Whole Property Retrofit: Redesigning Suburbia for an Uncertain Energy & Food Future

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The Resilience Hub  resiliencehub.org
2. What foods or plants would you like to see included in the design?

- Use stickers to vote for your favorite plants & foods.
- Use post-it notes to add your ideas that aren't shown.
To build personal, household and community resilience in the face of climate, energy & economic challenges...
While also creating thriving examples of **community abundance** consistent with permaculture ethics & ecological principles
RANGE OF BEHAVIORS & STRATEGIES

NEGATIVE
- polluting
- extracting
- degrading
- damaging
- depleting
- diminishing health & resources
- “brittle” vulnerable systems

NEUTRAL
- sustaining
- maintaining
- holding
- preserving
- conserving
- minimizing damage

POSITIVE
- repairing
- restoring
- regenerative
- increasing fertility
- increasing yield
- enhancing health & resources
- resilient systems
Permaculture

A **Design Method** and set of techniques based on ecological patterns; used to create healthy ecosystems and human settlements.

Food | Energy | Water

Buildings | Economy | Culture
PERMACULTURE DESIGN PROCESS

A suggested process that can be modified, expanded or contracted as you see fit. This process is generally not linear and some projects require more of some design stages than others!

1. AWARENESS RAISING
   about permaculture
   about the design process
   about the possibilities

2. GOAL SETTING & PREWORK
   goals, objectives & wish lists
   problems to solve
   research base mapping

3. SITE WORK
   observation
   data collection
   site surveying
   reading the landscape

4. ANALYSIS & ASSESSMENT
   zones & sectors
   input/output
   scale of permanence
   assets & challenges

5. DESIGN CREATION
   draft design concepts
   design review
   final design & supporting media

6. INSTALL & IMPLEMENT
   as time, money, and energy allow
   participatory ecology

www.resiliencehub.org
The Resilience Hub - Revised 2.15
Portland, Maine USA
Inspired by Kelton, Jackie, Toennies; Doherty & others.
Adaptive Resilience
Retrofitting Suburbia

An experiment in converting a suburban home (liability) to a regenerative ecosystem worthy of replication at scale (asset)
Initial Design Goals (2005)

- Get off fossil fuels
- Produce more food & medicine in the landscape
- Withstand disruptions (energy, food, weather, etc.)
Design Goals (now)

Same as 2005 PLUS...

- Create a functional alternative for people to **experience** (demonstration site)
- Have a place to **experiment** and test strategies
- Minimize living **costs** while maximizing **benefits** such as health, enjoyment, security, comfort, biodiversity, etc.
Whole Property Analysis

From ROI...

Primarily focused on financial metrics, cost of “investment” relative to increased returns or savings

i.e. cost of insulation : money saved on heating fuel
Whole Property Analysis

To IOR…

Input-Output Ratio

Seeks to use a comprehensive set of inputs and outputs to understand full impact
Whole Property Analysis

Heating Fuel
DHW
Electricity
Water & Sewer
Food
Transport
Property Maintenance
Whole Property Analysis

- Heating Fuel
- DHW
- Electricity
- Water & Sewer
- Food
- Transport
- Property Maintenance

- Comfort
- Security
- Community
- Neighborhood / Village
- Experience/Skills
- Resilience
- Adaptability
- Experimentation
- Quality of Life
- Ecosystem Health
House Elements & Strategies

Insulation (House + Basement)
Air Sealing
DQ Oil Boiler
Wood Stove for Heat
Replace Windows
New Roof (light color)
Solar DHW (90% fraction)
Integrate House/Yard (SE/SW sides)
Root Cellaring
Rainwater Collection
Electricity Reduction
Shade Plantings
Grey water
“Deep Energy” Incremental Retrofit
Clothes Drying
Some Tree/Shrub Crops

