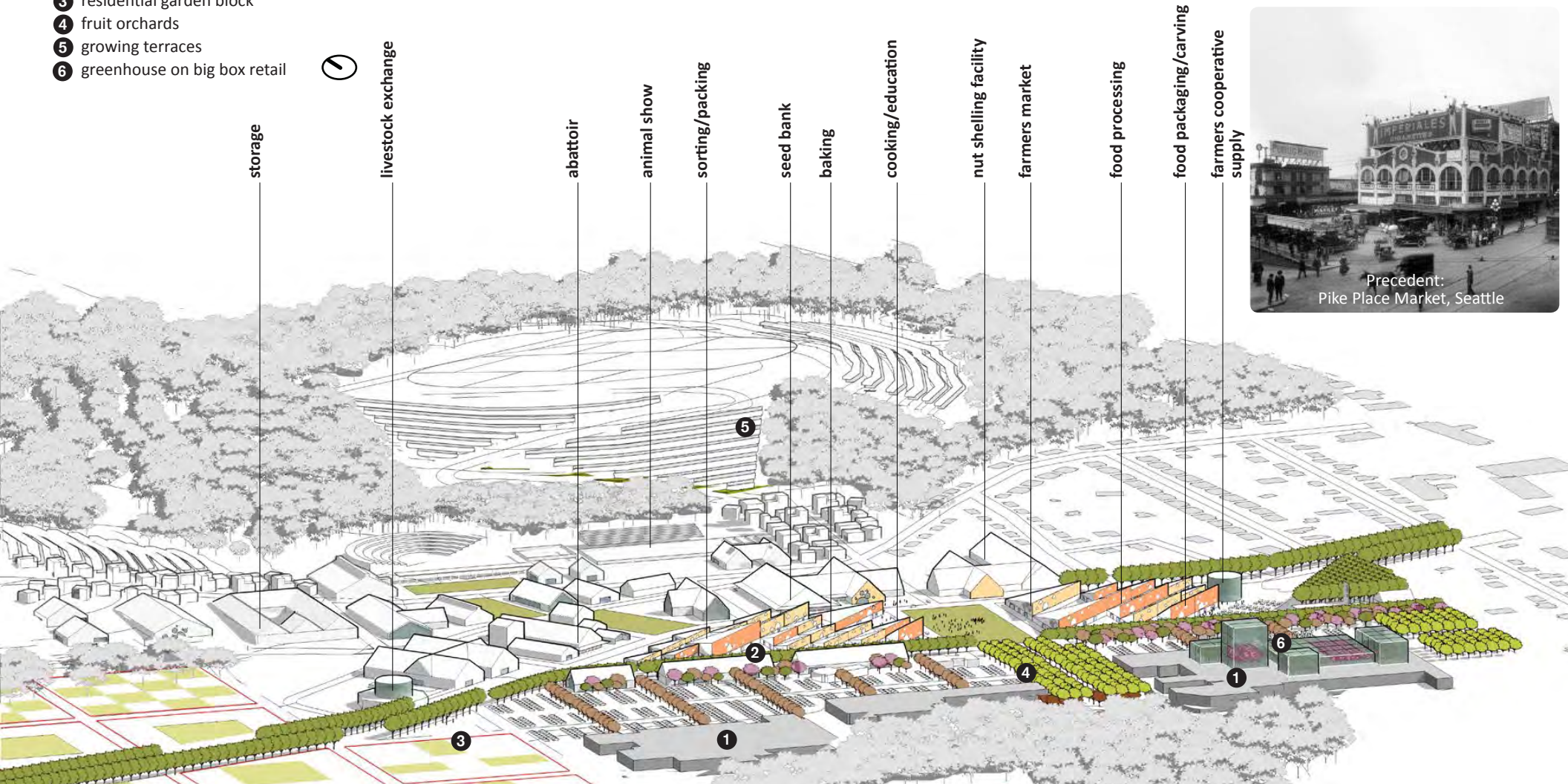
4

Food Hub

Relocalization of a food economy requires reclamation of a processing infrastructure scaled to the economics of small to mid-size farming. Here, *Food City's* hub aggregates facilities for processing, preparation and packaging, distribution, and marketing at an existing big box district within the greenbelt.



