



Arcology

A new, integrated model for affordable rural living — food, water, energy, and fertility, organized to close on site so a community sustains itself instead of importing its survival.

Closed-loop community systems

Central Appalachia

Pre-pilot

Rural communities pay a premium to import their own survival.

Across rural and post-industrial America, the basics are trucked in and piped out — and every one of those open loops carries capital out of the community. Each problem is treated separately, with a separate, expensive fix.

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- **Food shipped in** Counties grow commodity crops for export while residents drive an hour to fresh produce. In rural areas, "low access" means more than ten miles to a supermarket.

 - **Inputs bought in** Farms depend on synthetic fertilizer, fuel, and feed they don't control — costs that have grown more expensive and more volatile, where one disrupted supply chain can erase a season.

 - **Infrastructure aging out** Costly municipal water and sewer systems built for populations that have since left, maintained on a shrinking tax base.
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THE INSIGHT

These aren't separate problems requiring separate fixes. They're the **same problem — open loops** — and they are cheaper to solve together than apart.

Water, nutrients, calories, and energy are flows. If you design a community so those flows close on site instead of leaving the system carrying value, the recurring cost of living there drops structurally. The enabling pieces — source separation, nutrient recovery, affordable solar, decentralized water, remote-work connectivity — each matured independently. No one had assembled them into a single community model. So we did: specified, costed, and published.

~75%

of daily calories from the land — by design

425 kg

nitrogen recovered per 100 residents / year

0

synthetic fertilizer inputs required

100

people served per pilot unit

Towers do nutrition. Land does calories. The loop does the fertilizer.

01 · RESIDENCES

The people — demand and source

40 households ringed around the tower, uphill of the cascade. Rooftop rainwater ≈ domestic demand. Source-separating fixtures send urine, solids, and greywater out on three separate pipes.

~4,600 m³/yr rainwater captured

02 · CORE TOWER

The icon — greens, fish, eggs

A daylight grow dome with rotating aeroponic cylinders, a trout RAS basin, and laying hens. The clean potable loop is firewalled from the nutrient side.

15,000 kg produce · 2,000 kg trout · 27,000 eggs / yr

03 · LAND TIER

The calories — staples on contour

Concentric rings double as contour terraces. A Three Sisters guild plus storage apples, sorghum, chestnut, and hazelnut — grown in season, kept for winter.

~75% of daily calories

04 · NUTRIENT LOOP

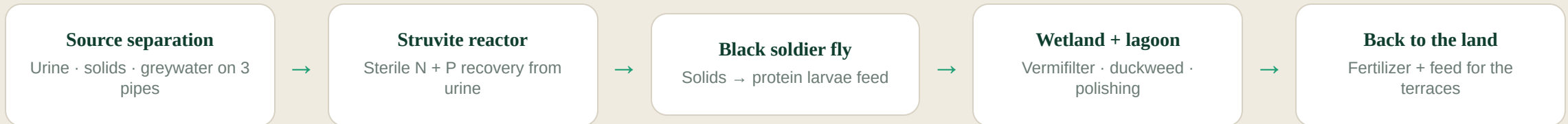
The engine — nutrients come home

A gravity cascade: struvite from urine, black soldier flies on solids, vermifilter, constructed wetland, duckweed lagoon. Returns to the land as fertilizer and feed.

~425 kg N · ~38 kg P recovered / 100 residents

We don't produce waste. We produce fertilizer.

A community's own outflows separate at the source and run downhill by gravity through five stages — returning nitrogen and phosphorus to the land, chemically identical to mined fertilizer. The clean side and the nutrient side never share an open surface.



Regulatory discipline by design. The clean routes — urine-to-struvite (sterile at source) and black-soldier-fly-to-non-food-feed — are what the plumbing is built around. Every output that touches food is mapped before concrete is poured.

A structural need — in a region already funding the solution.

The need is large and concentrated

The USDA estimates ~12.8% of the U.S. population lives in low-income, low-access tracts — roughly 19 million people in food deserts. Nine of the ten states with the greatest share are in the South, overlapping heavily with the communities we serve. These are precisely the places with available land and a need for new economic models.

The capital is real and growing

Through its POWER Initiative alone, the Appalachian Regional Commission has invested \$484.7M across 564 projects since 2015 — explicitly to fund agriculture, infrastructure, and entrepreneurship in coal-impacted communities. Its largest single package, \$68.2M, came in 2024. Our customers are already chasing exactly this funding.

19M

people in U.S. food deserts (USDA)

12.8%

of U.S. population in low-access tracts

\$484.7M

ARC POWER investment since 2015

\$68.2M

largest annual POWER package (2024)

Build to prove. License to scale. Engineer to sustain.