- Apples (4 Varieties)
- Pears (Asian + Euro)
- Precocious Hazelnut
- Apricot
- Rowan / Mountain Ash
- Blueberry (various)
- Strawberry
- Paw Paw
- Hardy Kiwi
- Gooseberry
- Currants
- Rosa Rugosa
- Pea Shrub
- Black Locust (fence)
- Peach
- Grapes
- Edible Bamboo
- Elderberry
- Raspberry
Other Perennial Crops

*Not including medicinals/culinary herbs*

- Turkish Rocket
- Caucasian Spinach
- Air Potato
- Dystaenia (Wild Celery)
- Chickendive (reseeding)
- Birdsfoot Trefoil
- Sorrel
- Sea Kale
- Good King Henry
- Comfrey
- Perennial Arugula
- Heritage Grains (Emmer, etc.)
- Ducks & Chickens
- Honey
- Ramps + Various “walking” onions
- Water celery
- Jerusalem Artichokes
Still on the Docket

- Sauna
- Wood cookstove
- Outdoor Kitchen
- Passive solar sunroom/ mudroom
- Cool cupboard
- Basement rainwater cistern
- Off-grid PV system
- More perennial food
- Workshop/Nursery space
- Neighborhood Cow 2.0
- Electric vehicles
Heating Fuel

2005

Approx 800 gal heating oil / year

~111 MBTU per year

2015

Approx 2 cord hardwood / year

~48 MBTU per year

Locally-sourced fuel from arborists & woodlot owners, super clean burn stove, far greater thermal comfort, external combustion air intake w/backdraft damper

$1600 savings per year
Domestic Hot Water

2005 included in oil boiler

2015 20 tube solar thermal system, Marathon tank, Purist module

Meets 90% of DHW needs, electric element fills the gap (approx 20 min per month); .5 gal/min shower head (AquaHelix)
Electricity

2005
~ 20 KwH per day
~ $1900 per year

2015
~ 10 KwH per day
~ $950 per year

Interior & exterior air drying of clothes, still run 2 small chest freezers, larger gains expected when we get off electric cookery, pv panels queued up for 2016 install (off-grid) (plan to get under 7KwH/day)
Water & Sewer

2005
~ 500 cf per month
~ $540 per year
original septic

2015
~ 300 cf per month
~ $216 per year
septic, greywater, composting toilet

avoided cost for connecting to municipal sewer ~10-15K, rainwater for all irrigation needs
approx 66K gal/year rainwater collection potential
Food

2005
CSA, groceries, occasional bulk purchase
~ $6000 per year

2015
~ $3000 per year
~ 1000# per year annual veg
~ 500# per year perennial food
[~2000#/year at maturity]

does not include meat, eggs, foraged foods. all food production costs offset by barter and sales of surpluses. 3-4h per week average labor “cost,” increased nutrition, soil carbon, biodiversity, etc.
Transportation

2005
~ 30K miles per year driven

2015
~ 15K miles per year driven

still using gas vehicles avg 25 mpg, lifestyle/job changes, public transport, cycling, walking
~ $13K savings per year
$18,850 per year in savings
(not including avoided sewer hookup)

investments averaging $5,000 per year
every 1% increase in soil organic carbon to 30 cm depth = 59 tons/acre CO₂ sequestered

AND

15,400 gal/acre more water-holding capacity

~98 tons of carbon sequestered in the soils of this property (6 new inches @ 10% SOC)
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Food
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Property Maintenance

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Security
Community
Neighborhood / Village
Experience/Skills
Resilience
Adaptability
Experimentation
Quality of Life
Ecosystem Health
Some learnings...

- Significant progress year-on-year with small amounts of cash investment (plus skills and social capital).
- One-third of an acre is way more than one-third of an acre.
- Open questions/ideas about how we support each other to do this work (skills, resources, advice, etc.)
- Need to keep working on metrics for whole property approach.
- Results are contagious.
The value of whole system design for the Suburbs...
Preliminary Charrette Ideas
Center for Local Self Reliance At Fairhaven Park
Discussion?
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