- ① existing big box retail center
- ② food hub
- ③ residential garden block
- ④ fruit orchards
- ⑤ growing terraces
- ⑥ greenhouse on big box retail



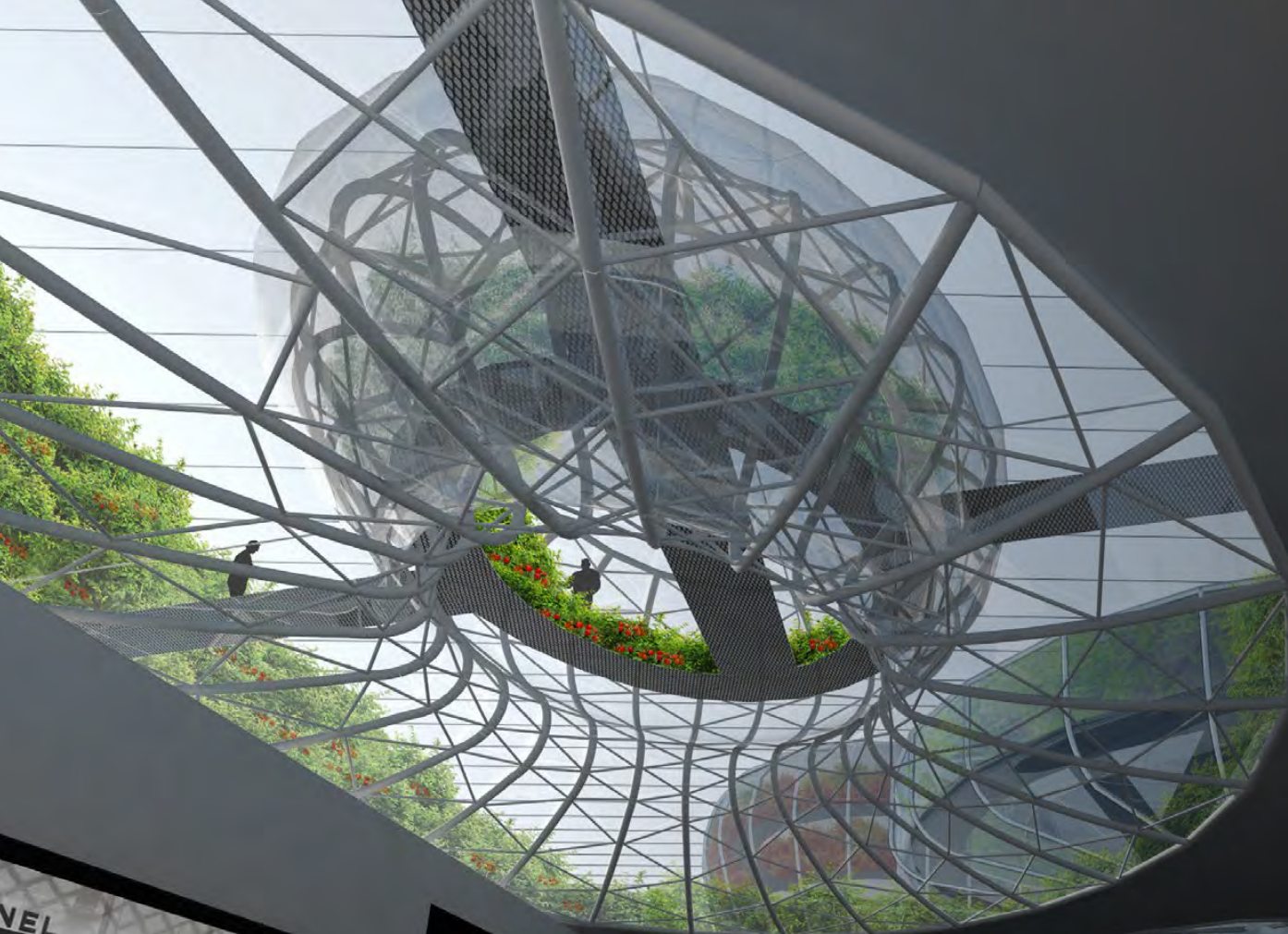
4

Mall Retrofit: Geothermal District

Beginning with Joseph Paxton's Crystal Palace, indoor malls and greenhouses have a shared history. Greenhouses on the mall's roof and edge optimize district-based energy storage and exchange, meanwhile creating a civic landmark at the highest point along this uptown ridge.

- ① existing mall
- ② existing big box stores
- ③ greenhouse roof
- ④ winterized farmers market and greenhouse
- ⑤ vertical farm and housing
- ⑥ thermal garden wall
- ⑦ fruit orchards
- ⑧ nut boulevard
- ⑨ residential garden block





Arkansas is awash in food... despite the nation's worst rate of child food insecurity.

Arkansas produces most of the nation's rice and ranks:

- 2nd for chicken production
- 3rd for catfish and turkey
- 4th for agricultural receipts
- 5th for sweet potatoes
- 6th for grain sorghum
- 9th for soybeans
- 10th for eggs (chicken) and pecans
- 11th for beef cows
- 12th for tomatoes
- 13th for blueberries and grapes
- 14th for watermelons
- 20th for wheat
- 21st for corn, oats, and peaches
- 24th for pigs

Northwest Arkansas is home to Tyson Foods - the world's largest protein producer - and Walmart, the nation's largest grocer



"The study of food is really part of the humanist curriculum."

Evan Fraser & Andrew Rimas,
Empires of Food: Feast, Famine, and the Rise and Fall of Civilizations