BUILD

Pilot communities

We develop pilot and demonstration communities that prove the model and generate development revenue. Capital-intensive, but the credibility engine for everything else.

Proves it

LICENSE

The model & standard

Developers, housing authorities, and municipalities adopt the model and design standard and fund their own builds. High-margin and capital-light — the licensee carries the capital.

Scales it

ENGINEER

Systems integration

We provide the design and systems-engineering to adapt the model to each site, monetizing the expertise directly between builds.

Sustains it

The license and engineering streams let the model travel on other people's balance sheets — so we grow without owning every project's capital stack.

We're not a better vertical farm. We're a different business entirely.

Beachhead customer

The **landowner-developer** — an individual or small entity with rural acreage and access to capital, motivated by mission as much as margin. They have the two things a pilot needs: land and the means to build. The customer set then widens to institutional developers, housing authorities, and rural municipalities.

The moat is integration

The components are commodities anyone can buy. The hard part — what took a decade of systems-engineering — is assembling them into a single loop that closes affordably on a real site. Vertical farming chased premium urban produce and stumbled badly; we serve rural communities where the value is lower cost of living. First credible, replicable standard wins the category.

Integration

accumulated systems know-how that deepens with each build

The standard

first replicable, costed model becomes the reference others build to

Founder + place

12 years embedded in the exact context this must prove out in

Pilot, prove the loop. Cluster, share the plant. District, change the region.

Each phase is sized off the same per-100-resident unit, so growth is replication, not redesign — and cost per household falls 20–40% from pilot to district as infrastructure is shared.

- **Pilot — 1 tower · 100 people · 40 households**
One dome, prove the loop. Planning capex \$1.5–2.5M.

- **Cluster — 5–8 towers · 500–800 people**
Shared central water, nutrient, and cold plant; shared solar and LED silos. \$8–15M.

- **District — 30–50 towers · 3,000–5,000 people**
District staple greenhouses, reservoir, energy plant. The scale that changes a regional economy.

Rural America is not short on ingenuity. It is short on margin.

When the fixed cost of living falls structurally, households and communities gain surplus — capital and time that went to survival become available to build with. That freed capital is what people invest in their own ventures, equipment, and education. A community that sustains itself keeps its capital circulating locally instead of exporting it every month.

Households gain margin

Lower cost of living frees capital to invest in local enterprise and innovation.

A new rural industry

Each build spreads durable, place-based construction and operations jobs that can't be offshored.

Value flows out as expertise

An Appalachian-born model exported to other rural regions — reversing a history of extraction.

Operators who have built real things in this region.



Payton May

FOUNDER

Twelve years building ventures in central Appalachia, including BitSource — a software and data firm that retrained laid-off coal workers into software developers. Systems and integration background; architect of the Arcology model.



Charles Justice

CO-FOUNDER (PROSPECTIVE)

Civil and mining engineering experience across the energy industry. Brings the earthwork, site engineering, and heavy-infrastructure expertise the terracing, water, and cascade systems require.



Lynn Parrish

CO-FOUNDER (PROSPECTIVE)

Background spanning the energy industry and land acquisition. Brings the land sourcing, partner relationships, and development capital pathways central to siting the first pilot.

Advised by research collaborators at the University of Pikeville on optimizing the system as an integrated whole.

From a rigorous concept to a proven loop.

Where we are

The full system is specified, costed, and published, with a public build directive and a working economic calculator. A self-funded demonstration model is underway. We collaborate with the University of Pikeville on related research, and bring an existing network of municipal, healthcare, and institutional relationships built over twelve years.

True by October 2026

A **working demonstration of the core loop** will exist — instrumented, with real recovery-rate and water-quality data replacing estimates. A **first pilot site** will be identified in central Appalachia, with land access through business partners. The **licensing framework** will be structured and ready to activate the moment the demonstration validates the model.

Published

full system spec, build directive & calculator live

Self-funded

demonstration model underway, built capital-efficiently

12 yrs

regional operating history & institutional network

\$100,000 builds the proof that unlocks everything downstream.

A full pilot is a ~\$2M project — this prize doesn't build a pilot, and we won't claim it does. It builds a working demonstration of the core loop: the most novel, most doubted, most de-risking part of the model.

Build the proof

Materials, fabrication, instrumentation, and assays for a demonstration of the nutrient loop and grow tower — turning the most skeptical claim into measured recovery rates and water quality.

Turn proof into a business

Refine unit economics with real data, produce the licensable design standard, engage a first landowner-developer partner, and lay groundwork for the next raise.



A place that leads rather than lags —
that exports a model instead of importing
decline.

We have the land, the need, and increasingly the will. What we've lacked is a model. That is what this is.

Arcology · Pikeville, Kentucky · USDA Zone 6a